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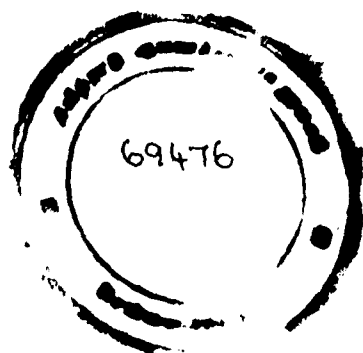
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PLATE I



A wild cacao tree on the "plateau" in the Mamaboen Creek Valley.

To face page 1.]

BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1930 ROYAL BOTANIC GARDENS, KEW

I.—NOTES ON WILD CACAO IN SURINAM AND IN BRITISH GUIANA. J. G. MYERS.

In 1920 Professor G. Stahel, Director of the Surinam Agriculture Experiment Station, published a brief description of a stand of wild cacao which he had examined on the 'Coppename River, of Dutch Guiana (8). His purpose was to discover whether the undeveloped hinterland could be regarded as the source of the widespread outbreak of witches'-broom disease (*Marasmius perniciosus*) which was doing such widespread damage in the cacao plantations of the lowlands. He wished also to examine the wild cacao for potential insect pests which had not yet reached the cultivated areas.

The present writer, investigating for the Empire Marketing Board the possibilities of biologically controlling the more important insect pests of the West Indies, wished to search the wild cacao for possibly utilisable parasites of the major insect pests of the cultivated plant—notably cacao thrips (*Heliothrips rubrocinctus*) and cacao beetle (*Stirastoma depressum*). The results of this examination will be published when the insects concerned have been determined. It is sufficient to state here that the chief insect pests of cacao were not found attacking the wild tree; and this, taken in conjunction with Reyne's observations, seems to indicate that thrips and cacao beetle, at any rate, have become attracted to cacao from other wild host-plants (for the beetle, notably *Pachira* spp.) since its extensive cultivation.

As the locality has not been visited since Prof. Stahel was there in 1920, and in view of Pittier's recent work (4 and 5), a few notes on the cacao trees themselves and their environment may be of botanical interest.

Paramaribo was left on 24th May, 1929, first by road, a few miles, and then by launch down a canal in a westerly direction to the Saramacca River, down which we journeyed all night to the sea, and passed up the mouth of the Coppename River before dawn the next day.

The banks were densely mangrove-clad (*Rhizophora Mangle*) with occasional stretches of *Drepanocarpus lunatus* on the water-front. Even only a few miles above the mouth, tall *Montrichardia aculeata* was not infrequent among the mangroves.

At noon we passed the mouth of the Tibiti Kreek, and thence-forward the mangroves lost their dominance, and were largely

replaced by *Drepanocarpus* backed by high and luxuriant *Montrichardia*. Behind this again the low mixed forest showed vast numbers of slender *Euterpe edulis* palms, often in pure stands of considerable extent. A *Maximiliana* was also fairly plentiful.

Very early in the afternoon the water front began to be occupied extensively by *Pachira aquatica*, interspersed with stretches of *Montrichardia*, sometimes bordered by beds of a *Crinum*.

Later a species of *Inga* appeared as a fringing bush, while the stretches of *Pachira* were varied with trees of *Pterocarpus draco*. *Euterpe edulis* continued the dominant palm at least on the banks. We continued after dark as far as Heidotti, the highest Indian (Carib) settlement on the Coppename, and spent the night there.

Continuing up the river next morning (26th) we found the vegetation of the banks profoundly changed. For some distance past the village there was considerable secondary growth—*Cecropia peltata*, *Triplaris surinamensis*. *Spondias* sp., a whitish berried *Cordia*, and bamboo.

The virgin forest later was of a mixed type, with a heavy fringe of creepers forming a curtain at the water's edge. Certain of these vines, notably *Allamanda cathartica* and undetermined members of the families *Malpighiaceae*, *Bignoniaceae*, *Convolvulaceae* and *Papilionaceae*, were in full flower. The dominant palm was now maripa (*Maximiliana Maripa*). *Montrichardia* was still frequent in places, but *Pachira aquatica* had gone. Small groves and clumps of *Ravenala guyanensis* appeared, and an *Ischnosiphon* was plentiful. Among the small trees was *Pentaclethra filamentosa*. Later, two species of *Costus* formed extensive brakes.

The scattered taller forest trees further from the bank now sometimes bore long streamers of *Tillandsia usneoides*.

The bank fringe in places consisted entirely of shrubs and small trees of a species of *Inga*. *Genipa americana* also stretched its branches over the water.

There were here and there considerable stands of *Heliconia Bihai*.

Kaaimanston, the highest Boschneger village on the Coppename River, was reached the same morning and arrangements made for the hire of dug-out canoes and paddlers for the journey up the Kwamma Kreek.

The mouth of this tributary (known also as the Marame) was entered about noon the next day, the launch being left in the main river, and the rest of the journey made in three canoes. The vegetation of the banks from Kaaimanston to the Kwamma Kreek showed little change from that of the previous day. *Inga* sp. was even more common.

On the creek, the forest was of the same mixed type, with occasional tall trees, among which were recognised silk-cottons (*Ceiba pentandra*) and some unusually large *Pentaclethra filamentosa*.

Patches of water-guava (*Psidium polycarpon*) appeared in the water near the bank or even (on submerged rocks?) in mid-stream. The water was very high.

Camp was made early in the afternoon and shelters thatched hurriedly with palm-leaves kept out the torrential rains, which fell without ceasing during the evening and night. The dominant palm of the undergrowth, and the one which was used for the camp-shelters was an undetermined species of *Astrocaryum*, known locally as "boegroemakkas" as Prof. Stahel informed me on our return. It was plentifully covered with long, brittle black spines.

Soon after leaving camp next day, rapids were encountered, and again at frequent intervals till we reached our final camping place, soon after noon, near the wild cacao on the Mamaboen Kreek, up which, from the Kwamma, we had to cut a way for the canoes through the bushes and trees which met over the water.

It was in this Mamaboen Valley that Stahel found cacao trees for a distance of some 6 or 7 kilometres, and he was informed by a reliable Boschneger (Granman Mentor) that the trees extend along the whole valley, which is 30 to 40 kilometres long.

Wet season conditions, with the frequent occurrence of flooded areas, made progress through the bush rather difficult, and we were able to explore only a very small part of this area in the three and a half days available.

By the character of the undergrowth the country traversed could be divided into three main types; firstly, the slightly higher patches with an undergrowth consisting almost solely of the boegroemakkas palm (*Astrocaryum* sp.); secondly, the lower areas, with stands of *Ravenala guyanensis*, *Euterpe edulis*, extensive beds of a *Heliconia* with canary-yellow bracts which I saw also on the Upper Barima River in British Guiana, some *Heliconia humilis* and an occasional *Socratea exorrhiza*; and thirdly, the intermediate lands, which comprised most of that we examined, and had a floor-covering of low ferns, *Ischnosiphon* sp., bush-rope tangles and an undergrowth of diverse shrubs, with *Maximiliana Maripa* the most abundant palm.

Between these types there was considerable overlapping. The *Astrocaryum* often entered largely into the shrub undergrowth and took the place of the *Maximiliana*: the *Ravenala* sometimes occurred in the same intermediate association. On the higher ground were occasional truly gigantic silk-cotton trees, and on the rocks themselves or on the adjacent forest floor was a slender *Heliconia* with a darkly spotted stem and bracts of a clear cherry-red colour, which is found also on the Upper Barima River. On the floor of the shrub association the curious red Balanophoraceous plant, *Helosis guyanensis* (determined by Prof. Stahel from my description), was not uncommon.

These three associations were largely distinguished by the plants of the floor and undergrowth, the trees, even of the lower tiers, save the palms, being largely neglected for lack of determinations. All three associations were, however, under the dense shade of tall forest, though the large trees of the uppermost storey were scattered.

Among the larger trees, a cedar (*Cedrela* sp.) occurred at very rare intervals. It is cut and floated down the rivers by the Boschneegers, for disposal to traders lower down and for use as bride-price and in other tribal customs.

Right on the bank of the Mamaboen, above our camp, was a tall tree of a species of *Pachira*, interesting as occurring nearly three days' journey above the last *Pachira aquatica* on the main river. Its pods were high out of reach, but appeared smaller, shorter and more oblong than those of *P. aquatica*.

The cacao trees were found usually in the intermediate association described above, with shrubby undergrowth and ferns. A number grew in lower ground, however, with their branches stretching far out over the creek or a tributary and their bases sometimes even deeply submerged in flood water. The smallest number, only one or two, was found in the higher ground, in the boegroemakkas association.

The cacao trees were constituents of the lowest storey of small trees, and were thus shaded not only by the scattered large trees of the highest layers, but also by those of the intermediate tiers. Some trees were growing singly, but most were in small groups of two to five. They varied in height from about 10 to 25 feet. There appeared to be no regeneration from seed, though in one case several germinating seeds were found lodged in the fork of an old parent tree. Most young trees originated from old nearly prostrate trees, which sent up shoots perpendicularly at intervals along their trunks, and adventitious roots downwards, sometimes from a height of several feet, like a mangrove. As the result of the dense shade and of their origin from old trees after this fashion, the trees were all asymmetrical, straggly and even spindling; though occasional trees stretching over the water were quite luxuriant. The foliage was everywhere green and healthy, save for occasional attack by biting insects, including a large and hitherto unrecorded Sphingid larva.

No flowers whatever were found. Fruit was plentiful, though less so than on most cultivated trees; but was nearly all unripe, and of a pale glaucous green colour. The ripe pods were of a bright clear yellow colour, with little indication of longitudinal ribs, and contained between 40 and 50 seeds of a deep lilac colour internally. The most interesting feature of the pods was their extreme uniformity. All were of the Amelonado Forastero type, with no variation. Prof. Stahel informs me that he now knows four other localities where wild cacao occurs in the interior of Surinam. He has examined two of these and has seen pods from a third, and found them to be all of this same type, which does not correspond with any of those cultivated in Surinam.

The ripe pods were quickly eaten, apparently by monkeys, judging by the form of the teeth-marks, and on the testimony of both Indians and Boschneegers. Even green pods were found

[Kew Bulletin, 1930.]

PLATE II



A wild cacao tree with several trunks in the fork, in the Mamaboen Creek Valley.

tentatively bitten into, while ripe pods, emptied of their contents, were often found long distances from the nearest cacao tree.

Witches'-broom disease (*Marasmius pernicius*) was frequent on the Mamaboen trees, as recorded by Stahel in 1920 (8). In fact this authority considers the present locality to have been the source of the widespread outbreak in the Surinam plantations; its great distance (170-180 kilometres) from the nearest of these explaining why cacao was grown without attack for 200 years.

The grounds for considering the above cacao bush as virgin forest and not the remains of forgotten Dutch or aboriginal plantations are as follows:—

The Coppename River is believed to be entirely uninhabited above Kaaimanston, which is 42 kilometres below the cacao. The highest Indian village is many miles (half a day) lower still, while all the Boschneger settlements on the Coppename, of which Kaaimanston is the highest, were founded subsequently to 1880, when these people were sent there from Saramacca (Stahel, 1920). Even to the present day no cacao is cultivated on the Coppename. The present Indian tribes of the Guianas do not know the use of cocoa and apparently never cultivate it (Schomburgk, John Ogilvie). Yet other extensive stands exist much farther in the interior, even near the Brazilian border.

Mr. John Ogilvie, whose knowledge of the interior of British Guiana is almost unrivalled, has kindly given me some notes on the occurrence of true wild cacao in that colony.

It is apparently confined to the far interior, where, however, it "grows extensively." Mr. Ogilvie writes, "The farthest north that I have seen cocoa is in Black creek, a branch of the Essequibo on the right bank, some distance above the mouth of the Rupununi River. It is plentiful in this creek, so much so that a balata bleeder in 1911 thought he had stumbled across an abandoned Dutch plantation and tried to get up a company in Georgetown for its exploitation. This creek is a short way to the South of the line from Primos Inlet, cut by the late H. P. C. Melville from the Rupununi River to the Correntyne. I have also seen cocoa on the Berbice River at a point due east of Black creek; the Berbice at this point being only a tiny creek."

The cacao near Primos Inlet was earlier seen by Robert Schomburgk (7, p. 134) who recognised it as *Theobroma Cacao* and remarked on its flourishing condition. He wrote, "es unterliegt wohl keinem Zweifel, dass die Bäume ursprünglich von den Indianern gepflanzt worden waren; aber aus ihrer bedeutenden Anzahl und ihrer weiten Entfernung vom Ufer musste ich schliessen, dass die Früchte durch Thiere vertragen, und die Bäume so verbreitet worden waren." We shall see later that there are practically no grounds for this view that the tree was originally planted.

Ogilvie has seen wild cacao also "on the upper branches of the Rewa and Quitaro creeks. The Rewa is a branch of the Rupununi

River. Cocoa occurs plentifully at points on the Kuduwini (Cuyuwini), Kassikedju or Dewar Wow, on the Kamu and Shewdikar creeks—all branches of the Upper Essequibo, as also on the main river itself."

It occurs again "on the Mapur Wow, the Trombetas and the Ha River. This is in Brazil, south of the Tumac Humac Mts., and I saw it in the Quitari (Kwitari) River, the boundary creek between Surinam and this colony, which creek eventually forms the Correntyne."

Robert Schomburgk (7, p. 58) saw the "*Theobroma Cacao* growing spontaneously" on the Capiwhuin (Kafuwini, a branch of the Trombetas, which is in its turn a tributary of the Amazon), where Ogilvie has also met with it. Schomburgk (p. 88) records it also on the Cutari (at the head of the Correntyne) and (p. 33) on the Upper Guidari (Quitari). Of the last locality (visited also by Ogilvie) Schomburgk writes:

"We had to cross numerous swamps abounding in a species of *Cacao*, *Theobroma bicolor* (?). The large melon-shaped fruits of all sizes, some green, some of a bright yellow, were eagerly collected by our Indians; and indeed the pulpy arillus which surrounds the bean has an agreeable vinous taste. There was sufficient evidence that rats, agouris, monkeys and peccaries were as eager after the fruit as our Indians, who, however, did not appear acquainted with the fine aroma which the seed itself possesses, and which induced Linnaeus to call it the food of the gods. We collected a number of seeds, of which I counted as many as sixty in one capsule. They afforded us for some mornings the most delicious cup of cocoa I ever tasted."

"It is remarkable that cacao in its wild state is only found in swampy, or, at best, moist situations. The trees which I observed, although of a peculiar growth, almost shrubby, and the trunk less developed than in large forest trees, often attained the height of 50 feet. The capsules were large, and contained from 60 to 70 seeds, which were larger than in the cultivated kind, but not so thick."

It will be seen that there is some uncertainty as to the species recorded by Schomburgk as wild cacao. In some localities he calls it *Theobroma Cacao* and in others identifies it, with a query, as *T. bicolor*. His brother, Richard Schomburgk (1848, 3.Th., pp. 844, 922), gives the name *T. Cacao* only to the cultivated plant. *T. bicolor* is, of course, a very different looking tree, with large, oval fruits, strongly reticulately-ribbed. Yet Richard Schomburgk saw what was almost certainly true wild cacao himself, on the Upper Pomeroon River in British Guiana (*Travels*, vol. ii., p. 394). He writes, "In the thicket along the banks I was astonished to find a number of cacao trees, laden with their beautiful yellow fruits. As settlements had never advanced as far up as we now were, the seeds must have got here at all events through some other agency, for I hardly believe that they are to be found wild on the coast and in this latitude. A special reason for this assumption is further, that

the coastal tribes have no particular name for the tree, but also call it cacao." The description given by the Schomburgks and by Ogilvie, of the wild cacao in the interior of British Guiana, corresponds fairly closely with that of the Surinam form on the Mamaboen; though some of Schomburgk's trees are certainly taller than any I saw. Schomburgk especially mentions the bright yellow colour of the ripe pods, while Ogilvie writes that "most pods are a greeny brown colour, but others are a light yellow. I cannot say whether they are different varieties or not. The dark colour predominates largely, and it may be that the yellow ones are ripe, although I think I have seen the purple of the seed showing in both varieties." It is then, in the absence of specimens of the British Guiana form, uncertain whether this is identical with the Surinam plant. But whether it is or not, Ogilvie is convinced it is truly indigenous. The Indians consider it poisonous, and *never* eat it, even when starving. "There are no signs of old settlements in these rivers, nor do the aboriginal Indians have any myths or traditions of former settlers. Cocoa must therefore be indigenous. In any case those seen must have been self-planted and they must have been doing so for generations." (J. Ogilvie, 14th June, 1929.)

Cacao of possibly the same type, and identified as *Theobroma Cacao*, is, according to Ducke (1925) "Indubitablement spontané dans le cours supérieur du petit Rio Branco au Nord-Est de Obidos, et à l'intérieur de la localité Francez au moyen Tapajos; dans les deux régions, exclusivement dans les sousbois d'un forêt très riche en Palmiers ['Uauassu'] *Orbignya speciosa* (Mart.) Barb. Rodr], en terrain humide ou un peu marécageux. Les fruits de ces cacaoyers sauvages ont la forme et la couleur (jaune) des arbres cultivés et sub-spontanés partout en Amazonie." It would be interesting to ascertain whether it occurs between these Brazilian localities and those mentioned by Ogilvie near the British Guiana border.

The apparent purity of type of the Surinam wild cacao is strong evidence of spontaneity, for Pittier has shown how mixed are the stocks of cultivated cocoa. This mixture is well shown even in some of the oldest of what Professor Dash has appropriately termed "historical cacao" (2). In British Guiana, at Coomacka, on the Berbice River, are the remains of a cacao plantation established some 200 years ago by a Dutch planter whose tombstone is still to be seen. Sir John Harrison visited this in 1913 and found that some of the cacao now formed large forest trees, up to 70 feet high (thus in marked contrast to the Surinam wild cacao). The type was identified as "Golden Caracas" and Harrison claimed that it was uniform and pure. Dash, however, while confirming Harrison's other observations, found undoubted evidence of mixture. He writes (2) "so far as one can judge, the plot contains a mixture of *Criollo* and *Forastero* types, while the descriptions (by the Government Botanist) also indicate that the trees are not of one type as previously supposed, but appear to be of mixed origin, showing characters associated with *Criollo* and *Forastero*."

For arranging the expedition up the Coppename River and for releasing Mr. J. W. Van Dijk, Government Chemist, to lead it, the writer is deeply indebted to the Surinam Government and especially to Prof. Stahel, Director of the Agricultural Experiment Station.

The success of the expedition was due entirely to the good management of Mr. Van Dijk. For help and hospitality to himself and his wife the writer takes pleasure in thanking also Prof. and Mrs. Stahel, Mr. and Mrs. J. A. Van Beek and Commissaris and Mrs. Munder. Prof. Stahel has kindly sent two of the very few ripe pods obtained to Professor Cheesman at the Imperial College of Tropical Agriculture, and the seeds have been sown for genetic study.

In connection with Dr. Myers' account of the wild Cacao in the Mamaboen Creek it is of interest to be able to record that two well-developed and perfectly formed ripe pods collected from the wild cacao trees in the Mamaboen Creek valley were very kindly sent to Kew in July last by Prof. Stahel. These fruits, which were preserved in fluid, are of the typical Amelonado-Forastero type. A number of young living plants, grown from seed from the same source, have also been received at Kew. These were sent over in a Wardian case from the Paramaribo Experiment Station and are making satisfactory growth. The uniformity that exists in this stand of wild cacao in Surinam—a feature on which stress is laid by Prof. Stahel and by Dr. Myers—is a matter of great interest and suggests the possibility of a homozygous strain of cacao being isolated from this source.

The probable connection pointed out by Prof. Stahel, that this stand of wild cacao may have with the now widespread witches'-broom disease (*Marasmius perniciosus* Stah.), in Surinam and Demerara is interesting. The disease was first noticed in about 1900 in plantations along the lower Saramacca river in Surinam. From there it spread to other cacao plantations in Surinam and eventually to adjoining parts of British Guiana. The Mamaboen Creek wild cacao, when discovered by Stahel in 1920, was reported by him to be badly infected with witches'-broom disease, and the same state of affairs was noticed by Dr. Myers on his visit—nearly ten years later. It seems safe to assume that the disease must have been continuously present in that area. Until the discovery of this wild cacao the disease had not been recorded on a truly wild host. The disease does not occur on plants other than species of *Theobroma*. In addition to plantation cacao the only two species of *Theobroma* on which the disease has been observed are *T. speciosa* Spr. and *T. bicolor* Humb. & Bonpl. These species seem to be susceptible only in the young stages, and ten to eleven year old trees at the Paramaribo Experiment Station, though growing next to heavily infected plantation cacao, very rarely showed any sign of the disease. At first it was thought, by van Hall and others, that *Theobroma speciosa*, which occurs wild in Surinam, must be the original

host of the disease, but this opinion was abandoned when the disease could never be found on trees of this species in the wild state. Moreover, cultivated cacao, free from the disease, was known to exist in the colony growing close to trees of *Theobroma speciosa* in the neighbouring forest.

Another more recently recorded species in Surinam is *Theobroma Herraniae* (Stahel, 8), the occurrence of which has in recent years been recorded from various localities, particularly along the Correntyne, Coppename and Morowijne rivers. Careful search has been made but witches'-broom disease has not been found on this species. The entire absence of the disease in these species of *Theobroma* led Prof. Stahel to the belief that some species as yet unknown, but closely related to plantation cacao, must exist somewhere in the hinterland, harbouring the disease. This culminated in his discovery of the wild cacao in the Mamaboen Creek valley.

As is the case with many other cultivated plants of long standing, the area which should be regarded as the original home of our cultivated cacao cannot be stated with certainty. It is generally assumed that it originated in the Orinoco valley and Upper Amazon where it occurs in much the same manner as in the Mamaboen Creek valley. Similar wild cacao occurs in the Upper Oyapok in French Guiana and has been known for upwards of a hundred years. Prof. Stahel makes the suggestion that the whole of the highland area, which extends from French Guiana in a westerly direction to the North of the Amazon valley might be regarded as the original home of Forastero cacao.

For Criollo the source of origin is probably farther to the west, either towards western Venezuela and Colombia or farther north among the Central American countries. Typical Criollo, in what was believed to be a truly wild state, has recently been recorded in British Honduras by Mr. H. C. Sampson (Economic Botanist, Kew), and members of the Forestry Department in British Honduras. Its distribution is stated to be confined mainly to the south of the Colony, where it occurs "in high bush and Cohune forest types in Silkgrass Reserve: of rather infrequent and scattered occurrence in the valley levels and foot-hills, the trees being generally lank with straggling open crowns." Pods of this cacao, kindly forwarded to Kew by the Conservator of Forests, show that there is no doubt that it is typical Criollo. There is, however, a certain element of doubt as to whether this cacao is truly wild and indigenous, or whether it may not owe its origin to early cultivation of Criollo in British Honduras. It would be of interest to know whether this form occurs under similar conditions in the territory between British Honduras and Venezuela.

The photographs reproduced on Plates I and II were taken by Prof. Stahel and were published in *De Indische Mercur* of the 24th September, 1920. Dr. de Bussy, Director of the Commercial Museum of the Colonial Institute, Amsterdam, with whom Professor

Stahel's negatives are deposited, has very kindly permitted their reproduction in the Bulletin.

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II.—NUXIA AND LACHNOPYLIS IN AFRICA. C. A. SMITH.

The genus *Nuxia* Lam. (Loganiaceae) is commonly credited with some 45 species, one, *N. verticillata* Lam., from Mauritius and Réunion, about a dozen from Madagascar and the Comoro Isles, and the remainder from Tropical and South Africa. Hitherto, however, no attempt seems to have been made to subdivide the genus, which is somewhat remarkable in view of the fact that it is composed of two sharply defined groups, differing from each other in their inflorescence as well as in floral details. The explanation of this may possibly be that the generic diagnosis of *Nuxia*, as formulated by later authors, was drawn up largely, if not entirely, from the characters of African and Malagasy species to the neglect of those of

the nomenclatural type. In the writer's opinion, however, the differential characters are of such a nature as to warrant the recognition of two independent genera, *Nuxia* Lam. (monotypic), and *Lachnopylis* Hochst., which accommodates all the African and Malagasy species referred to *Nuxia* by Robert Brown and later authorities.

The genus *Nuxia* was based by Lamarck (Ill. Gen. i. 295: 1791), on *N. verticillata* Lam., an arborescent shrub discovered in the Ile de France (now Mauritius) by Commerson* during his voyage round the world with Bougainville, and was probably named, as suggested by Cordemoy (Fl. Réunion. 467: 1895), in honour of "M. de la Nux, amateur de sciences à la Réunion, correspondant de Buffon."

About a quarter of a century later, Robert Brown (in Salt, Abyss. App. 63: 1814) published the names *Nuxia congesta* and *N. dentata* as nomina nuda for two species collected by Salt in Abyssinia, these being subsequently described by Fresenius (Flora, xxi. 2, 606: 1838) and Bentham (DC. Prodr. x. 435: 1846) respectively.

Curiously enough, in 1843 the same two species were independently described by Hochstetter in Flora, xxvi. 77, from specimens collected by Schimper in Abyssinia during the previous year, as syntype-species of a new genus *Lachnopylis*, the species being named *L. ternifolia* and *L. oppositifolia*. In the generic diagnosis Hochstetter described the inflorescence as cymose, the corolla-tube as equalling the calyx, and the style as being long-exserted, characters which immediately distinguish *Lachnopylis* from *Nuxia* Lam. sensu stricto. Two years later, the generic description of *Lachnopylis* was greatly amplified by Alph. De Candolle (Prodr. ix. 22), who observed that the cymes were "2-3-chotomous" (i.e. dichasial and trichasial). Yet in the following year *Lachnopylis* was reduced to *Nuxia* Lam. by Bentham (DC. Prodr. x. 434), who cited *L. ternifolia* and *L. oppositifolia* respectively as synonyms of Brown's two species. Bentham either did not observe, or (more probably) regarded as of little moment, the differences in inflorescence, relative length of corolla-tube to calyx, and that of style to corolla tube, which separate *Lachnopylis* from *Nuxia*. Since this reduction of *Lachnopylis*, no one seems to have questioned the unity of *Nuxia*, or even to have proposed its subdivision. But when naming South African specimens of *Nuxia*, recently sent to Kew by the Division of Plant Industry, Pretoria, the writer was led to investigate the affinities of two apparently undescribed Transvaal species with the Tropical African *N. polyantha* Gilg, and with the Malagasy group of species. The striking difference existing between the inflorescence of *N. verticillata* Lam. and that of all other species currently referred to *Nuxia* Lam. suggested that further differences might be found on investigation. The results obtained make an excellent case for retaining the genus *Lachnopylis* for the African and Malagasy species, thereby reducing

* Commerson had actually proposed the name *Nuxia* for the genus (vide Juss. Gen. 107, sub *Manabea* Aubl.), though Lamarck makes no mention of this.

Nuxia to which these are currently referred, to a monotypic genus unrepresented in Africa.

The two genera may readily be distinguished as follows :—

Nuxia : (Fig. 1, B).

1. Inflorescence repeatedly racemosely branched, with even the ultimate cymules arranged racemosely.
2. Corolla manifestly exserted from the calyx, with filaments about as long as, sometimes even shorter than the corolla-lobes, the latter not overlapping the calyx.
3. Style shorter than the corolla-tube.

Lachnopylis : (Fig. 1, A).

1. Inflorescence repeatedly dichasially branched with the ultimate cymules arranged cymosely.
2. Corolla tube as long as the calyx, with the lobes shorter than the long prominent filaments, and reflexed over the upper part of the calyx.
3. Style always much exserted from the corolla-tube.

Nuxia [Commers. ex Juss. Gen. 107 (1789), sub *Manabea* Aubl., pro syn.] Lam. Ill. Gen. i. 295 (1791); Pers. Syn. i. 132 (1805), excl. *N. elata* (Swartz) Pers.; Jaume St. Hil. Expos. ii. 344 (1805); Juss. in Ann. Mus. Hist. Nat. Par. vii. 66 (1806); Roem. & Schult. Syst. Veg. iii. 5 (1818); Spreng. Gen. i. 82 (1830); Endl. Gen. 687, n. 3972 (1839), partim; Benth. in DC. Prodr. x. 434 (1846), pro minima parte; Benth. & Hook. f. Gen. Pl. ii. 792 (1876), pro minima parte; Baker, Fl. Maur. & Seych. 234 (1877), pro minima parte; Baill. Hist. Pl. ix. 347 (1886), excl. ref. Afr. spp.; Engl. & Prantl, Nat. Pflanzenfam. iv. 2, 45 (1892), pro minima parte.

A glabrous and eglandular arborescent shrub, with moderately stout branches; the latter somewhat angled in the young stages, at length terete and covered with a greyish firm persistent bark, conspicuously pitted below the growing twigs with the old leaf-scars. Leaves long-petioled, 3-4-nately whorled along the young branches, casually opposite along the youngest shoots, coriaceous; stipules 0; interpetiolar ridge obsolete. Inflorescence terminal, repeatedly and laxly racemosely branched, only the ultimate branching being cymose, with the lowest branches arising from the axils of the uppermost leaves. Flowers small, and collected in cymules. Calyx 4-lobed, with ovate teeth which are from $\frac{1}{2}$ – $\frac{1}{3}$ as long as the tube; the latter short, cup-shaped, thin in texture, glabrous within. Corolla 4-lobed; tube subcampanulate, exserted from the calyx, circumscissile above the persistent base, with the throat covered by a more or less dense growth of bristly hairs; lobes strongly reflexed over the exserted part of the corolla-tube, neither cucullate at the apex nor provided with a callosity. Stamens 4; filaments wholly exserted, inserted on the corolla-throat between the lobes, as long as (sometimes shorter than) these, glabrous; anthers 2-thealous, with the thecae

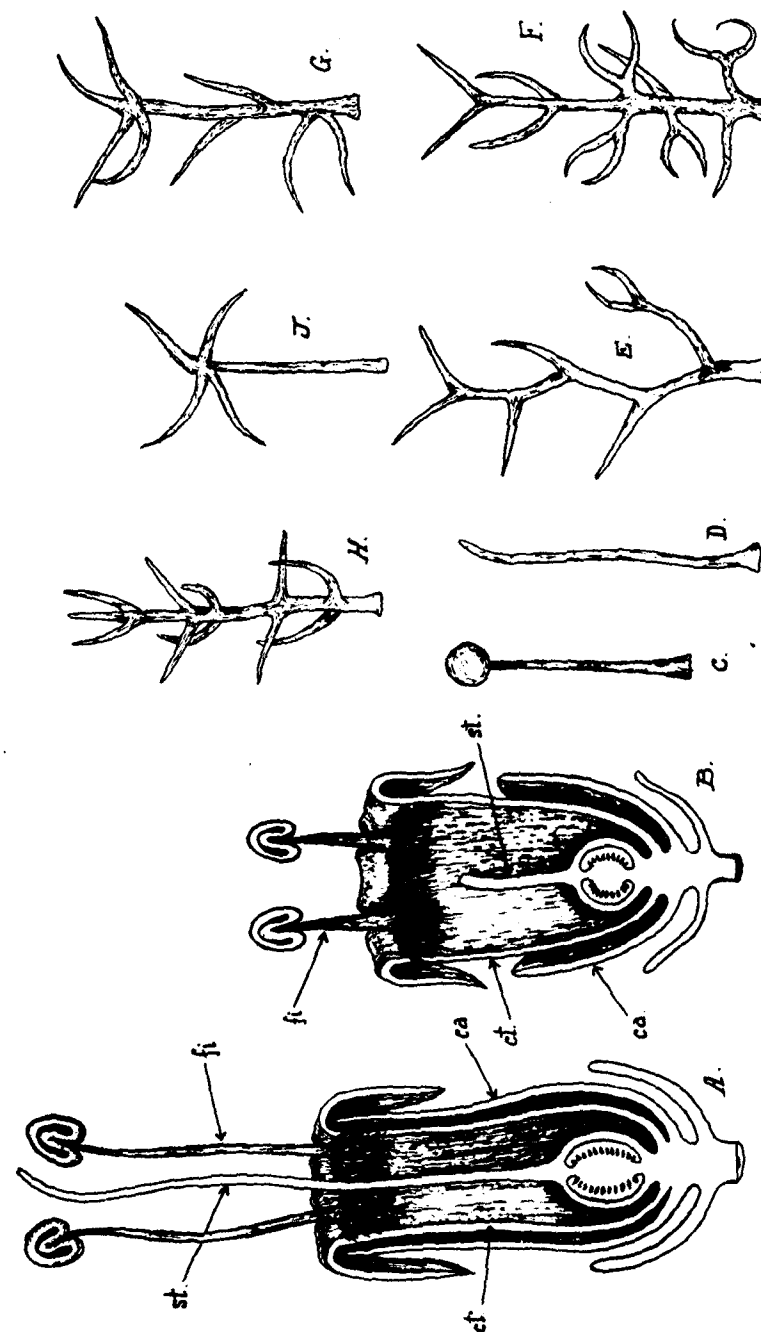


FIG. 1. A, Diagrammatic longitudinal section through a flower of *Nuxia verticillata* Lam., showing relative lengths of calyx (ca) to corolla-tube (ct), and style (st) to corolla tube and filaments (fi). c—j, Various types of hairs composing the indumentum in *Lachnopylis*:—c, Stipitate gland; d, Simple hair, from the leaves of *L. pubescens* (Sond.); e—h, Dendritic hairs from the lower surface of the leaves of *L. schistotricha* C. A. Sm.; i, Stalked stellate hairs from the lower surface of a leaf of *L. montana* C. A. Sm. All much enlarged.

confluent at the apices, at first cordate-reniform, at length strongly divergent. *Ovary* ovoid, silky-white hairy, 2-locular, with axile placentation and with numerous ovules in each loculus; style terminal, much shorter than the corolla-tube, glabrous; stigma terminal, truncate. *Fruit* a 2-valved capsule, only slightly exserted from the persistent calyx. *Seeds* oblong, small, numerous.

Monotypic. Endemic in Mauritius and Réunion.

N. verticillata Lam. Ill. Gen. i. 295, t. 71 (1791); Pers. Syn. i. 132 (1805); Jaume St. Hil. Expos. ii. 344 (1805); Roem. & Schult. Syst. Veg. iii. 103 (1818); Breon, Cat. Pl. Cult. Bourb. 28 (1825); Benth. in DC. Prodr. x. 434 (1846); Baker, Fl. Maur. & Seych. 235 (1877); Cordemoy, Fl. Réunion. 466 (1897).

Leaves elliptic to broadly oblong-elliptic, up to 11 cm. long and 7 cm. wide, obtusely rounded at the apex or acute, cuneate to the base into the 5 mm. to 3 cm. long petiole, with subrevolute entire margins. *Inflorescence* up to 20 cm. long and 28 cm. in diam., more or less pyramidal, with angled branches; secondary and further branches opposite to subopposite, more frequently alternate. *Calyx* about 2 mm. long. *Corolla* about twice as long as the calyx, and exserted for about half its length. *Filaments* somewhat widened to the base. *Style* about half the length of the corolla-tube. Other characters as for the genus.

MAURITIUS (Île de France), sine loc. exact., Commerson! (type, BM, K*); Bojer! (K); Michaux! (K); etc.

In Mauritius the species is a common constituent of woods, e.g. those of the Pouce, Nouvelle Découverte, etc., ascending to the tops of the mountains, and in Réunion (Bourbon) Cordemoy states (loc. cit.) that it is "très commun dans les forêts des zones basse et moyenne, et jusqu'à 2000 m. d'altitude. Fleurit en avril-mai. Fleurs d'un rose pâle, quelquefois blanches."

Common names: *Bois Malabar* or *Bois de Bouc* (Maur.), and *Bois maigre*, *Malbrouc*, or *Valaker* (Réun.).

In Réunion the timber is said to be used for building purposes, affording a more or less inferior grade of rafters employed in roofing houses.

In his original description of the genus, Lamarck describes the capsule as being dispermous, whereas the loculi are many-seeded, as has already also been pointed out by Jussieu (in Ann. Mus. Hist. Nat. vii. 66: 1806), who remarks "Michaux examina cette plante à l'Île-de-France, et reconnut que le fruit étoient des capsules à deux

*In citing specimens under the descriptions and references which appear in this article, the following abbreviations have been inserted after the numbers to indicate the herbaria in (or from) which the particular specimen was examined:—

BM, British Museum (Natural History), South Kensington. K, Royal Botanic Gardens, Kew. Pa, National Herbarium, Division of Plant Industry, Pretoria, South Africa. R, Herbarium of Rev. F. A. Rogers. Be, Botanical Museum and Gardens, Berlin—Dahlem. Z, Botanical Museum of the University of Zürich.

loges, remplies de graines nombreuses et menues, et il nous en envoya pour nous donner de moyen de vérifier nous-mêmes ce caractère."

Lachnopyllis Hochst. in Flora, xxvi. 77 (1843); Endl. Gen. Suppl. 3. 74, n. 3371/1 (1843); A. DC in DC. Prodr. ix. 22 (1845).

Nuxia Harv. Gen. S. Afr. Pl. 256 (1838); Endl. Gen. 687, n. 3972 (1839), partim; Bureau, Fam. Logan. 77 (1856); Harv. Gen. Ed. 2, 249 (1868), pro maiore parte; Benth. & Hook. f. Gen. Pl. ii. 792 (1876), pro maiore parte; Engl. & Prantl, Nat. Pflanzenfam. iv. 2, 45 (1892), pro maiore parte; Baker in Dyer, Fl. Trop. Afr. iv. i, 511 (1903); Sim, For. Fl. Cape Col. 274 (1907); Thonner, Blütenpfl. Afr. 455 (1908); Sim, For. Fl. Port. E. Afr. 90 (1909); Prain & Cummins in Dyer, Fl. Cap. iv. i, 1038 (1909); Phillips, Gen. S. Afr. Pl. 476 (1926); non Lam.

Dwarf or arborescent shrubs or tall trees, variously pubescent or tomentose on the young parts, inflorescence and leaves with stalked stellate or dendritic or candelabra hairs, or with stipitate glands mixed with simple non-glandular hairs, rarely glabrous in all parts. *Branches* moderately stout, ascending or spreading-ascending, with greyish to reddish-brown fibrous stringy bark. *Leaves* most frequently in 3- (rarely 4-) nate whorls and casually opposite only along the very young shoots, more rarely opposite and decussate, subsessile to shortly or long-petioled, very generally glandular-punctate, prominently 1-nerved, with from 4 to 13 pairs of upcurving prominently raised lateral nerves blending with one another along the margins, occasionally with the lateral nerves depressed and reddish in colour; stipules 0; interpetiolar ridge obsolete. *Inflorescence* terminal, rarely also axillary, densely many-flowered, repeatedly dichasial after the primary racemose branching, or, in one species, after 2- to 3-racemose branchings, or the flowers collected in dense globose or didymous pseudocapitula at the ends of the primary (rarely also the secondary) branches; the lowest branches arising singly (occasionally in pairs) in the axils of the uppermost bract-like leaves. *Flowers* often sweetly scented, sessile to long-pedicelled, generally disposed in more or less compactly arranged terminal 3-flowered cymules (with the lateral flowers bibracteolate), or in small pseudocapitula or, very rarely, in small pseudumbellules (with the bracts arranged in a false whorl). *Calyx* 4-lobed, mostly bilabiate, with either one lip or both lips 2-toothed or emarginate, coriaceous or thin, papery and brittle, scabrid, or pubescent or tomentose, or glabrous and viscid on the outer face, densely adpressedly silky-hairy within (rarely glabrous, or silky-hairy in the upper half only); tube campanulate. *Corolla* 4-lobed; tube cylindric, as long as, or somewhat shorter than the calyx-tube, circumscissile above the persistent base, with the throat closed by a dense growth of deflexed, at length more or less erect, bristly white hairs; lobes white or creamy, strongly reflexed over the upper part of the calyx, very frequently cucullate at the apex and with a

small subapical callosity (nectary?) on the inner face, usually adpressedly silky-hairy on the outer face. *Stamens* 4; filaments wholly exserted, inserted on the corolla throat between the lobes and always longer than these; anthers 2-theous, with the thecae confluent at the apices, cordate-reniform, at length strongly divergent. *Ovary* obovoid, 2-locular, with axile placentation and with numerous ovules in each loculus, silky white hairy in the upper half, rarely quite glabrous; style terminal, very much exserted from the corolla tube and as long as, and often overtopping the filaments; stigma terminal, truncate. *Fruit* a 2-valved septicidal capsule, slightly exserted from, sometimes included in the persistent calyx, usually densely adpressedly silky-hairy. *Seeds* oblong, numerous, small.

Species about 40 or more. Natives of Africa or Madagascar, with two species described from the Comoro Islands.

Type species: *Lachnophylis congesta* (R.Br. ex Fres.) C. A. Sm.

The species are widely distributed in Africa, though absent from the Karroo region of South Africa, and are specially abundant in Tropical Africa. The taller species, which are often up to 15 metres high, enter very largely into the composition of forests, e.g. *L. emarginata* (Sond.) and *L. floribunda* (Benth.) in the Eastern and South Eastern regions of South Africa, the former often growing in or, in the case of the dwarf species, act as pioneers on bare rocky outcrops (in the fissures), e.g. *L. montana* C. A. Sm. on the quartzite outcrops of the Magaliesberg and hills round Pretoria, and *L. breviflora* (S. Moore) on the northern escarpment of the Witwatersrand series near Johannesburg, Transvaal; or, as in the case of *L. oppositifolia* Hochst., frequent the banks of water courses and streams, e.g. in Angola, the Eastern Transvaal, Natal, etc.

Furthermore, some species yield good timber, though this is surpassed in quality by that of other indigenous woods.

As circumscribed in this paper, the genus may be divided into three more or less natural series according to the particular arrangement of the flowers on the inflorescence branches. Thus:—

1. LAXIFLORAE—Flowers subsessile or pedicelled, arranged in 3-flowered cymes at the ends of the tertiary or further branches of the inflorescence, with each of the lateral flowers bibracteolate (Fig. 2, A).
2. GLOMERULATAE—Flowers usually sessile, more rarely pedicelled, contracted into several to many-flowered pseudocapitula or pseudumbellules at the ends of the secondary or further branches of the inflorescence, with the bracts disposed in a false whorl (Fig. 2, B₂, C).

3. SPHAEROCEPHALAE—Flowers sessile, aggregated into several to many-flowered compact globose pseudocapitula terminating the primary (or, occasionally, the secondary) branches of the inflorescence, with the bracts much reduced and enclosed within the "heads" (Fig. 2, D₁, D₂).

Series 1. LAXIFLORAE C. A. Sm.

To this series belong the majority of the African species and a few of the Malagasy and Comoran species generally referred to *Nuxia*, among which may be mentioned* :—

L. congesta (R. Br. ex Fres.), comb. nov.—*Nuxia congesta* R. Br. in Salt, Abyss. App. 63 (1814), nomen, & ex Fres. in Flora, xxi. 2, 606 (1838), descr.—Abyssinia.

L. floribunda (Benth.), comb. nov.—*N. floribunda* Benth. in Hook. Comp. Bot. Mag. ii. 59 (1836).—Extends from the George Division of the Cape to Natal, the Eastern Transvaal and north to Tanganyika.

L. pubescens (Sond.), comb. nov.—*N. pubescens* Sond. in Linnaea xxiii. 84 (1850).—Transvaal Highveld.

L. emarginata (Sond.), comb. nov.—*N. emarginata* Sond. loc. cit. 83.—South Eastern Cape to the Eastern Transvaal.

L. tomentosa (Sond.), comb. nov.—*N. tomentosa* Sond. loc. cit. 84.—Transvaal Highveld.

L. breviflora (S. Moore), comb. nov.—*N. breviflora* S. Moore in Journ. Bot. xli. 403 (1903).—Transvaal Highveld.

L. heterotricha C. A. Sm., sp. nov. (see p. 28).—Southern Bechuanaland.

L. oppositifolia Hochst. in Flora, xxvi. 77 (1843).—Tropical Africa, Eastern Transvaal, Natal.

L. viscosa (L. S. Gibbs), comb. nov.—*N. viscosa* L. S. Gibbs in Journ. Linn. Soc. Bot. xxvii. 454 (1906).—Southern Rhodesia.

L. sambesina (Gilg), comb. nov.—*N. sambesina* Gilg. in Engl. Pflanzenw. Ost-Afr. C. 312 (1895).—Tanganyika.

L. speciosa C. A. Sm., sp. nov. (see p. 29).—Natal.

L. saxatilis C. A. Sm., sp. nov. (see p. 27).—Natal.

Series 2. GLOMERULATAE C. A. Sm.

The following African species belong here :—

Flowers pedicelled :

L. gracilis (Engl.), comb. nov.—*Nuxia gracilis* Engl. in Engl. Bot. Jahrb. x. 243 (1888).—Griqualand West.

*Only the names are here changed of those species which occur in South Africa or are referred to in this paper.

Flowers sessile :

L. glomerulata C. A. Sm., sp. nov. (see p. 24).—Western Transvaal.

L. polyantha (Gilg), comb. nov.—*N. polyantha* Gilg in Engl. Bot. Jahrb. xxx. 376 (1901).—Tanganyika.

L. suaveolens C. A. Sm., sp. nov. (see p. 23).—Western Transvaal.

The majority of the other Malagasy species currently referred to *Nuxia* also belong to this series.

(N.B. *Nuxia scytophylla* Baker, loc. cit., must be referred to another genus in *Loganiaceae*, probably constituting an undescribed genus by itself.)

Series 3. SPHAEROCEPHALAE C. A. Sm.

This series is constituted only by the following three species from Madagascar :—

L. sphaerocephala (Baker), comb. nov.—*Nuxia sphaerocephala* (Baker) Baker in Journ. Linn. Soc. Bot. xxii. 505 (1887).

L. terminalioides (Baker), comb. nov.—*N. terminalioides* Baker, loc. cit.

L. pachyphylla (Baker), comb. nov.—*N. pachyphylla* Baker, loc. cit. 506 ; pro majore parte.

The type of inflorescence-branching in the above three species is not always evident from first inspection. Thus, in Fig. 2, D₃, which shows a part of the inflorescence (one branch) of a specimen of *L. sphaerocephala* (Baker), the dichasial pattern is entirely obscured, and it is only by the examination of a series of specimens that the dichasial nature is revealed (as in *L. sphaerocephala*), by the presence of occasional didymous heads (Fig. 2, D₂), or, more rarely, by occasional dichotomous secondary branches terminating in pseudocapitula (Fig. 2, D₁).

Since the general consensus of opinion favours the view that a congested arrangement of the flowers, such as occurs in many *Rubiaceae*, *Dipsacaceae*, *Umbelliferae*, all *Compositae*, etc., marks a high evolutionary stage, there seems to be little reason to doubt that, as regards the inflorescence, the *Sphaerocephalae* are the highest evolved and the *Laxiflorae* the most primitive in the genus *Lachnophylis*.

On this basis it may reasonably be assumed that the *Glomerulatae* occupy an intermediate position between the former two series, and the probable course of evolution in the inflorescence may be represented diagrammatically as shown in Fig 2.

Fig. 2, A represents a lateral branch of the inflorescence of one of the *Laxiflorae*. Suppression of the quaternary and then of the

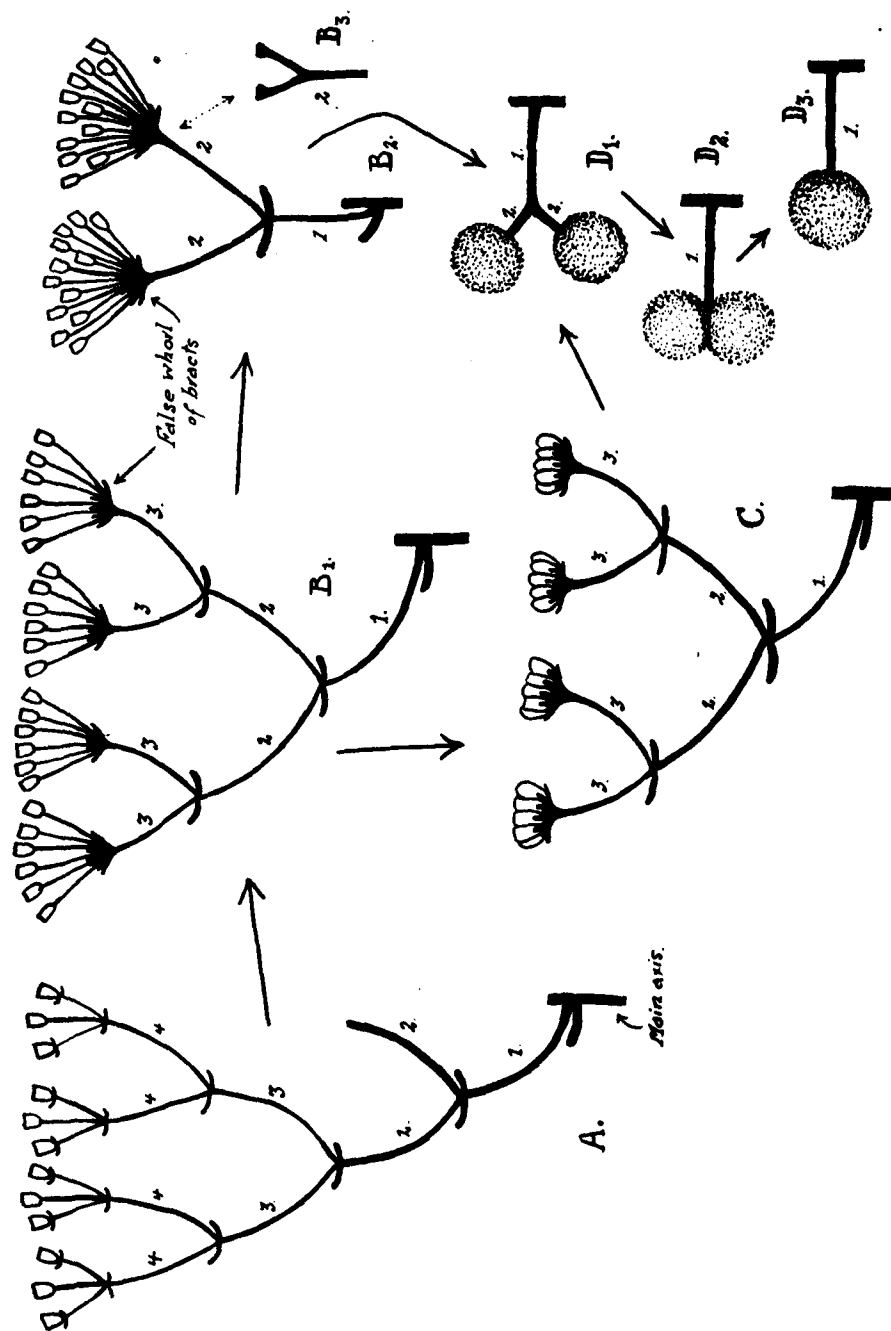


FIG. 2. Lateral branches of the inflorescence in *Lachnophylis*. A, *L. montana* C. A. Sm.; B₁, Hypothetical stage (*Glomerulatae*); B₂, *L. gracilis* (Engl.); B₃, Dichotomy in a secondary branch of *L. gracilis* (Engl.); C, *L. glomerulata* C. A. Sm. showing sessile flowers and false involucre; D₁—D₃, Various stages in *L. sphaerocephala* (Baker). Diagrammatic.

tertiary branches of the rhachis would, through an intermediate hypothetical stage B_1 , result in the condition shown in B_2 , actually found in *L. gracilis* (Engl.). In this species the little pseudumbellules represent condensed dichasial cymes, of which the dichotomous branches may often be seen (owing to incomplete fusion), e.g. in *Burchell* 1827 (in Herb. Kew), which certainly belongs to this species (B_3). By the disappearance of the pedicels in the last stage, the condition D_1 (casual in *L. pachyphylla* and very rare in *L. sphaerocephala*) would be reached, and a subsequent suppression of the secondary axes would then lead to the formation of the didymous pseudocapitula shown in D_2 (very casual in *L. sphaerocephala*), or the apparently simple pseudocapitulum in D_3 , characteristic of the last species.

The condition D_1 might alternatively be reached through stage C (exemplified by *L. glomerulata*). This stage itself may have been derived from stage A through B_1 by suppression of the pedicels of the latter. Suppression of the tertiary axes would then lead to the condition D_1 as suggested above.

The close grouping of the flowers demanded by the above processes, must of necessity be followed by a corresponding decrease in their size, or, alternatively, if the size be maintained as relatively constant, a reduction in the number of flowers in the ultimate pseudocapitula must follow. It is of interest to note that both these conditions are to be observed in the above three series. Thus, in the *Laxiflorae*, the flowers are from 5 to 6 mm. long (excl. the stamens); in the *Glomerulatae* about 2.5–3.5 mm. long (excl. the stamens), and in the *Sphaerocephalae*, less than 2.5 mm. long (excl. the stamens), except in the case of *L. pachyphylla* (Bak.). In that species reduction in the number of flowers forming the globose pseudocapitula is correlated with the retention of the relatively large flowers of the first series.

In concluding this part of the paper, the writer wishes to acknowledge his indebtedness to Dr. T. A. Sprague and Mr. J. Hutchinson of the Kew Staff—the former for constructive criticism on the paper as a whole, the latter for critical advice on, and assistance in the determination of, the Tropical African species of the genus—to Dr. A. B. Rendle, F.R.S., Keeper of Botany, British Museum (Natural History), for facilities to consult Robert Brown's and Spencer Moore's types, and to the Rev. F. A. Rogers, now in Bagdad, Persia, for permission to consult his rich South African herbarium during his absence, four very interesting species being described from that source alone.

The new species described below appear to have been confused in herbaria with other closely allied species of the genus, and since some of these, e.g. *L. pubescens* (Sond.) as delimited in the Flora Capensis, really include two distinct specific groups, the writer has supplied the following tentative key to the South African species, in which an attempt has been made to separate out these species from such

material as could be consulted within the time available. It should be noted that the present paper is not offered as a complete revision, but the key should be regarded as a guide towards distinguishing those of the South African species described below and their allies, while indicating also the possibility of utilising the special character of the indumentum (so far apparently not adequately appreciated) as a means of specific differentiation. (A few types of hairs are shown in Fig. 1, C—J.)

Intensive and extensive collecting of material of these species will show how far the characters utilised may be depended upon in any future revision, and, with this end in view, South African collectors should devote special attention to the genus as represented in the Eastern and North Eastern Transvaal. Material from these parts in the Kew and Rogers herbaria, though too scanty for satisfactory treatment, indicates that several undescribed species of the genus might yet be found. That this is more than likely appears from the fact that this part of the Transvaal is phytogeographically distinct from the rest of the province, and in this connection it may be noted that the majority of the African species of the genus, as far as this has been worked out, are confined to definite phytogeographical areas, and the exceptions are exactly those species [e.g. *L. floribunda* (Benth.) and *L. oppositifolia* Hochst.] which are most isolated in the genus.

Key to the South African species of *Lachnopylis*:

Flowers grouped in 6– many-flowered terminal pseudocapitula or pseudumbellules:

Flowers sessile:

Lateral inflorescence-branches at first 2–3 times racemously divided, at length dichasial.....1. *suaveolens*.
Lateral inflorescence-branches dichasially divided.....2. *glomerulata*.

Flowers distinctly pedicelled.....3. *gracilis*.

Flowers arranged in terminal 3-flowered cymules:

†Leaves, young stems and inflorescences quite glabrous in all parts:

Leaves opposite, never whorled.....4. *oppositifolia*.
Leaves ternately whorled, casually opposite only along the very young shoots:

Inflorescence ample and elongated; calyx chartaceous, glabrous (rarely only thinly hairy) within; ovary glabrous.....5. *floribunda*.

Inflorescence congested; calyx coriaceous, densely adpressedly silky-hairy within; ovary silky-hairy in the upper half:

Calyx swollen above the base around the ovary, keeled along the teeth; petals without a subapical callosity... 6. *saxatilis*.

Calyx never dilated at the base around the ovary, not keeled; petals with a subapical callosity:

- Leaves elliptic, tapering to the apices, markedly viscidulous, generally with more or less toothed margins, always drying green.....7. *viscidulosa*.
- Leaves oblong-obovate or obovate, not (or only very slightly) tapering towards the apices, never viscidulous, with entire margins and drying reddish- to chocolate-brown.....8. *emarginata*.
- †Leaves, young stems and inflorescences always with a distinct pubescence (rarely, as in *L. emarginata* var. *brevifolia*, confined only to the inflorescence):
- Indumentum composed of simple hairs only (rarely with a few scattered stalked stellate hairs):
- Indumentum on both sides of the leaves composed of stipitate glands sometimes intermixed with longer soft non-glandular simple hairs:
- Leaves broadly oblong to suborbicular, up to 3 cm. long and 2.5 cm. wide, rounded or subtruncate at the base, with very short (at most 3 mm. long) petioles; mature calyces at most 2.5 mm. long and 2 mm. wide; inflorescence never more than 5 cm. in diam. at maturity.....9. *heterotricha*.
- Leaves obovate to oblong-elliptic, up to 4 cm. long and 2 cm. wide, distinctly cuneate at the base into the 4 to 6 mm. long petiole; mature calyces never less than 4.5 mm. long and 1.5 mm. wide; inflorescence never less than 7 cm. in diam. at maturity.....10. *pubescens*.
- Indumentum (on lower face of the leaves only) composed of long fine eglandular hairs, sometimes with a few stalked stellate hairs intermixed.....11. *speciosa*.
- Indumentum always (except sometimes on the calyces) composed of stalked stellate or dendritic hairs, sometimes with a few simple hairs intermixed, never glandular in function:
- Leaves densely tomentose on both sides with more or less shaggy hairs:
- Calyx at most 2 mm. long; leaves with stalked stellate hairs, occasionally mixed with a few dendritic hairs; inflorescence up to 3 cm. in diam. at maturity.....12. *breviflora*.
- Calyx at least 4 mm. long; leaves with long shaggy dendritic hairs; inflorescence from 7.5 cm. to 10 cm. diam. at maturity.....13. *tomentosa*.
- Leaves with shorter less evident pubescence, never tomentose or shaggily hairy on both sides:
- Leaves drying reddish-brown or brown, glabrous and shiny above (occasionally very thinly pubescent above); inflorescence up to 4.5 cm. in diam. at maturity:

- Leaves elliptic to oblong-elliptic, up to 7 cm. long and 3.5 cm. wide, acute or subacuminate at the apices; leaf-margins very generally toothed...14. *schistotricha*.
- Leaves oblong-obovate to obovate-cuneate, up to 2.5 cm. long and 1 cm. wide, very slightly narrowed to the very obtusely rounded apices; leaf-margins entire.....8a. *emarginata* var. *brevifolia*.
- Leaves always drying green, usually densely (though shortly) pubescent on both sides; inflorescence up to 9 cm. in diam. at maturity.....15. *montana*.

1. *L. suaveolens* C. A. Smith, sp. nov.; affinis *L. glomerulata* C. A. Sm., a qua inflorescentia iterum nec semel racemose ramosa necnon partibus novellis dense pilosis differt.

A small shrub to 90 or 120 cm. high, with moderately stout ascending branches; branchlets closely leafy and more or less angled, densely pilose in the young parts, at length glabrous. *Leaves* ternately whorled, casually opposite along the very young shoots, oblong-obovate to obovate, up to 5 cm. long and 1.7 cm. wide, cuneate in the lower half into a distinct petiole up to 7 mm. long, coriaceous, dark green and prominently reticulated above, paler and prominently reticulated below, with the flat or subrevolute margins distinctly 1-6-toothed on either side of the rounded to subacute and abruptly mucronulate apex, densely silky-hairy in the young stages with long more or less adpressed hairs (especially along the midrib, margins, petiole and leaf-buds), soon glabrous and viscidulous. *Inflorescence* densely many-flowered, more or less pyramidal, up to 9 cm. long and 8 cm. in diam., copiously branched, with the branches angled and pubescent; each lateral branch of the main axis at first racemose and terminating in 2-3-furcate dichasia, with the primary branches of the raceme again racemously branched and the secondary branchlets thus formed breaking into 1-2-furcate dichasia, or with the primary branches of the raceme immediately giving rise to 2-3-furcate dichasia; lowermost branches arising singly or in pairs in the axils of the uppermost bract-like leaves; rameal bracts linear-subulate, pubescent. *Flowers* sweet-scented (*Hutchinson*), collected into terminal 6-15-flowered pseudocapitula surrounded by their short linear-pubescent bracts. *Calyx* campanulate, 4-toothed, up to 2 mm. long and 1 mm. wide, shiny and chartaceous, brittle, glabrous without, shortly adpressedly hairy in the upper, glabrous in the lower, half of the tube within. *Corolla lobes* narrowly oblong, cucullate at the apex and with a small subapical callosity, glabrous on the outer face.

WESTERN TRANSVAAL. Marico Div.: open slopes of hills above Zeerust, 1200 m., Feb., March, Rogers 20369! (type, Pa), *Hutchinson* 2950! (syntype, K, Pa).

This species is most readily recognised by the branching of its inflorescence, which is of interest further as showing occasional (descending) serial branching.

2. *L. glomerulata* C. A. Smith, sp. nov.; affinis *L. polyanthae* (Gilg) et *L. gracili* (Engl.), ab illa foliorum forma et floribus minoribus, ab hac foliis latioribus integris vel versus apicem paucidenticulatis floribus sessilibus recedit.

An arborescent shrub or small tree about 3 m. high. Branchlets closely leafy, terete, becoming angled towards the apices, closely pubescent, at length glabrescent. Leaves ternately whorled, petioled, oblong-elliptic to obovate, always strongly cuneate towards the base, up to 4.5 cm. long and 1.4 cm. wide, coriaceous, deep green above, paler and prominently 1-nerved on the lower face, closely reticulated on both surfaces, rounded, casually emarginate, or obtuse and mucronulate at the apex, with entire (or, in the upper half, casually and minutely denticulate) subrevolute margins, glabrous except for the midrib below from where the pubescence of simple hairs is continued along the 5-7 mm. long petiole. Inflorescence up to 9 cm. long and 6.5 cm. in diam., with long internodes between the branches; the latter 2-3-times furcate, angled and pubescent, especially along the nodes, with the lower branches arising from the axils of the upper bract-like leaves, and with the ultimate branchlets terminated by a compact pseudocapitulum of about 9-15 sessile flowers surrounded by a false whorl of short narrow linear-subulate bracts; rameal bracts linear or subulate, about 2 mm. long, more or less densely pubescent. Calyx campanulate (sometimes subcylindric in bud), 3.5 mm. long and 1.5 mm. wide, thin and membranous, 4-toothed at the apex, glabrous without, closely adpressedly silky-hairy within in the upper half of the tube, glabrous lower down; teeth subobtuse or rounded, mucronulate. Corolla lobes oblong-elliptic, without a small callosity near the apex, glabrous on the outer face.

WESTERN TRANSVAAL. Rustenburg Div.: Zwarttruggens, 1350 m., Feb., D. Fouche 9! (Pa, K).

3. *L. gracilis* (Engl.) C. A. Smith, comb. nov.

Nuxia gracilis Engl. in Engl. Bot. Jahrb. x. 243 (1888).

GRIQUALAND WEST. Hay Div.: (sine loc. exact.), on rocky slopes, 1220 m., Feb., Marloth! sine num. (type, Be, K). Herbert Div.: Upper Campbell, Nov., Burchell 1827! (K); Lower Campbell, Nov., Burchell 1817! (K).

4. *L. oppositifolia* Hochst. in Flora, xxvi. 77 (1843, descr., & in Herb. Schimp. Abyss. iii. n.1714 (U. i. 1844), nom. sol.; A.DC. in DC. Prodr. ix. 23 (1845).

N. dentata R.Br. in Salt, Abyss. Append. 63 (1814), nom. sol., & ex Benth. in DC. Prodr. x. 435 (1846), desc.; A. Rich. Tent. Fl. Abyss. ii. 124 (1851); Engl. Hochgebirgsfl. Trop. Afr. 335 (1892), incl. var. *glutinosa* Engl. loc. cit.; Gilg in Engl. Pflanzenw. Ost-Afr. C. 312 (1895); Hiern, Cat. Afr. Pl. Welw. iii. 700 (1898); Gilg in Warb. Kun.-Samb. Exped. 331 (1903); S. Moore in Journ. Bot. xli. 403 (1903), excl. var. *transvaalensis* S. Moore, loc. cit.; Baker in

Dyer, Fl. Trop. Afr. iv. i. 513 (1904); Di Capua in Pirot, Fl. Erit. 2, 211 (1904); Burt Davy in Kew Bull. 162 (1908); Prain & Cummins in Dyer, Fl. Cap. iv. i. 1040 (1909); Fiori in L'Agric. Coll. v. Suppl. 78, f.145A (1911), & Boschi E Piante Leg. Erit. 302 (1912); Eyles, Rec. Pl. S. Rdsia. 442 (1916); Sim, Native Timbers of S. Afr. 89 (1921); Broun & Massey, Fl. Sudan, 241 (1929).

Nuxia oppositifolia Benth. in DC. Prodr. x. 435 (1846); Wood, Revised List Fl. Nat. 191 (1908); Sim, For. Fl. Port. E. Afr. 90, 127, t.77, f.B (1909).

N. Schlechteri Gilg in Engl. Bot. Jahrb. xxxii. 140 (1902).

N. Antunesii Gilg in Thon. Blütenpfl. Afr. t.128 (1908).

SOUTH EASTERN REGION. Natal: (sine loc. exact.), Gerrard 716! (K), sine num.! (K), near the Nonoti River, May, Wood 3878! * (K). Zululand: (sine loc. exact.), 60 m., Dec., Haygarth in Herb. Wood 7399! (BM).

EASTERN TRANSVAAL. Barberton Div.: Komati Poort, 200 m., Dec., Schlechter 11738! (type of *N. Schlechteri* Gilg, BM, K, Z), Rogers 22191! (R).

TRANSVAAL BUSHVELD. Zoutpansberg Div.: Shilouvane Dec., Jan., Junod 1430! (K, Z); Messina, 600 m., Dec., Rogers 20700! (R).

Widely distributed in Tropical Africa.

"Timber reddish-yellow, up to 30 cm. diam., seldom sound, not scented, with a dense fibre and prettily streaked, useful for furniture, etc." Sim.

Engler (loc. supra cit.), makes a var. *glutinosa* on the viscidulous character of the leaves of his specimens, but from the fact that this viscidulous secretion is fairly general in the genus, especially among the glabrous species, it would seem to be a seasonal phenomenon most in evidence at the time of flowering.

The plant (Rand 1132, collected near Johannesburg) described by Spencer Moore, loc. supra cit., as *N. dentata* var. *transvaalensis* appears to be a distinct species, agreeing much more closely with *L. breviflora* (S. Moore) in the texture and dark impressed lateral nerves of the leaves. From the latter species it is, however, known by its much narrower and glabrous leaves. Fuller material is required for a detailed specific diagnosis.

5. *L. floribunda* (Benth.) C. A. Smith, comb. nov.

Nuxia floribunda Benth. in Hook. Comp. Bot. Mag. ii. 59 (1836), & in DC. Prodr. x. 435 (1846); Pappe, Silva Cap. Ed.2, 30 (1862); Fourcade, Rep. Natal For. 115 (1889); Wood & Evans, Natal Pl. i. 48, t.59 (1899); Sim, For. Fl. Cape Col. 274, t.157 (1907); Prain & Cummins in Dyer, Fl. Cap. iv. i. 1039 (1909); Sim, Flow. Trees & Shrubs in S. Afr. 178 (1919), & Native Timbers of S. Afr. 89 (1921).

* Wood seems accidentally to have distributed specimens of his plant as No. 3578, but in his "List" the number is correctly cited as 3878, the former number belonging to a different plant altogether.

Chilianthus triphyllus E. Mey. in Drège, Zwei Pfl. Doc. 172 (1843), nom. sol.

N. usambarensis Gilg in Engl. Glied. Veg. Usamb. 63 (1894), & in Engl. Pflanzenw. Ost-Afr. C. 312 (1895).

N. floribunda var. *Holstii* Gilg in Engl. Glied. Veg. Usamb. 54 (1894).

N. Holstii Gilg in Engl. Pflanzenw. Ost-Afr. C. 312 (1895); Baker in Dyer, Fl. Trop. Afr. iv. i, 515 (1904).

N. Volkensii Gilg in Engl. Pflanzenw. Ost-Afr. C. 312 (1895).

SOUTH WESTERN REGION. George Div.: forest near George, Aug.-Oct., *Prior*! (K), *Schimper*! (Z); Outeniqua Mountains, Montagu Pass, *Rehmann* 208! (Be, Z). Knysna Div.: in the forests at Knysna, Nov., *Marloth* 2575! (Be), *Bolus* 2145! (K); Kaatjes Kraal, near Yzer Nek, April, *Burchell* 5240! (K); between the Keurbooms River and Bietouw River, April, *Burchell* 5295! (K); in woods at Plettenbergs Bay, Oct., *Rogers* 15468! (R), *B. Smart* in *Herb. Rogers* 27889! (R), sine num. *Mund & Maire*! (Be, K), *Niven* 119! (BM), *Bowie* 6! (BM); Knysna forest, June, *Burchell* 5448! (Be, K); near the Knysna River ford, July, *Burchell* 5537! (K). Humansdorp Div.: near Humansdorp, Aug., *Rogers* 2843! (BM, R); in the forest at Witte Els Bosch, 230 m., Aug., *Fourcade* 844! (K); Storms River Forest, in the T'zitzikamma, 150 m., Sept., *Galpin* 4333! (K); in Coast Forest at Ratelsbosch, 200 m., Oct., *Fourcade* 507! (R); between the Gamtoos and Kromme Rivers, *Drège* 3524a! (Be, BM, K). Uitenhage Div.: between van Staadens River and Galgebosch, Feb., *Burchell* 4673! (K); in the Zwart Kops River Valley, 15-30 m., sine num., *Zeyher*! (Be); on the Zwartkops River banks and in ravines of the van Staadens Berg, *Zeyher* 115! (BM, K); on the Zwartkops River, sine num., *Ecklon*! (type, Be); on the van Staadens Berg, Sept., *Mrs. T. V. Paterson* 723! (Z); near Uitenhage, Dec., *Burchell* 4241! (Be, K). Port Elizabeth Div.: on the Krakakamma, sine num., *Zeyher*! (K); near Port Elizabeth, *Miss West* 63! (K).

SOUTH EASTERN REGION. Albany Div.: near the Great Fish River, *Masson*! (BM). Transkei, "Mamibi Station," Sept., *Forest Officer* in *Herb. Austro-Afr.* 870! (Z). Pondoland, Lusikisiki Div.: between the Umsamwubo and the Umsikaba Rivers, in shady ravines near the big waterfall, under 300 m., May, *Drège* 3524b! (Z). Natal, Alexandra Div.: at Dumisa, along the Umgaye, 600 m., June, *Rudatis* 1015! (Be, BM, K, Z); "Fairfield", 750 m., *Rudatis* 95! (Be); "Umkomanzi River district", in sandy rocky soil, July, *Wheeler*! (Z). Durban Div.: in woods at Berea, 45 m., May, *Wood* 7183! (Be, BM). Inanda Div.: Inanda, July, *Wood* 980! (K); hills near the Illovo River, June, *Gerrard* 1893! (K). Western Zululand (sine loc. exact.), April, *Baker* in *Herb. Evans* 528! (K); *Gerrard* 1893! (BM). Eshowe Div.: at Eshowe, Sept., *Rogers* 24459! (R).

EASTERN TRANSVAAL. Barberton Div.: at Barberton, *Thorncroft* 736! (BM).

TRANSVAAL BUSHVELD. Pietersberg Div.: near Haenertsburg, Feb., *Legat* 122! (BM, R); The Downs, Nov., *Rogers* 21976! (R). Zoutpansberg Div.: Louis Trichardt, June, *Rogers* 21172! (R).

Extends north as far as Tanganyika.

Common names: *Wilde Vlier Boom*, *Bosulier*, *Vlier*, *Wild Elder*.

"A very hard wood of a brownish-purple and an inconspicuous but rather pretty grain. It saws freely for so hard a wood and planes fairly well. It recalls the best boxwood in turning, as it is just as hard and the surface is just as good, but the grain is coarser. It takes a good finish, but the colour is considerably altered in the polishing. It is a very good turner's wood....." *Stone*.

6. *L. saxatilis* C. A. Smith, sp. nov.; affinis *L. emarginatae* (Sond.), a qua angustiore longioreque tubo calycis, corollae lobis sub apicem sine calloso differt.

A tall tree from 10 to 15 m. high; branchlets closely leafy, terete, angled in the younger parts, glabrous. *Leaves* in ternate whorls, petioled, obovate often very strongly cuneate to the base, rounded and mucronate or emarginate at the apex, coriaceous, dark green above, paler below, with entire flat to subrevolute margins, glabrous. *Inflorescence* compactly rounded and densely many-flowered, glabrous in all parts; branches fastigiate, angled, with small much reduced bracts. *Flowers* shortly pedicelled or sessile. *Calyx* campanulate, more or less 4-angled in the upper half owing to the decurrent keels on the lobes, up to 5 mm. long and 1.5 mm. wide. *Corolla lobes* oblong, obtuse and cucullate at the apices, without a subapical callosity, glabrous on the outer face. *Fruit* obovoid, densely adpressedly silky-hairy, slightly exserted from the calyx.

NATAL. Paul Pietersburg Div.: Bevaan Falls, July, *Wood* 3190! (K). Alexandra Div.: Ellesmere, on sunny krantz slopes, 600 m., *Rudatis* 1399! (type, K, Pa).

7. *L. viscidulosa* C. A. Smith, sp. nov.; affinis *L. pubescenti* (Sond.) et *L. emarginatae* (Sond.); ab illa foliis calycibusque glabris, ab hac foliorum forma recedit.

An arborescent shrub up to 5 m. high; branchlets closely leafy, angled in the young parts, glabrous throughout. *Leaves* in ternate whorls, petioled, elliptic, up to 6 cm. long and 3 cm. wide, thinly subcoriaceous, generally a bright green in colour above and below, with flat entire or (very frequently) more or less distantly and shallowly crenate-dentate margins, cuneate toward the base into the 3-7 mm. long glabrous petiole, gradually tapering to the acute to subobtuse or more or less rounded apices, closely glandular-punctate and with a copious viscid secretion during the flowering period, glabrous. *Inflorescence* lax, up to 5.5 cm. long and 7 cm. in diam., with the branches 2-3 times furcate, glabrous in all parts (rarely faintly puberulous along the younger branchlets); upper axillary bracts obovate to spatulate, at length much reduced and linear,

glabrous; the lower foliaceous, elliptic to spatulate, up to 2.5 cm. long and 1 cm. wide. *Flowers* manifestly pedicelled. *Calyx* subcylindric to campanulate (obovoid in bud), up to 5 mm. long and 1.5 mm. in diam., viscidulous and glabrous. *Corolla lobes* oblong, more or less cucullate at the apex and with a distinct subapical callosity, silky-hairy on the outer face. *Fruit* silky-hairy (at least in the upper part), about as long as, or included by, the calyx.

TRANSVAAL HIGHVELD. Witwatersrand Div.: Witpoortje Kloof, 1800 m., Aug.-Oct., *Rogers* 19220! (type, Pa, R), *Moss* 2476! (R); Johannesburg koppies, 1750-1850 m., Aug., *Moss* 2475! (R, Pa); Orange Grove, Johannesburg, Nov., *Rogers* 22362! (R). Pretoria Div.: "Near Pretoria", *Kirk* 30! (K).

8. ***L. emarginata*** (Sond.) C. A. Smith, comb. nov.

Nuxia emarginata Sond. in *Linnaea*, xxiii. 84 (1850).

N. congesta var. *emarginata* Prain in *Dyer*, Fl. Cap. iv. i, 1042 (1909).

SOUTH EASTERN REGION. Bathurst Div.: on the banks and to the east of the Kowie River, under 150 m., Nov., *Ecklon & Zeyher*! (type, Be); near Port Alfred, Oct., *Burchell* 4026! (K); between the mouths of the Great Fish and Riet Rivers, 90 m., Nov., *MacOwan* 297! (Pa); near Bathurst, 150 m., Nov., Dec., *MacOwan* 297! (Z). East London Div.: woods near East London, 150 m., March, April, *Flanagan* 94! (Z), *O. Kuntze*! (K). Natal, Inanda Div.: Inanda, *Wood* 576! (K).

CENTRAL REGION. Somerset East Div.: near Somerset East, *Bowker*! (BM, K).

EASTERN TRANSVAAL. Barberton Div.: summit of the Saddleback Mountain, near Barberton, 1500 m., May, *Galpin* 946! (K, Pa).

This is the "*N. congesta*" of many authorities to a greater or less extent, since *L. saxatilis* may have been included by them also.

8a. ***L. emarginata* var. *brevifolia*** (Sond.) C. A. Smith, comb. nov.

Nuxia congesta var. *brevifolia* Sond. in *Linnaea*, xxiii. 83 (1850).

TRANSVAAL HIGHVELD. Pretoria Div.: on the Magaliesberg, 1500-1850 m., June, *Zeyher* 1327! (type, BM, K); Koedoespoort, near Pretoria, *Rehmann* 4668! (K); hills near Pretoria, Sept., *McLea in Herb. Bolus* 3102! (K).

The affinity of this variety is with *L. emarginata* (Sond.) with which it agrees in the texture and general shape of the leaves, but differs in its smaller inflorescence and the presence of stalked stellate hairs on the lower surface of the leaves. It is not synonymous with *L. pubescens* (Sond.), as cited by Prain & Cummins (Fl. Cap. iv. i, 1041), for it differs from this species in its pubescence of stalked stellate hairs.

9. ***L. heterotricha*** C. A. Smith, sp. nov.; affinis *L. breviflorae* (S. Moore) et *L. viscosae* (Gibbs); ab illa pubescentia simplice e glandulis stipitatis composita facile distinguitur, ab hac omnibus partibus minoribus multo recedit.

A small shrub, about 2 m. high, with the branchlets closely leafy, terete, striate or angled along the densely glandular hairy younger parts. *Leaves* ternately whorled, casually opposite along the very young shoots, petioled (with the petiole up to 1.5 mm. long and densely pubescent with stalked glands), broadly oblong-elliptic to suborbicular, up to 3 cm. long and 2.5 cm. wide, subcoriaceous, pale green and concolorous, with reddish impressed (not raised) lateral nerves and reticulations, rounded to obtuse at the apex, rounded to subtruncate at the base, with entire or casually crenate-dentate flat or subrevolute margins, densely pubescent on both surfaces with two sets of hairs—one set of short stipitate glands, and one set of longer simple hairs especially prominent along the midrib below and on the petioles. *Inflorescence* more or less compact and rounded, up to 2.5 cm. long and 5 cm. in diam., very densely pubescent in all parts with slender stipitate glands and simple hairs; branches 2- to 3-furcate, strongly angled, bearing much reduced bracts. *Flowers* sessile or up to 2 mm. long pedicelled. *Calyx* more or less cup-shaped (obovoid in bud), up to 3 mm. long and 2 mm. wide, densely pubescent, viscidulous. *Corolla lobes* broadly oblong, cucullate at the apex, but without a small subapical callosity on the inner face, thinly hairy on the outer face. *Fruit* subexserted from the calyx, adpressedly silky-hairy.

SOUTHERN BECHUANALAND. Lobatsi, 1200 m., Oct., *Rogers* 6213! (type, Pa, R).

10. ***L. pubescens*** (Sond.) C. A. Smith, comb. nov.

Nuxia pubescens Sond. in *Linnaea* xxiii. 84 (1850); Prain & Cummins in *Dyer*, Fl. Cap. iv. i, 1041 (1909), pro minima parte.

TRANSVAAL HIGHVELD. Pretoria Div.: on the Magaliesberg, 1500-1850 m., June, *Zeyher* 1326! partim (type, BM, K, Pa), *Burke* 259! (BM, K).

See note under *L. montana* C. A. Sm. (No 15).

11. ***L. speciosa*** C. A. Smith, sp. nov.; affinis *L. tomentosae* (Sond.) et *L. sambesinae* (Gilg); a quibus pilis foliorum plerumque simplicibus distinguitur.

A tall shrub or tree; branchlets usually closely leafy, frequently with the floriferous shoots ternately whorled, striate or angled along the closely pubescent young parts, at length terete. *Leaves* ternately whorled, casually opposite along the youngest shoots, petioled (the petiole from 2 to 5 mm. long and densely pubescent), oblong-obovate to elliptic, up to 6 cm. long and 2.5 cm. wide, coriaceous, somewhat discolorous, obtuse or rounded at the top, cuneate to the base, with the margins entire and subrevolute, softly pubescent on the lower face (never glabrous), with fine spreading hairs and casually interspersed stalked stellate hairs, glabrous above (except sometimes along the somewhat impressed midrib near the base). *Inflorescence* compactly rounded, up to 10 cm. in diam. and 4.5 cm. long; branches 3-4 times furcate, strongly

angled, densely pubescent; rameal bracts much reduced, narrowly obovate-cuneate to linear, at most 4 mm. long and 1 mm. wide, at length shortly linear-subulate, adpressed to the branchlets. *Flowers* sessile or with pubescent pedicels up to 0.5 mm. long. *Calyx* campanulate and 4-ribbed in the upper two-thirds, up to 6 mm. long and 2 mm. wide, coriaceous, densely pubescent on the outer face with simple spreading hairs, more or less viscidulous. *Corolla lobes* oblong-elliptic, without a small subapical callosity, adpressedly silky-hairy on the outer face. *Fruit* slightly exserted from the calyx, densely adpressedly silky-hairy.

SOUTH EASTERN REGION. Natal, Ismont, 600–700 m., April, Wood 1862! (Pa, K).

Only two flowering branches of this species have thus far been met with, and, judging from Wood's Revised List of the Flora of Natal, where these are referred to as "*Nuxia* sp.", this indefatigable collector seems to have collected it only once.

12. ***L. breviflora*** (S. Moore) C. A. Smith, comb. nov.

Nuxia breviflora S. Moore in Journ. Bot. xli. 403 (1903); Prain & Cummins in Dyer, Fl. Cap. iv. i, 1041 (1909).

TRANSVAAL HIGHVELD. Witwatersrand Div.: on the northern escarpment of the Witwatersrand series, near Johannesburg, Rand 712! (type, BM); on hills at Orange Grove, Sept., Moss 4130! (Pa, R).

13. ***L. tomentosa*** (Sond.) C. A. Smith, comb. nov.

Nuxia tomentosa Sond. in Linnaea, xxiii. 84 (1850).

N. congesta var. *tomentosa* Cummins in Dyer, Fl. Cap. iv. i, 1042 (1909).

TRANSVAAL HIGHVELD. Pretoria Div.: on the Magaliesberg, 1500–1850 m., June, Zeyher 1326, partim (type, not seen), sine num., Burke! (BM); Koedoespoort, near Pretoria, on slopes of hills, Rehmann 4667! (K).

14. ***L. schistotricha*** C. A. Smith, sp. nov.; affinis *L. sambesinae* (Gilg) et *L. speciosae* C. A. Sm.; ab illa foliorum forma apiceque et inflorescentia minora, ab hac indumenti indole differt.

A tall tree, with the branchlets closely leafy, terete and glabrous, or angled and closely pubescent along the younger upper part. *Leaves* in ternate whorls, petioled (with the petioles densely pubescent and at most 5 mm. long), elliptic, up to 7 cm. long and 3.5 cm. wide, always markedly tapering to the acute or subacuminate apex, cuneate to the base, coriaceous, dark green above, paler below, with the margins flat and often entire, densely pubescent (subtomentose) on the lower face (especially along the midrib) with soft branched hairs having few to many sometimes forked branches, glabrous above or minutely puberulous in the younger stages. *Inflorescence* compactly rounded, up to 3.6 cm. long and 5 cm. in diam.; branches 1- to 2-furcate, densely pubescent and angled. *Cymules* 3-flowered, but very densely crowded on the short (up to 1 cm. long) terminal

branches of the rhachis. *Flowers* subsessile or on 1 to 2 mm. long pubescent pedicels. *Calyx* campanulate, up to 4 mm. long and 2 mm. wide, laxly pubescent with short branched and intermixed simple hairs. *Corolla lobes* oblong, cucullate at the apex, without a subapical callosity on the inner face, thinly adpressedly silky-hairy on the outer face.

EASTERN TRANSVAAL. Lydenburg Div.: Graskop, 1160 m., July, Rogers 23028! (type, Pa, R), 23453! (R).

A specimen in Herb. Kew., Eastwood 5, "Brittlewood," from the Houtbosch, Transvaal (October 1905), is almost an exact match of *Swynnerton* 606 from Melsetter, Rhodesia, and named *Nuxia sambesina* Gilg in Herb. Kew. Neither of the two specimens, however, agrees with typical *L. sambesina* (Gilg) in texture and shape of the leaves and pubescence, but may possibly belong to an undescribed species, being certainly distinct from *L. schistotricha*. Fuller material of the Houtbosch plant will be required for description.

15. ***L. montana*** C. A. Smith, sp. nov.; affinis *L. pubescenti* (Sond.), a qua pilis stipitatis stellatis facile distinguitur.

An umbrageous arborescent shrub or small tree up to 3 or 4 m. high, often with glabrous innovation shoots. *Trunk* up to 15 cm. diam. at the base, tapering gradually upwards to about 5 or 6 cm. diam. below the branches. *Branches* moderately stout, spreading or ascending, leafy towards the apices of the more or less strongly angled and densely stellately pubescent younger branchlets. *Leaves* ternately whorled, casually opposite on the very young shoots, petioled (with the petioles pubescent and up to 7 mm. long), varying from elliptic-subacute to broadly oblong-obovate (more rarely suborbicular) and emarginate at the apex, firm and coriaceous, more or less prominently nerved below, densely gland-dotted, closely pubescent on both surfaces with stalked stellate hairs (or in some examples, glabrescent above), with the margins entire or notched at the apex, or slightly crenate-dentate in the upper half, always distinctly cuneate to the base. *Inflorescence* up to 8 cm. long and 9 cm. in diam., densely many-flowered, with the branches 2 to 4 times furcate, strongly angled and often subtomentose with stalked stellate hairs. *Flowers* subsessile or up to 4 mm. long pedicelled. *Calyx* campanulate, up to 4.5 mm. long and 2 mm. in diam., pubescent (on the outer face) with fine short simple hairs (with occasional intermixed stalked stellate hairs). *Corolla lobes* cucullate at the apex, with a small subapical callosity, adpressedly silky-hairy on the outer face.—*Nuxia pubescens* Prain & Cummins in Dyer, Fl. Cap. iv. i, 1041 (1909), pro maiore parte; non Sond.

TRANSVAAL HIGHVELD. Witwatersrand Div.: on ridges and koppies above Johannesburg, 1500 m., Sept., Moss 4671! (R), 2478! (Pa); Klipriviersberg, near Johannesburg, May, Ommanney 121! (BM); Houghton Ridge, Johannesburg, 1500 m., May, Burt 5247! (K). Pretoria Div.: on the Magaliesberg, 1550–1800 m.,

June, *Burke* 259! (only as to the top right-hand specimen on the sheet in Herb. Mus. Brit.); north ravine at Waterkloof, near Pretoria, on quartzitic outcrops, 1500 m., Aug., *Mogg* 15186! (type, Pa, K); south slopes of the Magaliesberg at Mountain View, on quartzitic krantz faces and summits, 1550 m., April, *Mogg* 15136! (syntype, Pa, K).

L. montana is a very common species on the hills round Pretoria and on the Magaliesberg, where, according to the excellent notes by Mr. A. O. D. Mogg of the Division of Plant Industry, Pretoria, it is found in the fissures of quartzite and chert outcrops, acting as a pioneer species on the bare rock. It flowers sporadically almost throughout the year, being at its best during October.

Up to the present specimens referred to the above species have been variously placed under *L. pubescens* (Sond.) and *L. tomentosa* (Sond.), but apart from several other characters, the nature of the indumentum in the three species is quite sufficient to keep each distinct. In *L. montana* this is composed of relatively short stalked stellate hairs, in *L. pubescens* of stipitate glands mixed with simple non-glandular hairs, and in *L. tomentosa* of longer shaggy dendritic hairs, which are non-glandular.

If these three species are correctly delimited in this paper, it would appear that *L. pubescens* (Sond.) has not been collected again since about 1843 when Burke and Zeyher collected it on the Magaliesberg, while *L. tomentosa* (Sond.) appears to have been collected only once since that date by Rehmann.

III.—CARDAMOMS. I. H. BURKILL.

This list of cardamoms is not unlikely to prove useful to students of the Zingiberaceae. A few new names are proposed in it, as it seems necessary to accept *Languas* vice *Alpinia* for the species of Asia which hitherto have been in *Alpinia*, and a new varietal name is desirable under *Elettaria Cardamomum*. Moreover a plea is made for the retention of the name *Amomum* to include the species (excepting species now in *Aframomum*) placed in that genus by Roxburgh and all later botanists, on the ground that if we adhere strictly to the rules of priority in nomenclature, a long, and to most of us unwelcome, series of new names will have to be put forward, the fact being that no Linnean species remains in the genus.

The last statement will be challenged, as Karl Schumann in his monograph of the Zingiberaceae (Engler's Pflanzenreich, iv. 46, 1904, p. 238) ascribed the name "*Amomum Cardamon* Linn." to the Round Cardamom of Java; and this it is which Dr. A. S. Hitchcock, using the name correctly as *A. Cardamomum*, proposes to regard as the standard-species for the genus (International Botanical Congress, Cambridge, England, 1930, Nomenclature, Proposals by British Botanists, 1929, p. 114). It is necessary therefore to shew that the name *Amomum Cardamomum* has been transferred from one cardamom-yielding plant to another.

In the Species Plantarum, 1753, pp. 1-2, Linnaeus placed four plants in *Amomum*. These were:—

- A. Zingiber*, which became *Zingiber officinale* Roscoe, in 1807,
- A. Zerumbet*, which became *Zingiber Zerumbet* Smith, in 1804,
- A. Cardamomum*, which became *Elettaria Cardamomum* Maton, in 1811, and
- A. Granum-paradisi*, which became *Aframomum Granum-paradisi* K. Schumann, in 1904.

The third of these is the important one in this plea; and it has to be shewn how it became a changeling between 1753 and 1810, having been in 1753 the Malabar cardamom, but in 1810 becoming the round Java cardamom. In 1753 Linnaeus in his Species Plantarum, p. 1, devised its name for the plant which he recognised as giving the Cardamomum minus of the pharmacists, referring to his Materia medica of 1749, and to his Flora zeylanica of 1747. The Materia medica deals with the fruits only, the Flora zeylanica with the plant; and what is said in the latter is of the greater importance to us. In it he calls the plant *Amomum scapo bracteis alternis laxis caule brevior*, the "ensal" of Ceylon, as given in Burmann's Thesaurus zeylanicus, p. 54, and Hermann's Musaeum zeylanicum, p. 66, and the "elettari" of Rheede's Hortus malabaricus, xi, plates 4, 5 and 6, i.e., Rheede's "elettari (prima)" and "elettari secunda."

"Ensal" and "elettari prima" are undoubtedly conspecific; and "elettari secunda" probably represents the same species, but the drawing is bad. We well know that the plant which gives the Malabar cardamom is called at the present time ensal by the Cinghalese or elettari by the inhabitants of the Malabar coast: and when we consult reliable books of the two centuries before Linnaeus we find that Cardamomum minus is in them invariably the fruit of this plant, though we are told that it was so well-known that to ask for cardamomum was sufficient to procure it; and that by English pharmacists it might be called Cardamomum verum. Firmly to establish our case, here is a list of references to writings quoted by Linnaeus and others of his time wherein the Malabar cardamom can be without any doubt recognised in figures and descriptions of Cardamomum minus:—

- 1574, Clusius, Aromatum Hist., p. 99.
- 1598, Mattioli, Opera, p. 28.
- 1623, Bauhin, Pinax, p. 413.
- 1644, Bodaeus a Stapel, Theophrasti de Hist. Comm., p. 1014.
- 1694, Pomet, Hist. de drogues, p. 41.
- 1698, Bontius in Piso, De Ind. utriusque Re Nat., p. 126, the detached fruits only.
- 1699, Morison, Hist. plant., p. 254.
- 1714, Barrelier; Plant. icon. exhib., p. 127 and fig. 571, the figures taken from N. Maronea's De Amomo, 1608.
- 1736, Geoffroy, Treatise on Physick, p. 324.
- 1760, Trew, Herbarium blackwellianum, iv, plate 385.

It was different with the name "*cardamomum majus*," which successive writers used in different ways. Cordus used it for grains of paradise; Clusius used it for the Ceylon or greater cardamom; Matthioli for grains of paradise; Bauhin and Bodaeus for the Ceylon cardamom; Bontius for a species of *Languas*; Pomet, Morison, Barrelier and Geoffroy for grains of paradise; and Trew for the Ceylon cardamom.

Pomet, who has been quoted, gave fantastic drawings of the infructescences of the cardamoms in which trifoliate leaves replace the bracts; these figures, however, are still useful as being true in other respects. But Bontius muddled the records, by figuring a plant of the Javanese round cardamom as *cardamomum minus* and a *Languas* as *cardamomum majus*. "*Gloriatur autem Bontius se primum esse qui cardamomum exacte descripsit*," wrote Ray (Hist. plant, 1688, p. 1204); but it had been better if Bontius had not endeavoured to describe it. Barrelier, later, excluded such Cardamoms as the round Java cardamom from *Cardamomum* calling them *Amomum*.

Bontius' mistake led to the one real inaccuracy in Linnaeus' references for his *Amomum Cardamomum*, for by 1747 he had accepted the figure as of his plant, and this acceptance ultimately led to the transfer of the name.

In 1754 Linnaeus identified as many of the plates in Rumpf's Herbarium Amboinense as he could, and ascribed fig. 1 of plate 65 in volume 5 to *Amomum Cardamomum*. Rumpf's text makes it seem probable that he was right; for Rumpf states that he knew four cardamoms in trade, and one—this one—in life, which had been brought to Amboyna about 1670 via Java, and grew to an undersized plant in the gardens of the town. His figure interpreted by the aid of the text appears to be of a plant of the Malabar cardamom wanting in robustness, the variety of it giving the larger-fruited Ceylon or greater cardamom; for he contrasted it with a smaller-fruited Malabar cardamom. In 1762 Linnaeus issued the second edition of his *Species Plantarum*. The same four species were enumerated; and though the definition of *A. Cardamomum* is slightly altered, there is no change in what Linnaeus meant; but he passed a misprint and made an error in regard to his citations from Rheede's *Hortus Malabaricus*, by citing Rheede's *Elettari secunda* only (plate 6) as *Amomum Cardamomum* and Rheede's *Elettari (prima)* which is on plate 5, as plate 6 and transferring it to *A. Granum-paradisi*, whereas it is more undoubtedly his *A. Cardamomum* than is *Elettari secunda*. The error does not invalidate the species. Apparently Linnaeus had transposed these references, and then corrected one of the numbers in partial discovery of this mistake. The third edition of the *Species Plantarum*, 1764, changes nothing.

Before Willdenow produced his edition of the *Species Plantarum* in 1797, several species had been added to *Amomum*. Sonnerat had described the Malabar Cardamom again, but under a new name

A. repens (Voyage aux Indes Orientales, v., 1782, p. 272). Koenig (in Retzius, Obs. 3, 1783), Thunberg and Loureiro had added, Thunberg a *Zingiber* and the others certain obscure species. Willdenow incorporated them. He re-defined *A. Cardamomum* and did not recognise that *A. repens* Sonn. should have been placed as a synonym. In his redefinition he ascribed to it an obovate spike (possibly from Bontius, possibly from Rumpf), and this seems to have led Roxburgh to identify as *A. Cardamomum* Linn. a plant which he had raised from Sumatran seed: in fact he cites for it Willdenow's edition of the *Species Plantarum* (Asiatic Researches, xi., 1810, p. 343). Though the definition of 1810 is inadequate, we know quite well what that plant was, as a figure of it is given in Roxburgh's *Plantae Coromandelianae* (1819, plate 227). Roscoe was at the time working at the genera of the *Zingiberaceae* in Britain, and fixed his idea of *Amomum* by Bontius' figure (Trans. Linn. Soc., viii., 1807, p. 352); but with Roxburgh really commences a clear conception of what *Amomum* might be, and he added to the genus several species which all botanists have kept in *Amomum*; and Maton in the year 1811 (Trans. Linn. Soc., x. p. 249), created the genus *Elettaria* for *Amomum Cardamomum* Linn. Blume in 1827 (Enum. Fl. Jav. i. p. 48) used Linnaeus' name like Roxburgh, for the wrong species.

Under our circumstances, the common-sense procedure is to conserve *Amomum* Roxb., abandoning *Amomum* Linn., and to take as a type-species one of Roxburgh's own, preferably *A. aculeatum*, of which he gave a figure in 1810. To make this effective the genus should be conserved also against Giseke's proposed genera *Meistera*, *Wurfbarnia*, *Paludana*, and *Etlingera* (Praellect. in Ord. Nat. plant, 1792, pp. 205-209) and *Elettaria* Maton against *Amomum* Linn.

It is not possible to obtain a rational foundation for *Amomum* earlier than Roxburgh's work. There are objections against considering Willdenow to be the creator of the present *Amomum*, as it is not possible to take his *A. Cardamomum* for a type species. Nor is it possible to take Roscoe's. Both were confused. There are strong objections against bringing into the argument Koenig's and Loureiro's species, for we do not know exactly what any of them are, though, commencing with Karl Schumann, botanists have been in the habit of affixing the name *A. uliginosum* Koen. to a Malacca plant, Koenig having observed his specimen in Junkseylon.

A. Cardamomum Roxb. of course must have a new name; and *A. Kepulaga* Sprague and Burkill is proposed, *kepulaga* being the Javanese name for the cardamom which it gives.

Cardamoms of International Commerce.

Elettaria Cardamomum Maton

var. *minuscule* Burkill, the Mysore cardamom, the Malabar cardamom and the Mangalore cardamom.

var. *major* Thwaites, the Ceylon or Greater cardamom, or Long cardamom or "Wild" native cardamom (of Ceylon).

Amomum subulatum Roxb., the Greater Indian or Nepal cardamom.
Amomum Krervanh Pierre, the Cambodian cardamom.
Amomum Kepulaga Sprague and Burkill, the Round cardamom of Java or the Cluster cardamom.
Aframomum Melegueta K. Schum., Grains of Paradise (peppery) from the west coast of Africa.
Aframomum Granum-paradisi K. Schum., ditto.
Aframomum sp., the Korarima cardamom (*Amomum Korarima* Pereira, from East Africa.

Cardamoms of Internal Trade, and local use.

India :—

Amomum aromaticum Roxb. Apparently this was grown formerly in Bengal and its cardamoms were an article of trade. Though Sir George Watt failed to find it about 1890, Sir George King obtained evidence of its use.

Languas Galanga Burkill (*Alpinia Galanga* Swartz), yielding the Galangal cardamom.

China and Indo-China :—

Amomum echinosphaera K. Schum., its camphoraceous cardamoms selling as kreko shmol in Cambodia and along with others in Annam as sa-nhan. They are reckoned next in value to those of *Amomum Krervanh*.

Amomum xanthioides Wall., the Xanthioid cardamom of Tenasserim and Siam. The Hairy China cardamom which has been unsatisfactorily traced to *Amomum villosum* Lour., Tschirch cautiously ascribes to the neighbourhood of *A. xanthioides*.

Amomum sp., a very similar Chinese cardamom, camphoraceous, and differing from the last in having few prickles on the fruit-wall.

Amomum sp., an ovoid cardamom assigned to *A. ovoideum* Pierre; but perhaps the same as the last.

Amomum sp., grown in Yunnan, and very near to *A. aromaticum*. Like others it sells in China as tsao-kou. It was figured by Hanbury as the Ovoid China cardamom, and called *A. medium*; but it is not *A. medium* Lour.

Amomum sp., the large round China cardamom described by Hanbury.

Amomum Tomrey Gagnep., the tom-rey of Indo-China.

Amomum sp., the bitter-seeded cardamom of China, which is stated to be obtained in Yunnan, Kwang-tung and Cochin-China. Tschirch suggests that it is derived from *Costus speciosus*; but this is not possible. It possesses the name of *Amomum amarum* F. P. Smith, and certainly is an *Amomum*.

Unidentified cardamoms of Indo-China, traded in as krakor-sva or red krakor, krakor sar or white krakor, and krakor momis or velvety krakor.

Languas globosa Burkill (*Alpinia globosa* Horanin., *Amomum globosum* Lour., *A. glabrum* Baill.), the small round China cardamom, sold as tsao-kou and as sa-nhan.

Languas Galanga Burkill, as in India.

Languas conchigera Burkill (*Alpinia conchigera* Griff.).

Malaysia :—

Amomum dealbatum Roxb., which name, as Valetton has shewn (in Bull. Jard. Bot. Buitenzorg, ser. 3, 2, 1920, p. 355), covers the *A. maximum* of several authors. It is cultivated in Java, and is also found wild in the teak forests.

Riedelia curviflora Oliv., used in Eastern Malaysia.

Vanoverberghia sepulchrei Merr., used in the Philippines, also other species mentioned above under *Amomum* and *Languas*.

Africa :—

Aframomum, several species, including *A. angustifolium* K. Schum., *A. mala* K. Schum., *A. Hanburyi* K. Schum., **A. macrospermum** Burkill (*Amomum macrospermum* Smith) and *A. latifolium* K. Schum.

The word cardamom entered the languages of Europe through Greek, but certainly was not a Greek word in the beginning. It consists of amōmon and a prefix, card-, the origin of which is unknown; some have suggested that it came from a south India language and meant wild, but that is a guess only. Theophrastus in the fourth century B.C. knew two spices, cardamomon and amomon, which came to Greece through Media, but he did not describe them. Dioscorides, five centuries later, stated that cardamomon was the best of the aromata which came to the Levant by Commagene, Armenia and the Bosphorus, and therefore from the east. He calls it pungent and rather bitter. Galen, his immediate successor, and other physicians who followed, likewise attributed bitterness to it. As none of the cardamoms of international trade are really bitter, though sometimes there is a slight bitterness in *Elettaria Cardamomum* var. *major*, writers have asserted that the cardamomon of the Greeks was none of the modern cardamoms. The sanskrit gave to modern Indian vernaculars words for the cardamoms akin to ela, and left in Java ela-ela for *Amomum gracile* Blume, a plant much closer in appearance to *Amomum aromaticum* than to *Elettaria Cardamomum*. Such words do not appear to have left any record among the Greeks, and it seems impossible to arrive at a clear understanding as to what was the oldest known cardamomon. Indeed Theophrastus may have meant a group of species rather than one in particular, for Pliny certainly used the word cardamomum for a group. In Pliny's time four kinds were sold in Rome: "Quatuor ejus genera: viridissimum ac pingue, acutis angulis, contumax fricanti, quod maxime laudatur: proximum e rufo candicans: tertium brevius atque nigrius. Pejus tamen varium et facile tritu, odorisque parvi: qui verus, costo vicinus esse debet." Pliny calls them oblong seeds, an expression which fits the cardamoms from *Elettaria*: and these probably were among the four.

IV.—TASMANIAN MUSEUM AND ART GALLERY, AND BOTANICAL GARDENS.

The Report of the Trustees for the year ended June 30th, 1929, has reached Kew in the form of a type-written copy and is a document of considerable interest, especially from the Botanical side.

Mr. L. Rodway, C.M.G., who has been one of the Trustees for many years, resigned his position in October 1920, but fortunately he has been persuaded to accept the position of Advisory Director of the Botanical Gardens and also Officer in Charge of the Botanical Section of the Museums. Tasmania owes so great a debt to Mr. Rodway for all the work he has done in connection with the Flora of the Island—which has been undertaken in an honorary capacity—that the retention of his services augurs well for the further stimulation of interest in Botanical exploration in Tasmania.

Another welcome addition to the Trustees is Mr. A. V. Giblin, who is now a valued correspondent of Kew. He is taking a very keen interest in the Flora, and is undertaking journeys from time to time to interesting localities, with the object of studying critically the various types of vegetation found at different altitudes in the Island and the possible occurrence of natural hybrids in certain genera.

It is also welcome news that the Government have agreed to increase the annual vote, but, as the Trustees very rightly point out, a larger sum than the £1500 now voted is needed in order that the Institution may be able to carry out the many lines of work which should be undertaken before it may be too late.

The Report on the Herbarium by the Director of the Museum and Art Gallery is of so much historic value that it is here reproduced, and it is followed by Mr. Rodway's Report to the Trustees.

Herbarium.

"In my report for the year 1919 I drew attention to the need for a botanical section of the Museum being established. I am glad to be able to report that after ten years effort in this direction, it has been found possible to establish an herbarium, and of even more importance, to secure Mr. Rodway's services for part time to take charge of this section of the Museum's work. Much of the initial work of establishment has been carried out by the Botanical Section of the Royal Society of Tasmania acting under the direction of Mr. L. Rodway, assisted by Mr. A. V. Giblin, to whose personal interest and activity a great deal of the present progress is due. Mr. Rodway has been ably assisted by Mrs. Rodway in several sections of the work, and thanks are due to the above and others for the progress made to date which is set out in the separate report.

"To quote from my report of ten years ago, I then stated:—
'At the present time Mr. L. Rodway, C.M.G., possesses a magnificent botanical collection, representing the work of a lifetime. This

collection includes many types and co-types. Mr. Rodway informs me he intends to present it where it will be of value and of use, but he is certainly not going to give it to any institution where it cannot be properly preserved. I hope that arrangements can be made for this collection to be officially accepted in the Tasmanian Museum.'

"Since the above was written Mr. Rodway has placed his collection of flowering plants on loan to the University, but he has already placed his collection of Cryptogams in the Tasmanian Museum Herbarium which, from present indications, will develop into the Tasmanian National Herbarium, and I venture to repeat the hope expressed ten years ago in regard to Mr. Rodway's main collection.

"Efforts are being made to secure additional financial support in order that Mr. Rodway's exceptional botanical knowledge may be available in full measure. Advice has just been received of a small Commonwealth grant to aid in research work, particularly as regards grasses and fungi, and other avenues will be approached during the year. Considering the honorary work done by Mr. Rodway for so many years past as honorary Government Botanist and the very marked assistance he has rendered to the Agricultural and Forestry Departments in particular there should be support forthcoming from these quarters if not from the Government generally.

"A detailed report of the work of this section is given in the report of the Director of the Herbarium attached hereto."

"Report of the Director of the Herbarium.

"The Chairman and Trustees of the Tasmanian Museum,
1st July, 1929.

"Gentlemen,

"The Tasmanian Museum Herbarium was established in November 1928 and fills a long felt want as regards the work of the Museum and Tasmania generally.

"The need for active botanical research on the economic side is particularly urgent in a country such as Tasmania, and especially so owing to its present state of development. The Herbarium has been equipped with shelving, specimen cases, sorting cabinets, and office fittings as far as financial circumstances would permit. Much of the work being done in the Herbarium is being carried out in an honorary capacity by members of the botanical section of the Royal Society, acting under my direction.

"The initial and present main work consists of the collection, identification, preservation and cataloguing of a complete collection of the Tasmanian flora, together with a second set intended for the Federal Herbarium at Canberra, as well as a third set for Kew. This work is being done in close collaboration with Dr. Hill, Director of Kew, who laid the foundation of this phase of the work during his recent tour to Tasmania. To date, over 700 flowering plants

have been duly mounted and an equal number of Fungi. The Hepatics and other sections are also receiving attention. The preparation of a vernacular list of Tasmanian plants is also being given consideration.

"The Trustees are appealing for additional funds in order to extend the work of the Herbarium, and in the event of such funds being secured the following, among other matters, will receive attention:—The study of fungi and their effect on vegetation, the formation of a collection of plants affected by diseases caused by fungi, the introduction to Tasmania of valuable eucalypts, and the growth under forest conditions, the improvement of pasture lands, and the investigation of Tasmania's native grasses, the utilisation of Tasmania's button grass country, cross-fertilisation and improvement of certain native plants of economic use, the investigation of native plants other than eucalypts suitable for paper production.

"Considering the short time the Herbarium has been in operation considerable progress may be claimed to have been made as regards this section of the Museum's work.

LEONARD RODWAY,

27.6.29. Director of the Herbarium."

The remarks of the Director of the Museum and Art Gallery as to Mr. Rodway's invaluable services to Tasmanian Botany need no endorsement, and it is to be hoped that a generous response may be forthcoming, either from Government or from private sources, to recompense him to some extent for all he has done to further the study of the vegetation of Tasmania.

Now that interest in the Tasmanian flora has been so much stimulated and a band of keen workers is being got together the Report giving the results for the present year will be eagerly awaited. We also look forward with keen interest to the promised sets of specimens for the Kew Herbarium.

There is also a Report of the Superintendent of the Botanic Gardens, but as this is a document mainly of local interest it is not reproduced.

The Hobart Botanic Gardens are beautifully situated on sloping ground overlooking the magnificent harbour, and the fine lawns very much enhance their charm. The Gardens, when I visited them, were well laid out and in good condition. They are under the charge of Mr. John Wardman, the Superintendent, who in his early days received some of his horticultural training under the late Mr. R. I. Lynch at Cambridge.

There are several fine specimens of Conifers and other exotic trees, but there is no particular systematic arrangement of the plants, and the Gardens might be considered rather more as a pleasantly planted park than a strictly Botanic Garden.

In the private part there was quite a good collection of native trees and shrubs. It would add greatly to the interest and educational value of the Gardens if the display of native Tasmanian trees and shrubs could be developed and allied species from South Australia and Victoria could be grown in association with the Tasmanian plants.

It would also be of great interest if a collection of "Antarctic" trees and shrubs and herbaceous plants could be made, as the climate of Hobart would probably be eminently suitable for their growth.

Such a feature in the open would be unique as far as Botanic Gardens are concerned; it is to be hoped, therefore, that the Trustees may be able to get together a representative collection of the plants which may have spread from the old Antarctic continent, representatives of which are now found growing in Southern Chile, New Zealand and Tasmania. Such genera as *Eucryphia*, *Nothofagus*, *Knightia*, *Laurelia*, *Fuchsia* and *Calceolaria*, for instance, from Chile and New Zealand, together with any of the species which are native in Tasmania, would make a collection of very great value and should stimulate interest among those who are taking up the careful study of the Tasmanian vegetation.

A. W. H.

V.—ADDITIONS TO INDEX KEWENSIS: X.*

Journal of Botany 1924, 1925, Supplements.

Dr. H. O. Forbes's Malayan Plants.

Owing to an unfortunate oversight the new names contained in the above work were omitted from the Index Kewensis, Supplement VII, and are therefore being included in Supplement VIII. In order to minimize the risk of these names being overlooked in the meantime, a list of them is given below. All new names are followed by the author's name and reference to the page in the Supplement to the Journal of Botany. In the case of new species the locality is cited, and new transfers are followed by the binary names on which they are based.

M. L. G.

[Journal of Botany 1924, Supplement.]

POLYPETALAE.

Annonaceae.

- Polyalthia Kingii* E. G. Baker 3.—Sumatra.
- subsessilifolia* E. G. Baker 3.—Sumatra.
- Goniothalamus Forbesii* E. G. Baker 4.—Sumatra.

Polygalaceae.

- Xanthophyllum Forbesii* E. G. Baker 7.—Sumatra.

Tiliaceae.

- Grewia Henrici* E. G. Baker 13.—Sumatra.
- sumatrana* E. G. Baker 13.—Sumatra.
- Elaeocarpus celebesianus* E. G. Baker 14.—Celebes; Java.

* Continued from *Kew Bull.* 1926, p. 483.

Burseraceae.
Santiria Forbesii E. G. Baker 16.—Sumatra.
longepaniculata E. G. Baker 17.—Sumatra.

Meliaceae.
Dysoxylum brachypodium E. G. Baker 17.—Sumatra.
lasiophyllum E. G. Baker 18.—Sumatra.
Chisocheton sumatranus E. G. Baker 18.—Sumatra.
dempoënsis E. G. Baker 18.—Sumatra.
Aglaiia kabaënsis E. G. Baker 19.—Sumatra.
longepetiolulata E. G. Baker 20.—Sumatra.
pyricarpa E. G. Baker 20.—Sumatra.

Olacaceae.
Phytocrene Forbesii E. G. Baker 21.—Java.
Strombosia rapaneoides S. Moore 22.—Sumatra.

Ampelidaceae.
Leea Forbesii E. G. Baker 24.—Sumatra.

Sapindaceae.
Lepisanthes Forbesii F. G. Baker 25.—Sumatra.
Nephelium Forbesii E. G. Baker 25.—Sumatra.
Pometia Forbesii E. G. Baker 26.—Sumatra.
Guioa Forbesii E. G. Baker 26.—Sumatra.

Balsaminaceae.
Impatiens albo-rubra Hook. f. 27.—Sumatra.
dempoana Hook. f. 27.—Sumatra.
Forbesii Hook. f. 28.—Sumatra.
heterosepala Hook. f. 28.—Sumatra.
lonchocarpa Hook. f. 29.—Sumatra.

Leguminosae.
Mucuna ovalis E. G. Baker 32.—Sumatra.

Rosaceae.
Pygeum glabrifolium E. G. Baker 33.—Sumatra.
viride E. G. Baker 34.—Sumatra.

Myrtaceae.
Aphanomyrtus Forbesii Greves 36.—Sumatra.
Eugenia amboinensis Greves 36.—Amboina.
dempoënsis Greves 36.—Sumatra.
kabaënsis Greves 38.—Sumatra.
siphonantha King ex Greves 38.—Sumatra.

Melastomaceae.
Marumia ciliatiloba E. G. Baker 40.—Sumatra.
Medinilla verrucosa E. G. Baker 41.—Sumatra.
sumatrana E. G. Baker 41.—Sumatra.
Pternandra Forbesii E. G. Baker 41.—Sumatra.

Samydaceae.
Casearia Forbesii E. G. Baker 43.—Sumatra.

Begoniaceae.
Begonia longepetiolata E. G. Baker 44.—Sumatra.

Araliaceae.
Schefflera canaliculata E. G. Baker 44.—Sumatra.

GAMOPETALAE.

Rubiaceae.
Nauclea superba S. Moore 46.—Sumatra.
megaphylla S. Moore 47.—Sumatra.
Lerchea capitata S. Moore 48.—Sumatra.
Ophiorrhiza extenuata S. Moore 48.—Sumatra.

[Journal of Botany 1925, Supplement.]

Tarenna scabrida S. Moore 49.—Sumatra.
mollis S. Moore 50 : *Webera mollis*.
Randia jasminiflora S. Moore 50.—Sumatra.

Compositae.
Vernonia Forbesii S. Moore 54.—Sumatra.

Vacciniaceae.
Vaccinium pensile S. Moore 55.—Sumatra.
fastigiatum S. Moore 56.—Sumatra.
eugenioides S. Moore 56.—Sumatra.

Myrsinaceae.
Ardisia subtilis S. Moore 58.—Sumatra.

Sapotaceae.
Bassia magnifolia King ex S. Moore 60.—Sumatra.
Forbesii King ex S. Moore 60.—Sumatra.
sericea King ex S. Moore 61.—Sumatra.
Payena ornata S. Moore 61.—Sumatra.
eugeniaefolia King ex S. Moore 61.—Sumatra.

Ebenaceae.
Diospyros sphenophylla Hiern 62.—Java.
refracta Hiern 63.—Sumatra.
globulifera Hiern 63.—Sumatra.
lonchophylla Hiern 63.—Sumatra.
Jabadii Hiern 64.—Sumatra.
Maba Forbesii Hiern 64.—Sumatra.

Oleaceae.
Jasminum curtlobum S. Moore 66.—Sumatra.

Loganiaceae.
Fagraea spatiosa S. Moore 69.—Sumatra.
pyriformis S. Moore 70.—Sumatra.

Gentianaceae.
Gentiana humifusa S. Moore 70.—Sumatra.
Limnanthemum sumatranum S. Moore 71.—Sumatra.

Cyrtandraceae.
Aeschynanthus dempoënsis S. Moore 73 : A. Forbesii, Ridley.
Agalmyla brevifolia S. Moore 73.—Sumatra.
Stauranthera parvifolia S. Moore 73.—Sumatra.
Chirita Ridleyana S. Moore 74 : C. Forbesii, Ridley.
Cyrtandra perplexa S. Moore 74.—Sumatra.
locuples S. Moore 75.—Sumatra.
flabellifolia S. Moore 75.—Sumatra.
minor S. Moore 75.—Sumatra.
scutata S. Moore 76.—Sumatra.

Acanthaceae.
Staurogyne setisepala C. B. Clarke ex S. Moore 77.—Sumatra.
Strobilanthes assimulatus S. Moore 77.—Sumatra.
thunbergiaeflorus S. Moore 78.—Sumatra.
deminutus S. Moore 78.—Sumatra.
Hypoestes bantamensis S. Moore 79.—Java.

Verbenaceae.
Callicarpa rudis S. Moore 80.—Sumatra.
Ridleyi S. Moore 80.—Java.
Clerodendron lanceoliferum S. Moore 81.—Sumatra.

MONOCHLAMYDEAE.

Piperaceae.

- Piper accedens* S. Moore 84.—Java.
late-oblongum S. Moore 84.—Java.

Lauraceae.

- Litsea crebriflora* S. Moore 87.—Sumatra.
prolixa S. Moore 88.—Amboina.
Neolitsea formosa S. Moore 88.—Sumatra.
latifolia S. Moore 89 : *Litsea latifolia*.

Santalaceae.

- Scleropyrum moschiferum* S. Moore 90 : *Pyrularia moschifera*.
Calyptosepalum S. Moore 91 (gen. nov.).
sumatranum S. Moore 92.—Sumatra.

Euphorbiaceae.

- Cleistanthus castus* S. Moore 93.—Sumatra.
Glochidion pusilliflorum S. Moore 93.—Sumatra.
peltiferum S. Moore 94.—Sumatra.
versicolor S. Moore 94.—Sumatra.
disparilaterum S. Moore 95.—Sumatra.
prinoides S. Moore 95.—Java.
foliosum S. Moore 96.—Sumatra.
grave S. Moore 96.—Sumatra.
Drypetes microphylloides S. Moore 97.—Sumatra.
Neoscortechinia sumatrensis S. Moore 99.—Sumatra.
Clonostylis S. Moore 101 (gen. nov.).
Forbesii S. Moore 101.—Sumatra.
Blumeodendron sumatranum S. Moore 102.—Sumatra.
cuneatum S. Moore 103.—Sumatra.
Gelonium sumatranum S. Moore 104.—Sumatra.
affine S. Moore 104.—Sumatra.

Moraceae.

- Ficus tenuipes* S. Moore 107.—Timor.
nitentifolia S. Moore 107.—Timor.
reticulatissima S. Moore 108.—Timor.
tenimbrensis S. Moore 111.—Timor Laut.
Artocarpus brunneifolia S. Moore 112.—Sumatra.
Conocephalus Forbesii S. Moore 112.—Amboina.

Urticaceae.

- Pellionia sumatrana* S. Moore 113.—Sumatra.

Fagaceae.

- Pasania induta* S. Moore 114 : *Quercus induta*.
daphnoidea S. Moore 114 : *Quercus daphnoidea*.
rajah S. Moore 115 : *Quercus rajah*.

MONOCOTYLEDONES.

Orchidaceae.

- Eria rhinoceros* Ridley 116.—Sumatra.
Calanthe breviflos Ridley 117.—Java.
Forbesii Ridley 117.—Sumatra.
Phalaenopsis Forbesii Ridley 118.—Sumatra.
Sarcanthus Forbesii Ridley 118.—Java.
Forbesina Ridley 120 (gen. nov.).
eriaeformis Ridley 120.—Sumatra.

Zingiberaceae.

- Alpinia Annabellae* Ridley 121.—Amboina.

Haemodoraceae.

- Ophiopogon caulescens* Ridley 122 : *Chloopsis caulescens*.
acaulis Ridley 122 : *Chloopsis acaulis*.

Commelinaceae.

- Forrestia distans* Ridley 124.—Java.

Palmae.

- Pinanga Forbesii* Ridley 124.—Sumatra.

VI.—MISCELLANEOUS NOTES.

The retirement of DR. A. B. RENDLE, F.R.S., from the Keepership of Botany, British Museum (Natural History), is announced to take effect in January, 1930. Dr. Rendle joined the Museum Staff in 1888 and succeeded to the Keepership as long ago as 1906, on the retirement of the late Mr. George R. M. Murray, the algologist.

During his period of service at the Museum he has found time, in addition to his administrative duties, to pursue actively his interest in the study of the Monocotyledons. This has found expression in many publications. His *Classification of the Flowering Plants, Gymnosperms and Monocotyledons* (1904), was for many years the standard textbook of its kind. He was responsible for the sections dealing with the Monocotyledons in several papers in the *Journal of the Linnean Society*, on Wollaston's Ruwenzori plants (1908), Swynnerton's Gazaland collection (1911) and Compton's New Caledonian plants (1921). He also collaborated with the late Mr. William Fawcett in the preparation of four volumes of the *Flora of Jamaica* (1910-26), and contributed the account of Urticaceae published in the *Flora of Tropical Africa* (1917).

A long association with the Linnean Society, of which he became a Fellow in 1888, culminated in his election to be President of the Society in 1923, a fitting recognition of the service he has done the Society during his four periods on the Council, and as Botanical Secretary from 1916 to 1923. As representative of the Linnean Society he took a prominent part in the International Botanical Congress held at Vienna in 1905.

Dr. Rendle has always taken a keen interest in the question of botanical nomenclature. In conjunction with the late Mr. James Britten, he compiled a revised list of the names of British Seed-Plants and Ferns (1907), embodying various changes required to bring the nomenclature into accordance with the International Rules of Nomenclature adopted by the Vienna Congress. He also presided over the sectional meeting on Nomenclature held at the Imperial Botanical Conference, London (1924), when several important resolutions for the modification of the International Rules were adopted for recommendation to the next International Botanical Congress.

In addition to these activities Dr. Rendle has for many years been Professor of Botany to the Royal Horticultural Society, whose Victoria Medal of Honour in Horticulture he received in 1917.

His keen interest in British Botany is perhaps best shown in his contributions to the *Journal of Botany*, the editorship of which he took over on the death of the late Mr. James Britten. He has always taken an interest in local natural history societies and has been President of the South Eastern Union of Natural History Societies.

Dr. Rendle was President of Section K. of the British Association at the meeting at Newcastle in 1916. In 1909 he was elected a Fellow of the Royal Society and is now a member of the Council.

On his retirement he has the best wishes of his fellow botanists that he may for many years enjoy the opportunity to devote himself to the botanical work in which his interests lie unhampered by official duties.

He is succeeded by the Deputy Keeper in the Department, MR. JOHN RAMSBOTTOM, O.B.E.

The Department of Agriculture, Trinidad.*—On retiring from the post of Director of Agriculture, Trinidad and Tobago, MR. W. G. FREEMAN has taken the opportunity of presenting an interesting review of the development and work of the Department from its foundation in 1908.

"During 1928 the Department completed the first twenty years of its existence, having been founded on 1st November, 1908. As, in addition, this is the last annual report I shall write on the Department which I joined as Assistant Director in 1911, and of which I have been Director since 1917, it seems appropriate to review very briefly events during this period. Like some other Departments of Agriculture in the Empire, e.g., Jamaica, British Guiana, Ceylon, etc., the Department traces its origin back to its Botanic Garden founded in 1818, which for many years did all the work of introducing new plants, testing them, and advising on their care. The need of chemical assistance led to co-operation with the Government Analyst and in 1908 a definite Department was formed by amalgamating the Government Botanical and Analytical departments, and the Government Farm which dates from 1879. There were also put under the Department, River Estate, 1500 acres, acquired originally as a water pumping station, and St. Augustine Estate, some 3000 acres, bought to obtain a new site for the Farm. In addition there were a small Botanic Station and a Farm in Tobago.

From its origin the Department with the large properties of St. Augustine and River to administer has been in a different position from most Departments of Agriculture even now, and has had to face practical agricultural problems on an estate scale.

When the Department was formed in 1908 there was also created a Board of Agriculture, an executive body with its own funds raised

*Administration Report of the Director of Agriculture for the year 1928. Trinidad and Tobago. Government Printing Office, Trinidad, 1929, pp. 56.

by a special tax, which had control, under its own staff, of all work connected with diseases and pests, and also of agricultural education amongst the peasantry. This continued until 1920 when the Department was reorganised, all the work and staff put directly under it, and the Board of Agriculture changed to an advisory body.

From soon after the outbreak of the Great War the Department has experienced difficult times. During the war period it, not unnaturally, was understaffed. At the reorganisation it was re-modelled on a scale commensurate with the work to be done. The period of general trade depression followed very quickly; some posts were abolished or not filled. Another disastrous result was that the new Head Office building, the necessity for which had been very great for some years, although started in 1921 was not completed, and for seven more years the accommodation has been absolutely inadequate. There came the Imperial College of Tropical Agriculture, towards which the Colony gave large financial assistance (about 50 per cent. of the total contributed by all the Dominions and Colonies), and gave rise to a popular view that there was no need for both a College and a Department. The result was further reduction of staff, the Entomologist and even such an absolutely necessary officer as an Assistant Director being dispensed with. These circumstances, together with the inevitable increase in work as a country develops and new problems arise, have for a long time almost crippled the Department, and reduced its working capacity to a dangerously low level. It has pulled through as well as it could by the loyal co-operation of all the members of the staff whose devotion to their work, under very difficult conditions, I take this opportunity of putting on record."

Mr. Freeman then takes each branch of the Department and gives a general note on its activities from the date it was first started. The remainder of the Report is devoted to current work.

His reference to River Estate and St. Augustine Estate is amplified in a further section of the Report. River Estate, a property of 1500 acres, was acquired by the Government in 1897 for £4,629 to secure the water rights for a pumping station for Port-of-Spain. At that time it was an abandoned sugar estate, with a few cacao trees whose total crop was 182 bags (165 lb.). In 1908 this estate was placed under the Department of Agriculture and since 1920 has been a section of the Department. As an estate it has paid its way, and its profits have been utilised for its further development. Its cacao crop is now over 1300 bags, and the estate, which now includes areas under limes, coffee, beans, citrus, and timber, is valued at £35,000.

St. Augustine Estate was also an abandoned sugar estate. It was purchased for about £9,000 in 1900, as a new site for the Government Farm. It was managed by the Department from 1908, and some £11,000 was spent on its development. The estate was broken up in 1920 on the reorganisation of the Department, the Farm, St. Augustine Experiment Station, and two pastures—these latter

since presented to the Imperial College—and the Cotton Research Station, being retained by the Department. Some areas were sold, as was also the old machinery, whilst unsold lands were handed over to the Crown Lands Department. By 1920 the Department had repaid the original cost, deposited over £12,000 profits in the Treasury, and at that date still held land and property to the value of some £33,000.

Mr. Freeman is to be succeeded by Mr. E. J. WORTLEY, O.B.E., F.L.S., who has for some years been Director of Agriculture, Nyasaland.

Derris.—The extended use of "Tuba" root in the preparation of proprietary insecticides has resulted in larger areas being devoted to the cultivation of this plant in the Federated and Unfederated Malay States. According to the Annual Report of the Agricultural Department for 1928 the area now planted in Johore is about two thousand acres, though only seven hundred acres are devoted to the crop in the Federated Malay States. From experiments carried out at the Serdang Experiment Station, where several species of *Derris* are cultivated, it has been shown that there is a wide degree of variation in the toxic content of the roots of the different species and varieties. The roots of *Derris malaccensis* Prain, commonly known as "Erect Tuba," are regarded as being more highly toxic than those of *Derris elliptica* Benth. ("Tuba puteh"). An interesting fact is that the fine lateral rootlets have been shown to possess a higher toxic content than the large roots in all cases. The most suitable time for harvesting *D. elliptica* is considered to be about two years from planting, for at this stage toxicity is at a maximum, but is inclined to decrease after this period. A ready sale is said to exist locally in Malaya for the air-dried root, prices varying from 25 to 30 cents. (Straits) per lb.

F. N. H.

It is with much pleasure that we record the following 'Kew' distinctions from the New Year's Honours List:—MR. JOSEPH JONES, formerly Curator of the Botanic Gardens, Dominica, and MR. W. R. MUSTOE, Superintendent, Horticultural Operations, Delhi, to be Officers, and MR. J. AIKMAN, Assistant, Royal Botanic Gardens, Kew, to be a Member, of the Most Excellent Order of the British Empire.

We learn that MR. W. J. BEAN, I.S.O., has been appointed Adviser and Consultant on the planting on Highways to the Ministry of Transport. He already advises on the planting schemes of the Technical Committee of the Roads Beautifying Association.

DR. T. A. SPRAGUE, Assistant, has been appointed by the Minister of Agriculture and Fisheries to the newly created post of Deputy Keeper of the Herbarium.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1930 ROYAL BOTANIC GARDENS, KEW

VII.—A BOTANICAL EXPEDITION TO PERSIA. J. M. COWAN.

A proposal for a botanical expedition to Iraq and Persia put forward by the Director of the John Innes Horticultural Institution, Merton, early last year appeared to be one with which Kew could be very profitably associated.

With the concurrence of the Empire Marketing Board and the Ministry of Agriculture and Fisheries, it was arranged with Sir Daniel Hall that Dr. J. M. Cowan, a temporary member of our staff, should accompany Dr. C. D. Darlington from Merton, and that the Expedition should be a joint one.

The selection of Dr. Cowan for this interesting expedition proved to be a very fitting choice, since in addition to being a keen botanist, he is a traveller of experience, a qualification which, as may be gathered from the following narrative, is essential for anyone attempting to carry out journeys in Persia.

Dr. Cowan has prepared the accompanying general account of the tour, in the course of which he received every assistance from H.M. Consuls and others, to whom grateful thanks are offered for all their kindness.

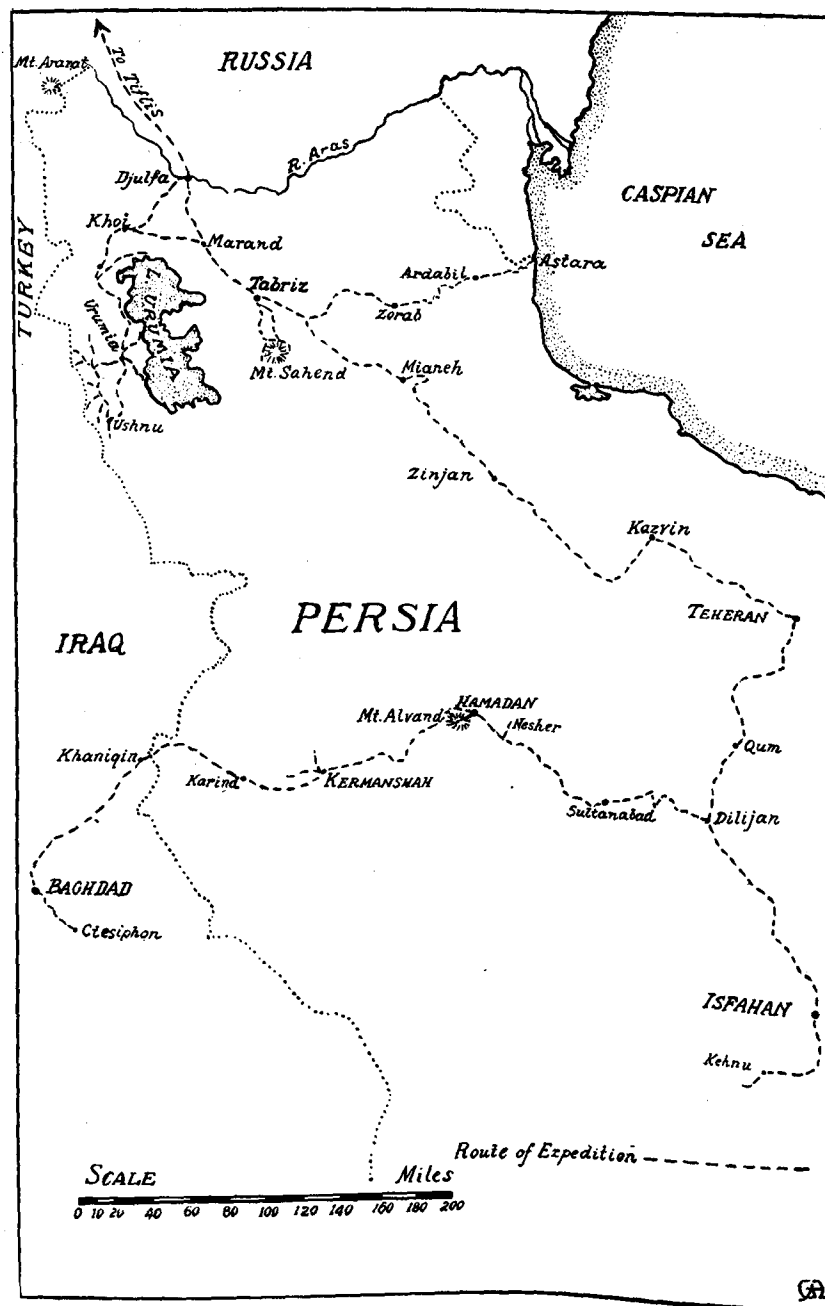
Valuable collections of living bulbs of Tulips and other plants have been successfully brought home as well as living specimens and seeds of plants of economic interest, and a very important collection of Herbarium material* which is now being identified by Dr. Cowan.

This further opportunity of being able to send a competent botanist to explore and collect in a region likely to yield plants and information of value to the Empire, has been rendered possible by the grant of the Empire Marketing Board to Kew.

A. W. H.

At the time of our departure for Persia, the whole of Europe was locked in snow and a journey by train even to Marseilles was an uncertain adventure. There was thus no choice in the selection of a route for we had to arrive by a definite date in Damascus, so, leaving London on February 22nd, 1929, we travelled by sea via Gibraltar to Port Said.

* The collection is deposited in the Herbarium at Kew. The serial numbers given after botanical names in this account refer to the collector's field numbers of this collection.



Dr. Cowan's route on his botanical expedition through Persia.

PALESTINE.

The Sinai desert was crossed by night. As the train passed through Southern Palestine in the early morning, it was interesting to note some of the changes that had taken place since I had been there during the war. The most striking feature was the great increase in the number of Jewish Settlements in the course of the last ten years. Fleeting glimpses showed, not only scattered villages as of old, but many solitary homesteads, a fact which is noteworthy as evidence (in spite of recent disturbances) of the more settled condition of the country. The settlers appeared to be prosperous and, under the new conditions, the land is naturally more intensely cultivated than under the old and its fertility seems to have considerably increased. Orchards and orange groves have expanded and planting is progressing rapidly. The main difficulty that growers have to contend with is, I was told, the marketing of their fruit. It is claimed that the greater part of the profit goes into the pockets of middlemen, and attempts are now being made to organise a more direct system of selling so that the Jaffa orange may obtain the popularity it deserves.

Another striking feature of the general development of the country is the great improvement in communications. Many of the roads, formerly unmade tracks, have been converted into highways permitting fast travel at almost every season.

It was disappointing not to have time to revisit some of these localities; and I should have liked also to see something of the afforestation work which has been undertaken. The route we followed, however, gave no opportunity of witnessing development in this direction.

The sand dunes along the coast which were rapidly encroaching upon fertile agricultural land appeared to have advanced, in some places considerably.

On the limestone hills the creation of forests must necessarily be slow, yet there are areas where, with the help and sympathy of the local population, timber might be grown without much initial preparation of the soil. As far as could be seen, however, conditions in the region traversed were much the same as they were during the war.

The road over the Lebanons being blocked by snow, we proceeded from Ludd (Lydda) to Jerusalem by train, and from there by car, a delightful journey to Tiberias, along the shores of the Sea of Galilee and then across the Jordan into Syria and on to Damascus.

We were too early to see the hillsides a blaze of colour with spring flowers, but there were here and there purple tints where the common *Cyclamen*, *C. latifolium* Sibth. & Sm., and a small *Erodium* were just coming into flower, also a few patches speckled red with the Syrian Poppy.

DAMASCUS TO BAGHDAD.

The journey across the Syrian Desert from Damascus to Baghdad, a distance of 533 miles, was made in the Nairn Desert Transport 65 h.p. Safeway Coach.

Although the traveller is regaled, before starting, with harassing tales of cars that have come to grief or disappeared, there is actually nothing, beyond the discomfort of two days' continuous violent jolting, that would upset even the most timid traveller. When the first ten miles of the journey are accomplished, the fields and Date Palms of Damascus have been left behind and the bleak, arid hills to the north of the city are quickly receding. Onwards, as far as Ramadi, there is nothing but desert.

Having crossed a dry sandy stretch of country we came, somewhat suddenly, to a region where rain had obviously fallen within the past few days. The general colour of the landscape changed from a sandy to a greenish-yellow, owing to large irregular patches of vegetation. Throughout the Syrian Desert the rainfall apparently varies considerably, for arid sandy belts alternated with greener stretches and at one point there was, in fact, a distinct line which marked a very recent fall of rain. Taking the whole desert journey, it was not the barrenness of the land so much as the extraordinary amount of vegetation that was its most striking feature at the time we crossed. It was evident too that the spring herbage cannot be so meagre as might be expected, for it supports, for a time at least, vast numbers of cattle and seems to maintain them in good condition. During the first day's journey we passed through a whole series of Bedouin encampments, which spread out before us continuously for an hour, until we had covered a distance of 40 miles. There were camels by the thousand, sheep, goats, donkeys and Arab ponies, all in every shade of colour from pure white to jet black. While passing through this well-grazed area we saw in the distance a small lake, about a mile long. It was the only real stretch of water we passed in the desert, although one mirage after another preceded us for most of the way.

During the twenty minutes' halt for lunch, I was able to examine some of the vegetation more closely, and in this short time collected some sixty species in flower. They were scattered in small irregular groups often with considerable intervals between each plant and with wide blanks between the groups. Many of the plants were only from half an inch to one inch high. The groups were composed of mixed associations, Composites predominating. The most striking of these was the minute, orange-flowered *Calendula persica* C. A. Mey. There were several small Leguminous plants (*Medicago* most abundant), and Crucifers, *Arenaria* sp. and a pink-flowered *Erodium*. *Iris Sisyrinchium* L. (22) occurred in small groups and a *Cyperus* sp. in larger patches, both gregarious. The main fodder grass was *Poa bulbosa* L. (11). A number of species were remarkable on account of their grey foliage, amongst these being *Filago prostrata*

Parl., *Plantago Loeflingii* L., *Ceratocephalus falcatus* Pers. and the curious button-like *Odontospermum pygmaeum* Hoffm. (1), sometimes known as "the Rose of Jericho."

Part of the night of March 9th was spent at Rutbah, a stone-built fort, and Ramadi was reached the following afternoon. From here across the Euphrates to Baghdad and the Tigris the landscape is relieved by scattered wheat fields and the horizon is broken by groves of Date Palms.

For a week (March 10th to 17th), we remained in Baghdad, awaiting the arrival of equipment from Busra and were much indebted to Mr. J. F. Webster, Inspector-General of Agriculture, for help with final arrangements and in negotiating the maze of formalities that have to be gone through ere Persian territory may be entered. Two pleasant afternoons were spent collecting round Baghdad and as far as Ctesiphon, with the Rev. F. A. Rogers, and several visits were paid to the Agricultural Farm and College at Rustam, where we enjoyed the hospitality both of Mr. F. K. Jackson and of Mr. D. D. Patterson, the Principal. One afternoon I spent with Mr. Jackson looking over and arranging the local herbarium at the College, which contains an excellent representation of the local flora.

But Baghdad, even in March, is not an alluring city. The glare of the sun-dried bricks is trying, and walking and driving is none too pleasant on account of the impossibility of moving about without inhaling large quantities of the local dust. It was surprising to find within the city no public parks or gardens. Of the one miserable playing ground for children, recently opened, the municipality, judging from the local newspaper, is inordinately proud.

The banks of the Tigris, with its long vistas and cooling breezes, offer so much scope for these amenities, which are usually regarded as necessities under much less trying conditions of climate, that it seems extraordinary that the more enlightened of the local population have not yet come to appreciate the value of civic "lungs." What trees there are in the city are dust-covered, and the exotics struggling to maintain life in private gardens look very sad.

For the tour through Persia a 30 cwt. Ford Truck of the new type, sent out from England, was the means of transport used. In spite of steep gradients and of roads often no better than a ploughed track, the truck did its work efficiently; in fact, by no other means of transport could so much have been accomplished in the time. We travelled 3,500 miles in the lorry, and, using it as a base, made excursions by pony, mule or on foot, another 400 miles.

BAGHDAD TO KHANIQIN.

From Baghdad to Khaniqin on the Iraq frontier the first part of the way is flat. The soil is a heavy alluvium and about Baghdad the greater part of the country is irrigated and carries crops of wheat and barley. The commonest weeds in the fields are the familiar *Lepidium* *Draba* L., *Malva rotundifolia* L., *Reseda decursiva*

Forsk. (211), *Camelina* sp. and *Capsella Bursa-pastoris* L., with several bulbous *Muscari* and *Ornithogalum*. Seven miles from the city the last of the cultivated land is reached; the track then runs through arid country, near the railway for part of the way, and passes only an occasional village.

In the vicinity of Khan Bani Sa'ad, date palms become an important feature on the horizon and near here a small swamp was passed with surrounding *Juncus*, and with masses of *Ranunculus aquatilis* L. in the water.

After 65 miles of level ground the Jebel Darawishka range had to be crossed, the lower slopes of which carry a dwarf vegetation, very similar to that of the Syrian desert. Just as we were descending the Khaniqin slope of this barren-looking range of hills, we made the most interesting find of the day, a fine yellow Tulip with a black centre. To collect about a dozen bulbs we had to get out our mining tools, for the ground was exceedingly hard and stony and the bulbs a foot or more below the surface of the ground. To trace the slender white stem which led down to the bulb, without cutting it, was no easy matter.

The night of the 18th March and the following morning were spent in Khaniqin, Mr. F. Haire of the R.F.A. being good enough to accompany me as guide on a short excursion. Although we did not again find the yellow Tulip, there were many other plants already in flower. The frontier was crossed in a dust storm, visibility being just good enough to discern above the road two solitary trees which seemed out of place in these arid surroundings.

PERSIAN FRONTIER TO HAMADAN.

To the Persian plateau from Kasr-i-Shirin is a climb of about 5000 ft. The slope is fairly steadily upward for 35 miles. Patches of cultivation and rolling plain with wide stretches of arable land soon replace arid conditions. There are several steep ascents, the last and most formidable being the Pai Tak which is negotiated by a series of hairpin bends. When we reached the top, winter conditions prevailed, the distant hills were covered with snow, what trees there were were leafless and there was as yet no sign of spring flowers. From the top of the Pai Tak pass there is a short descent with scattered Oak scrub on either side and then the Karind Plain is entered. This is the first of a series of plateaus often thirty or forty miles or more in length, and fifteen to twenty miles in breadth, which characterise the country as far as Teheran. These wide plains lie at altitudes varying from 3000 to 6000 ft. and are separated by steep ranges of hills which have to be crossed by zig-zag tracks.

Kermanshah, which lies in the centre of the plain of the same name, at an elevation of 4500 ft. above sea level, is flanked by mountains snow-capped in the early spring, not unlike the Spanish Sierra Nevadas. Our stay here was longer than we had anticipated, for we had arrived at the beginning of the Persian New Year celebrations and had to leave our goods for a week in bond, learning

that the first requirement for an extended tour in Persia is an infinite patience.

An exceptionally cold spell just before our arrival had set back early growth, and we found few plants to collect, the ground being for the most part almost bare except for scattered clumps of the withered shoots of *Euphorbia Myrsinites* L. (343). Several excursions were made, to Tak-i-Bustan, to Lake Nil-i-Nuphar with M. Moreaux of the Customs department, and in other directions.

The whole of this part of Persia is treeless except round towns and villages where small plantations are often found along the banks of streams. The species usually planted is *Populus euphratica* Oliv., occasionally *P. alba* L., less seldom Willows, and 'Sangit' (*Elaeagnus angustifolia* L.).

I was astonished to find that the methods adopted in establishing these plantations would do credit to a well-trained forester. At Kermanshah the plantations were typical. The main stream, which ran along a narrow valley, was tapped by a permanently flowing artificial water channel, four feet wide and two feet deep, which had been constructed along the hillside on the contour. Along both banks of the channel Poplars had been planted. Parallel to this permanent water course, at four feet intervals down the slope to the stream at the bottom of the valley, shallow trenches had been dug and the ground was roughly terraced. Along one side of each trench a row of seedlings had been planted so that, to irrigate the successive rows, all that was necessary was to break the bank of the channel above and to allow the water to flow down and along each contour trench in turn. The original planting had been done closely at a spacing of about six inches. No actual thinning was made but the method of felling had very much the same effect as an *éclaircie par le haut*. The fastest growing poles reached a height of 25 to 30 feet and a diameter of about 9 inches in 14 to 15 years and were then removed. The least vigorous stems were by this time suppressed. Thus the commercially mature plantation, at the age of about 20 years, consisted of a fine stand of straight poles from a foot to eighteen inches apart in the woods. Further there was in the small area planted a series of age classes, which would maintain a permanent supply of straight poles. These constitute the chief demand for timber, since in a Persian village the houses are flat roofed and when the walls have been taken to a height of about eight feet, the rafters, invariably round untrimmed poles, are laid down at intervals of one foot to eighteen inches. They are covered by bundles of faggots or roughly split batons laid at right angles to them. A layer of rubble is laid on top and the roof is completed by adding a coating of mud. Thus none of the timber is wasted, though its use is confined to roofing and the making of agricultural implements, the local fuel being cow or camel dung. For these poles, transport, always a difficult matter in Persia, is provided by donkeys. The load varies from two to six poles per animal, crossed near the

butt-end and lashed to the pack saddle. The thin ends of the poles splay out and drag along the ground, the donkey being at the fulcrum of his scissor-shaped load.

It was our intention to proceed northwards from Kermanshah by the Senneh road and to make excursions towards the frontier. North of Senneh, however, the Persian army was engaged in a war with the Kurdish tribes, in an attempt to disarm them, and we were unable to obtain permission to proceed by this route. "A fool who collects weeds" might have some ulterior motives.

By the 29th March we had overcome customs difficulties and left Kermanshah meaning to proceed southwards to Sultanabad and Isfahan in order to encounter warmer weather. The road took us by the great rock of Bisitun, which rises almost vertically 5000 ft. above the plain, and we stopped frequently to collect but found little. At Kangavar a passing motor driver warned us not to attempt the direct road to Sultanabad so, recognising that a prearranged programme in Persia is for ornament rather than use, we took the longer route by Hamadan. This necessitated crossing the Asadabad pass at an altitude of 7300 ft., but the road was fortunately free from snow, although large snow drifts lay all around and a bitterly cold wind was blowing near the summit.

We had only descended a short distance when suddenly to our astonishment we discovered a large number of Crocuses in full bloom. Amongst them were two Irises, one *Iris reticulata* Bieb. (336) with pale blue petals speckled a darker blue and with a yellow spot, and another a species of the *Oncocyclus* group. Tulips, *Muscari*, *Allium* and *Ornithogalum* were abundant, but the first green leaves were only just appearing above ground. At last we had reached a paradise for collectors, for the whole hillside, whether the land was bleak and waste or more sheltered and ploughed for cultivation, was green-dotted with these young plants. Earlier disappointments were forgotten and we had collected a goodly number of bulbs before darkness and a heavy downpour compelled us to hurry on to Hamadan. But already we had decided that we must wait over for a day or two and explore this neighbourhood more thoroughly.

To Mr. Davis, Vice-Consul at Hamadan, who next morning rescued us from our so-called hotel, we were truly grateful. With him we made a number of excursions, one to Mt. Alvand, where we reached a height of about 8500 ft. before being stopped by snow. Here again there were in some places many bulbous plants just breaking through the earth, but at this season much of the ground was quite bare and everywhere the soil was very stony. On many of the slopes low bushes of a spiny *Astragalus* were scattered at intervals of 20 or 30 feet, and on others a semi-herbaceous *Salvia* and the remains of a *Euphorbia*. All these plants were of a dark brown colour and, having recently lost their winter shroud of snow, as yet showed no signs of new growth. Looking down into the main valley which leads up from Hamadan we could see on the lower

slopes tall poplars standing leafless and conspicuous with their white bark, and above them, on the higher slopes, willows with bright red twigs, a fine picture in contrasting colours. Nearer Hamadan almond and apricot orchards had been planted in the valley and the whole ground was carpeted with a deep blue *Muscari*, a wonderful natural colour scheme, which would be well worth imitating in gardens.

HAMADAN TO ISFAHAN.

An attack of influenza unfortunately kept me for a few days in Hamadan, but by the 11th April I was able to be out again, and by this time the poplars and "Chanars" (*Platanus orientalis* L.) on the roadsides and in the gardens were yellow and green with their young foliage and in the orchards the almonds and apricots were in blossom. We left Hamadan on the 16th April for Sultanabad, spending the greater part of that day on the mountains near the village of Nesher where, under the guidance of an old man who skipped about with the agility of a young goat, we collected large numbers of Tulips, red, yellow and white, *Fritillaria imperialis* L. and other species. At Sultanabad we spent the night with the British Vice-Consul, Mr. Hutton and his wife. The collections made by Mr. R. Strauss, his predecessor, from this part of Persia are well-known.

Thanks to the energies of Mrs. Hutton we were able to satisfy ourselves that excellent wine can be made from the grapes of the country if care is taken in the manufacture. Since the Mohammedan religion forbids its followers to taste of the fermented grape, wine in Persia is usually made by Armenians; it is often difficult to obtain, and is of poor quality, being, as a rule, extraordinarily acrid. In one locality we were told that 72 varieties of grapes are grown, principally for raisins. The vineyards, however, looked so neglected and the system of pruning so haphazard that the crops obtained must be very much smaller than would be possible with better methods. When transport conditions have been improved and there is greater facility for export, and markets other than the Russian are organised, there is no doubt that this industry will become much more important than it is at present.

Leaving Sultanabad by the road to Qum we turned aside at Ibrahimabad to Emrabad. Here for several miles the plateau is covered with tufts of *Gladialus atrovioleaceus* Boiss. (599) scattered about at intervals of 1 to 2 yards, the only other frequent species being a *Euphorbia*. Consociations such as this, with a single dominant species, are typical of large areas on the arid or semi-arid Persian plateaus. Further south a *Salvia*, in evenly distributed clumps 2 to 3 ft. in diameter and 1 to 2 ft. high, with a drab foliage closely resembling the colour of the soil, is the dominant plant.

In other areas, *Cleome coluteoides* Boiss. (568), with a pungent and objectionable odour, forms consociations. Elsewhere species of *Euphorbia* are dominant. North of Isfahan the vegetation of

considerable tracts of country is characterised by *Artemisia* sp. Again, *Peganum Harmala* L. is widespread over other areas.

On hilly ground, and over a great extent of the plateaus also, there are mixed associations, with Composites (the genera *Senecio*, *Achillea*, *Anthemis*, *Matricaria*, *Tragopogon*, *Saussurea*, predominating), Crucifers (especially *Alyssum*), *Roemeria*, *Acantholimon*, *Silene*, *Reseda*, *Linum*, *Geranium*, *Euphorbia*, *Tulipa* and *Muscari* as the plants most frequently encountered.

When we had shown our passports and given our fathers' names and a brief autobiography to the police, a precautionary measure against brigands, we were allowed to enter the city of Isfahan. Here we were royally entertained at the Consulate by Mr. and Mrs. Bristo. Their garden is one of the finest we saw in Persia. The green lawns near the entrance are lined with Cypress trees, and a water pool in the centre gives it something of the appearance of the gardens of the Taj Mahal in miniature. Further back are some tall specimens of Pines, and several Oriental Planes, and a number of fine *Robinia Pseud-acacia* trees bearing enormous hanging clusters of cream-coloured flowers. In the flower beds Petunias were the most flourishing of the exotics, their growth being so vigorous that they were regarded almost as weeds.

In Isfahan a good deal of time had to be spent in drying and packing our collections, but one excursion was made to the village of Kehnu on the borders of the Bakhtiari country. Here I was the guest at lunch of the headman of the village and of one of the "gulams" from the consulate and we supped in Persian style. I saw something of the local agricultural methods and the skilful layout of the fields to facilitate irrigation.

For conducting water to the area, two methods are in general use; an open channel or "jub," and an underground tunnel or "kanat." The "jub" starts from a stream, the "kanat" from a water-bearing *stratum* in the hills, possibly many miles from the locality where the water is required. Along the line of the tunnel wells are dug at intervals which vary according to the nature of the soil. Near the starting point they are said to be sometimes as much as 500 ft. deep. The men employed to do the excavation have a wonderful sense of direction and seldom go astray when tunnelling from one well to the next.

By the mouth of each well there is a huge mound of earth, and long lines of these may be seen in many parts of Persia. An astonishing amount of work is put into the construction and maintenance of these "kanats." Each year the tunnels have to be cleared and this is done by parties of men working in pairs. A windlass is erected over the mouth of each well in turn, and while one man is let down by a rope and works below ground, his companion remains at the surface to haul up the bucketsful of mud collected.

The principal crops grown are barley, cotton, opium and mustard. Two crops of barley are sown, one in the autumn and one in spring. Five or six months are required from the time of sowing

till harvest and the land is irrigated at intervals of 40 days. The Opium Poppy is sown with Cotton and *Kalashu*, a kind of garlic, the Poppy being harvested before the Cotton matures. Mustard requires 7 to 8 months to ripen and the oil is used for lighting and as a lotion for applying to the backs of camels. A press of a kind I had not seen before was used for extracting the mustard oil. In a dimly lit cavern three long tree trunks were lashed securely one above the other; their length was about thirty feet and the diameter of the largest over four feet. The butt ends of these enormous boles were let into a recess in the end wall some four feet above ground level, while the narrow ends were hoisted, by a primitive derrick, fifteen feet to the roof of the building. The mustard seed was laid in a hole in the ground a foot or two from the wall and above it a log, the size of a butcher's bench, was placed vertically under the main boles. Other logs were added to fill in the gap and were jammed fast with wedges driven by a heavy mallet. Then the windlass was allowed to turn, the trunks descended from the roof, giving a tremendous pressure, and the oil that oozed out was collected at a point six feet below the surface of the ground, to which a well gave access.

With seven enthusiasts from the village, who were enjoying a lorry ride for the first time, a collecting expedition was made to a range of hills fifteen miles away. No car could have been expected to go over worse country and it was only possible by the ease with which the load could be converted into additional power. After a fairly successful time we returned to Kehnu after dark, and instead of proceeding to Isfahan, I was the guest for the night of the headman, who provided all necessities. I slept comfortably, for the village was well walled and it was five years since the last raid, in which 65 of the inhabitants were massacred.

ISFAHAN TO TEHERAN.

From Isfahan to Qum we had retraced our track as far as Dillijan and, with numerous halts for collecting, were able to cover the 174 miles to Qum in our longest single day's journey. On the other hand, a week or two later, it took us seven hours of hard work to cover four miles; such is motoring in Persia. Qum was visited with the object of obtaining, if possible, cuttings of a seedless Pomegranate which was known to grow about there. After a long search we were successful in finding it, and although most of the Pomegranate trees in the orchards had been killed by a phenomenal frost earlier in the year, we were fortunate enough to secure cuttings. A few days later they left Teheran by air mail, and arrived safely at Kew, where the *anare behaste* or "Pomegranate of Paradise" is now growing. It may be interesting to add a note as to the method of culture of the Pomegranate. It is propagated by cuttings, and trees are planted at approximately eight feet intervals. During the whole of summer the land is irrigated every six days. The soil is tilled in the early spring, being turned over to a depth of about

two feet. Using long-handled spades four men dig together. They raise their spades simultaneously and plunge them close together into the ground. A wooden footrest near the base of the spade enables them to apply pressure by jumping upon it as they drive in the spade. Then together they lift the heavy sod and toss it into the air so that it is partly broken in falling. The whole operation is then repeated. There is apparently no timekeeper, yet the men work in complete harmony and cover the ground at an astounding pace. After digging, barley is sown as a catch crop and is harvested before the Pomegranates ripen.

In Teheran my time was fully occupied for four or five days despatching collections homewards. This is not the simple business the uninitiated might be led to expect—the process had the horrors of a recurring nightmare, and I was grateful to those at the Legation, especially to Mr. Henderson, who made matters easier.

Sunday was spent as the guest of Sir Robert Clive, at Gulahek, in the Legation garden. I had the pleasure also of meeting Dr. Sayid Khan, who assisted me with the purchase of seeds and drugs and lent me several interesting old Persian illustrated Herbals.

From Teheran, had time been available, we should have travelled as far as Asterabad on the Caspian Sea, but a wire to Tabriz brought the reply that the spring flowers were already beginning to appear, so we hastened towards the less-known regions round Tabriz and Urumia.

TEHERAN TO TABRIZ.

We left Teheran on May 2nd, and were impressed by the greenness of the vegetation and greater density of the population as compared with the more arid tracts further south. As far as Kazvin, it was rare to be out of sight of a habitation. To the north lay the Elburz Range from which numerous streams run down to the plain. This accounted for the fertility of the district, for much of the soil in Persia requires only water to convert it from barren into fertile land. The streams at the same time do a good deal of damage during flood, leaving wide stony beds, just as may be seen along the foothills of the Himalayas on a much larger scale.

On waste land the outstanding plant was the Cistus-like *Hulthemia persica* Bornm. (856) with bright yellow petals and a dark brown centre. It is a low spiny shrub, not as a rule exceeding one foot in height, but covering altogether many acres.

After Kazvin we left the road and took to a mere track, indicated by the line of poles of the Indo-European Telegraph. Our pace was reduced to 10 m.p.h., punctuated by frequent pauses to negotiate ruts and cross drains, and by sudden spurts when the surface for a moment would permit of some acceleration. Zinjan lies near the point of two approaching ranges of hills. From Zinjan we followed the Zinjan Rud more or less closely for a distance of about seventy miles, the country becoming again more arid. It was no longer necessary to negotiate the famous Kuflan Kuh, up which

cars had to be hauled by a capstan, for a new road had been built. Here we found a most striking Crucifer, *Aethionema pulchellum* Boiss. (712). It grew in shrubby cushions, 2 to 3 feet in diameter, and these were dotted all over the hill-side, each cushion a marvellous blaze of pinkish-purple. Another conspicuous plant in the same locality was an orange-coloured *Glaucium*.

By the time we were approaching Mianeh we had descended to an elevation of 3000 feet and became aware of the change from temperate to semi-tropical conditions, not only by the rise in temperature but by the presence of rice fields, with buffaloes ploughing as in India. The plain of Mianeh is exceedingly fertile and stretches for nearly twenty miles. Rice is the principal crop grown and there is no shortage of water, which comes from the river, Kizil Uzin, which we crossed by a stonework bridge with 23 arches.

Without calling a halt in the village of Mianeh, which has gained a reputation on account of its specially noxious bug *Agras persica*, we climbed again out of the plain and spent the night at Suma. This is a delightful little village recalling Avon-side haunts in Banffshire. Near our hut was a fast-flowing brook making a pleasant song, beautiful green grass and Buttercups, and in the distance Poplar trees, Willows and a rustic bridge spanning the stream.

From Suma the road is a series of zig-zags up and down with 47 rivers to ford in the valleys. Near Yusufabad we passed a freshwater lake, and having negotiated the perilous-looking ascent and descent of the Sibilik Pass, were in well-irrigated country with row upon row of pollarded Willows. After a few miles of more barren country we arrived at Tabriz, having completed the 400 mile journey in five days. In Tabriz we were entertained most hospitably by Mr. Gilliat-Smith, who is himself a keen botanist and has sent valuable and interesting collections from the Tabriz area and elsewhere to Kew.

AROUND LAKE URUMIA.

After a two days' halt in Tabriz, I set out again (this time by myself) for Urumia, travelling via Djulfa and Khoi, reaching the Russian frontier (88 miles), in under four hours, a journey which takes two days in the Persian train! Here I turned south-west and between Djulfa and Khoi in one or two localities only, but there abundant, I found *Iris Barnumae* Foster & Baker growing profusely in small clusters. Next day, between Khoi and Urumia its so-called variety (var. *urumensis*, 1290), which has a brilliant yellow flower, was found also in one or two localities, notably on the Kushji Gadugi Pass.

To the south of Dilman the road crosses a low-lying portion of the plain of Salmas, which in recent geological times must have formed part of the Lake of Urumia. The landscape was a blaze of yellow with *Ranunculus*, recalling the Oxford meadows in early summer. Soon after our first sight of Lake Urumia we passed a ruined village, the first of many, for these are a constant feature of the district,

where there is scarcely a house that has not suffered in the war and post-war disturbances.

Mr. and Mrs. Muller of the American Presbyterian Mission, to whom I had a letter of introduction, very kindly asked me to make their house my headquarters during my stay in the district.

Excursions were made to the parts nearer Urumia, to Band and to the Lake, then several days were spent in the Mission rest house at Sir, from which the surrounding areas were explored. The road to Sir for part of the way follows the Bardeshur Chai, whose banks are lined with willows (two species), a *Prunus*, a *Fraxinus*, poplars and an occasional *Crataegus*. The lower hills have a sparse vegetation, but yielded *Capparis sicula* Duham. (1516), *Aristolochia maurorum* L. (1219), and *Orobanche* sp. parasitic on *Salvia* and on Thyme. At higher altitudes the pastures improve and the vegetation above 6000 ft. is luxurious.

There are few grasses, but Composites, Labiates and Leguminous plants are abundant. *Astragalus*, *Salvia*, *Nepeta*, *Veronica*, *Aethionema*, *Euphorbia*, *Centaurea*, and *Tragopogon*, are the commonest genera. *Linum austriacum* L., with delicate blue flowers, covers great parts of the hillside, and *Campanula involucreta* Aucher (1257) and *Ixiolirion montanum* Herb., both with conspicuous blue flowers, are also frequent. *Gladiolus atrovioleaceus* Boiss. is not uncommon on many of the slopes and several species of thyme and *Acantholimon* occur, forming small brightly coloured clumps. Among the more striking plants *Onobrychis cornuta* Desv. must be mentioned; growing in great cushions up to three or four feet wide; a group of these, covered with their pink flowers, makes a wonderful display. *Stachys lavandulifolia* Vahl. with its long purple, feathery calyx-lobes is fairly common, and *Verbascum phoeniceum* L. (2261) with its remarkable bronze-coloured petals and purple filaments is rare. Comparatively few species grow gregariously, but some of the small and more sheltered hollows were yellow with the flowers of a *Ranunculus*. Here and there small patches were carpeted blue with *Globularia trichosantha* Fisch. & Mey., or elsewhere with the "forget-me-not" *Echinopspermum Szovitsianum* Fisch. & Mey., graceful in appearance if not in name. Near the top of Sir Dagh the vegetation is again more sparse and the commonest plant is the fennel-like umbellifer, *Prangos ferulacea* Lindl. (1867), which is abundant enough to make green the predominating colour.

The longest and most interesting excursion undertaken in the Urumia District was to the Plains of Mergavar and Tergavar and on to the frontier hills beyond. Permission to make this excursion was withheld for some time, but eventually given on the condition that a military escort should accompany the party.

After the prolonged haggling which usually precedes the conclusion of a bargain in the East, mules and ponies were obtained at a reasonable price, and I set out from Urumia on May 16th.

As the convoy slowly wound its way past Band and on up the valley of the Bardeshur Chai we were able to scour the surrounding hills. Camp was pitched on the Plain of Dhast, near the village of Silvana, where the river bends northwards to enter the hills again. Next morning it was raining hard at daybreak, so we decided not to move camp but to explore further up the valley and the nearer hills.

A mile above camp we passed some Kurdish tents with flocks of cattle, goats and sheep, and soon the valley narrowed into a rocky gorge which made going difficult. On marshy ground there were two orchids, one *O. maculata* L., or a near relative, with spotted leaves and a large head of purple flowers, the tallest plant proving on measurement to be 2 ft. 5 in. high. Thereafter we crossed a huge snowdrift and, leaving the ponies, climbed up the mountain side. In a small valley we came across several stunted trees, and some scattered shrubs. An oak, one or two Acers, *Pyrus*, *Crataegus*, *Prunus*, *Rhamnus*, and a small shrub with a *Dalbergia*-like leaf. On a flat piece of ground, that had probably once been inhabited, we observed a walnut tree about 30 ft. high and a group of a purple-flowered *Allium*, with very large heads, standing over three feet in height. All over the hillsides there were masses of bright-coloured flowers. Among the most striking were a large Poppy very similar to the garden *Papaver orientale* L., but with pink instead of scarlet flowers, the purple *Primula auriculata* Lam. in great clumps by the marshy banks of mountain streams, a mauve *Centaurea* and a yellow-flowered species of the same genus almost equally handsome, yellow Achilleas, great numbers of shrubby Crucifers (mostly *Aethionema* sp.), pink and white thyme, purple *Nepeta* and *Salvia*, *Ixiolirion*, *Campanula*, *Linum* and *Astragalus*, not yet in flower but much like gorse, and other legumes of this and of other genera with pink, blue, yellow and magenta flowers.

Next morning we moved to Tergavar and camped close to the village of Derbend, at the foot of the hills. On the plain there was little we had not already found. I was fortunate enough to observe a solitary group of three plants of *Iris Ewbankiana* Foster, or a closely allied species, with petals of a light buff colour veined in brownish-crimson, with a spot of the latter colour in the centre of each flag.

The following day, with the son of the Haji of Hoshaku, who was ordered by his father to keep me "on his eye," I explored the hills to the west of the village up to a height of 8500 ft.

The hills which skirt the plains of Mergavar and Tergavar must surely form some of the finest pasture lands in the world, for much of the time one walks in herbage up to the knees, as if in dense meadows. Yet, although growth is so exuberant during the latter part of May and in June, the growing season is soon over. Under heavy grazing and the hot summer sun, the pasturage quickly dries up and disappears, and by July there is said to be little herbage left. Thus although the pasturage is magnificent while it lasts, the short

season favours the nomad rather than the settler. The majority of the tribes who graze these tracts are, in fact, nomadic, coming from Iraq and Turkey in great numbers during the summer, and they denude the whole country very rapidly. Further south parts of the mountain sides had already been grazed by the time we arrived, and there was little left either for beast or for botanist. Around some of the few villages on the plains attempts at cultivation were being made, but as long as unsettled conditions prevail there is no hope of much development in this direction. Even though the Persian Army is maintaining a sort of order, the villagers informed me that it was useless to grow barley, as it would be stolen to feed the troopers' horses.

We next moved southwards and camped for several nights in the Plain of Mergavar, making daily expeditions into the hills. Above an elevation of 7000 ft. snowdrifts were frequent, and from some of the higher points magnificent views of the surrounding country were obtained.

On the swampy ground close to the edges of melting snowdrifts were often found a *Colchicum* and a small *Scilla*, with flowers of a deep royal blue or sometimes white, or again white with blue veins. Under two feet of snow they were just appearing above the ground with yellow leaves, but near the edge they had grown to a length of 4 to 6 inches and were lying flat along the ground, all pointing outwards in a struggle to escape and to reach the light. As soon as the young plant was partly exposed by the melting snow it bent upwards and the young flower bud immediately began to expand. When the icy rim had quite released the plants from its grasp they stood upright and in a few hours burst into full bloom. But their splendour was short-lived. In a day or two the older flowers around the outside edge of the patch withered, and then successively those more recently exposed. Thus, a narrow advancing border of flowers always followed the retreating snow.

Monday morning, the 26th May, was cloudy when we left camp near the village of Nawe. The mules moved slowly, and when we had gone about five miles and were passing over a low-lying tract of country, the rain-clouds suddenly burst upon us. A torrential downpour came on with cracks of thunder and great streaks and flashes of lightning. Hail too fell, and the mules turned tail to the storm and could scarcely be persuaded to go on. For a mile around the plain was soon well under water, and further on a river, in flood and impassable, forced us to retrace our steps to the nearest village.

There we arrived drenched to the skin and were glad to accept the hospitality of a Kurdish house where, with an open fire in the centre of a small, ill-ventilated room, and with tears in our eyes from the smoke, we listened to wild Kurdish songs and partook of the inevitable tea; a party of seventeen, all told, with servants, mule-teers, escort and our hosts. It was interesting to find among the Kurds the legend of the Mandrake. A plant, they said, was

uprooted by means of a rope tied to it and to the tail of a sheep, and as its roots were severed it uttered painful groans.

Next morning we were able to ford the stream, and left the Plain of Mergavar by a narrow valley, scantily wooded with walnut and willow. As we ascended, the valley became narrower and steeper and in several places was difficult for the mules to negotiate. After about two hours we got through to more open ground, still climbing, until we were among snowdrifts, and then after following the crest of a range of hills we descended slightly and pitched camp on the edge of the Plain of Gilashe. From our camp I climbed further into the hills, passing the point where the stream, which flowed near our tents, had its source in a miniature glacier in a hollow of the hills, where the snow was banked up fifty to sixty feet deep. I climbed almost to the level of the unbroken line of snow which, at this time of year, is at about 9000 ft., but at these higher levels few plants had yet appeared. Among the rocks which capped one of the lesser heights a species of *Ephedra* was growing.

From Gilashe we followed the valley of a stream which led down to Ushnu, but before descending to the town we had a fine panoramic view of the Ushnu Plain, chequered green and black. Fields of young wheat alternated with great squares of land ready ploughed for the planting of tobacco, for which Ushnu is famous. Beyond lay a circle of snow-clad mountains, dividing Persia from Iraq, a gap which was clearly discernible marking the shortest pass to Rowanduz, a two days' journey. A day was spent in Ushnu in an endeavour to dry some of our plants, which were suffering owing to the heavy rains we had experienced.

There are two routes from Urumia to Ushnu, one in the plain and approaching the Lake, the other through the hills as far as Chichu and Tamatar. We chose the second route for our return journey in order that we might pass through a considerable tract of fine forest, of which we had been told by a Persian Government official. The forest, however, turned out to be forest only in the legal sense, and although for fifty or a hundred yards we did walk under the canopy of Walnuts and Willows, the term scrub would have been much more applicable. The "forest" area lay in the lower rocky slopes of the valley formed by a branch of the Baradur Chai, which descends from a plateau near Ainurum, 14 miles to the Urumia plain. The average height of the trees or bushes, which were widely scattered, was 15 to 20 feet, and the commonest plants were *Pyrus Amygdalus* L. and a species of *Prunus*, a small leaved *Acer*, *Crataegus*, *Fraxinus*, *Zelkova*, *Quercus*, *Populus*, and a shrubby barberry. The last part of the way back to Urumia was under a blazing sun along a yellow sun-baked road, with scant vegetation, a sudden change from the bitter cold in the mountains.

The return journey from Urumia to Tabriz was not altogether uneventful. One night was spent near the village of Khantakhte, and I visited the village of Ioshonlu, the name signifying "full of

Ioshon" or *Artemisia*. Next day in endeavouring to ford the river near Khoi, the bridge having been washed away, we stuck in the middle of the stream and had to be rescued by a team of buffaloes. Water reached the top of the bonnet of the engine and unfortunately damaged some of our specimens in a box at the bottom of the lorry. The following day, when again held up by floods, we made use of the railway line and crossed a bridge in our lorry over the sleepers. We arrived back in Tabriz on June 8th.

From Tabriz excursions were made to the Sahend Range, where we camped near the village of Zinjinab, and to the vicinity of Yam, Mr. Gilliat-Smith accompanying me on both occasions.

TABRIZ TO ASTARA.

The longest excursion, however, was to Astara on the Caspian Sea, a distance of just under 200 miles. The road to Teheran is followed for 25 miles, when the track leading to Astara bends to the left along the shores of the freshwater lake at Yusufabad. In configuration the country is again a series of undulating plateaus at different levels, separated by steep ranges of hills. To the north lies Savalan, the second highest mountain in Persia. Beyond Zorab a good many species, hitherto not seen, were collected, and there were many more grasses than occurred in the vegetation of the country further west. It was on this journey, owing to the track being deep in mud, that we spent the greater part of a day covering a distance of four miles. From Ardabil the plateau extends eastwards for fifteen miles, then there is a drop of 5000 ft., to the Caspian Sea. On the plateau the annual rainfall is probably not more than 12 inches, whereas on the slopes which face the Caspian it is as much as 70 or 80 inches, an increase which is naturally reflected by a sudden change in the vegetation. Before descending, there is a short rise to the top of a narrow range which fringes the plateau, and within half a mile of the top the semi-arid and herbaceous vegetation of the plateau is replaced by scattered shrubs four to five feet high.

A hawthorn and a rose are at first common, with scrubby oaks, elms and *Prunus* when the rainfall becomes heavier. On the Caspian side of the ridge the upper slopes are heavily grazed and there are considerable patches of open grassland, but scattered shrubs, sometimes with bracken (*Pteridium aquilinum* L., 1633) in between, continue some distance downwards. The first group of trees on the more gradual slopes are 500 ft. below the crest of the range.

When the mist which enveloped the summit had been left behind the view was magnificent and, as the car bumped over the ill-laid cobble stones or reversed to round one of the many hairpin bends, we looked far down upon a wide vista of wooded mountains. Range after range runs steeply down to the distant Caspian.

On the higher slopes the forest is partially destroyed by grazing, and there are open, light grassy-green spaces, but lower down the dense evergreen forest entirely covers the mountain sides. Here and there a splash of yellow marks a ripening wheat crop, or a

solitary house may be seen with slanting roof, the planks held down by large stones, as in Tibet. Far in the distance is the narrow plain of Astara with the deep blue sea beyond.

Some twelve miles above Astara in a corry where two streams meet, and within a stone's throw of the Russian frontier, we pitched our tents. Steep mountains, clothed in dark green forest, hemmed in the small plateau we had chosen for our halting place. By the roadside and in the forest common species of ferns such as *Dryopteris Filix-mas* Schott., *Phyllitis Scolopendrium* Newm. (1650), *Asplenium Adiantum-nigrum* L. (1636), and *Polystichum aculeatum* Schott. were seen by us for the first time in Persia and in the undergrowth the *Ruscus*-like *Danäe racemosa* Moench. (1673) was also common. The principal trees in the forest were *Acer insigne* Boiss. & Buhse and *A. laetum* C. A. Mey. (1656), *Fagus orientalis* Lipsky (1666), *Zelkova crenata* Desf. (1668), *Tilia rubra* DC. (1655), *Prunus* sp., *Euonymus latifolius* Scop., *Albizia Julibrissin* Willd. and *Ilex Aquifolium* L. (1648).

As the plains of the Caspian are approached the valley widens and flooded rice fields occupy the flatter ground. The road at length emerges from the hills and the dense well-grazed scrub which fringes the lower edge of the forest gives place to cultivation. The remaining four miles of the way to Astara lie through "bunded" rice and wheat fields. We camped on the seashore, where the sand is dotted with wild pomegranate bushes (*Punica Granatum* L.) which were just in flower.

TABRIZ TO BATUM.

This was our last excursion in Persia, and on returning to Tabriz we had to pack, dispose of the lorry and despatch our collections of dried plants, bulbs, seeds, photographs, and kit; for we were advised to take little with us, as our route homeward lay through Russia, from Djulfa to Tiflis and thence to Batum.

At Tiflis, Professor Sosnofsky showed me round the Botanic Gardens, which are very pleasantly situated on a steep slope with subsidiary ridges and ravines. The more recently made part of the garden is the most interesting, as the various types of natural forest in Georgia have been reproduced by careful arrangement in planting and tending.

In Batum also I visited the Botanic Garden, which lies about seven miles from the city on a hillside looking down to the Black Sea. Here plants are arranged in geographical areas. To me the most interesting feature of the surrounding country was the extraordinary resemblance in the exotic vegetation to that of parts of the Darjeeling District of India. Large areas of tea had been planted and *Cryptomeria japonica* D. Don. (introduced to Darjeeling about 1864), was widely planted here also. *Hydrangea* sp. and masses of bamboo (*Arundinaria* sp.) in the undergrowth added to the similarity, while occasional fine examples of *Cupressus funebris* Endl.,

Pinus longifolia Roxb., *Picea morinda* Link., and *Araucaria Bidwillii* Hook. further strengthened the resemblance.

From Batum I travelled, through the courtesy of Captain Pool, on a British oil tanker to Constantinople, thence by Vienna and Paris, arriving again in London on the 27th July, 1929.

VIII.—A NEW STINKWOOD FROM EAST AFRICA. J. HUTCHINSON AND MARION B. MOSS.

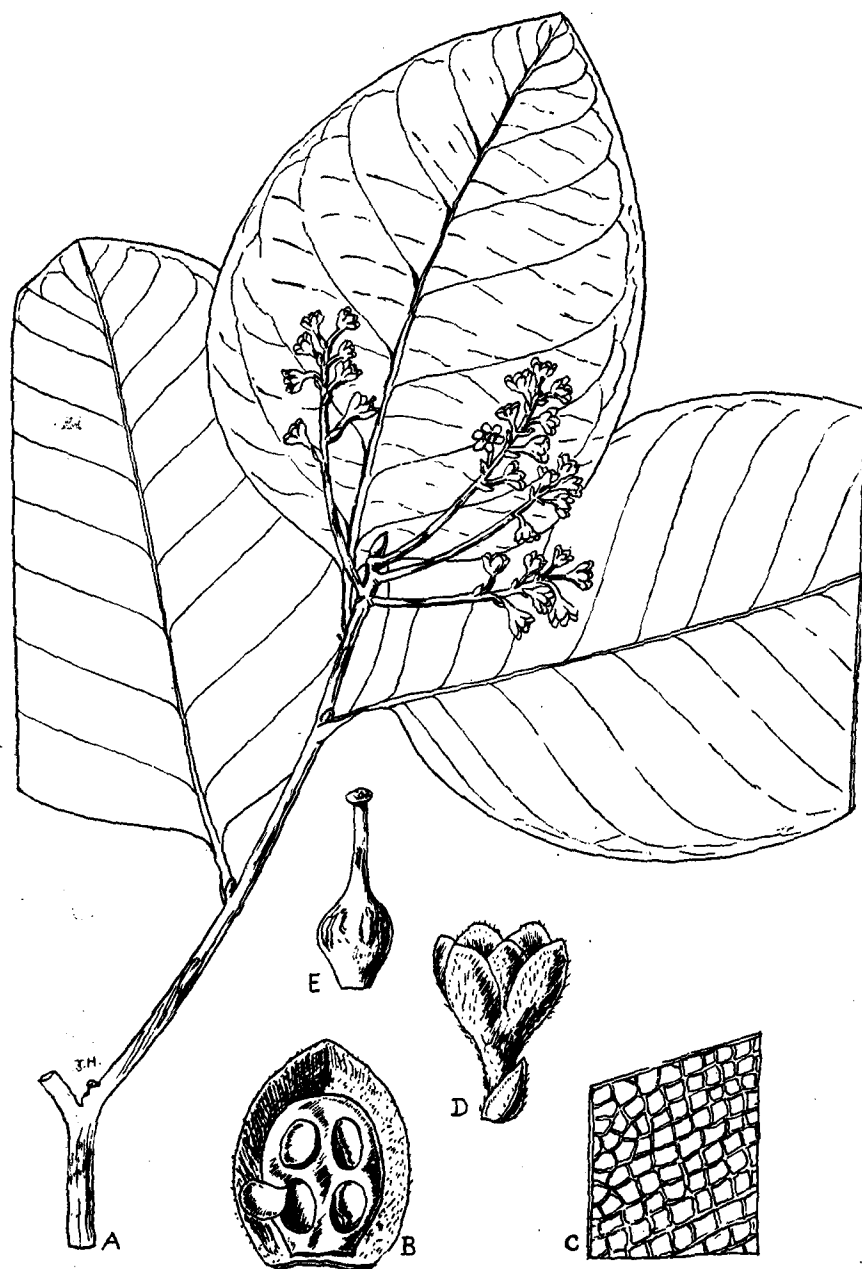
The genus *Ocotea* is represented in tropical and subtropical America by a very large number of species. In Africa and the African islands there are very few, most of them occurring in the Mascarene Islands. The African species are, however, of very great economic importance. In the *Kew Bulletin* for 1919, pp. 153-164, one of us gave an account of the Rain-tree of Hierro, in the Canary Islands, under the name *Oreodaphne foetens* Nees. This tree is by some considered to be an *Ocotea* (*O. foetens* Webb & Berthel.). The Cape Stinkwood, *Ocotea bullata*, is, of course, a well-known timber tree of South Africa, and occurs in the forests of Knysna as far north as Natal,* according to Sim.† As is often the case with a common and well-known timber tree, the material, even at Kew, is far from adequate and needs supplementing in order to show the range of variation of the leaves of mature and young shoots and of saplings, and further material of flowers and fruits is also required.

The only species hitherto known from East Tropical Africa is *Ocotea usambarensis* Engl., which ranges from Mt. Kenya and the Aberdares as far south as the Kinga Mountains in the Kyimbila District of Tanganyika Territory. A drawing and description of this species was published by Dr. Stapf in Hooker's *Icones Plantarum*, t. 2934, whilst an account of its very valuable timber was given by the late Sir D. E. Hutchins in *Colonial Reports, Miscellaneous*, No. 41, p. 18 (1907). In East Africa it is spoken of as the East African "Camphor," the Kikuyu native name being "Mozaiti."

Unknown to Hutchins, however, besides good material of this camphor tree, he also sent a leaf specimen of another species, here described. He actually distinguished it by a different native name "Muzura," marking it as "equal to the Cape Stinkwood" with which he was naturally very familiar. Ample material now supplied by Mr. H. M. Gardner, Conservator of Forests, Kenya, has enabled us to recognise the presence of this very distinct species in the East African forests.

* A leaf-specimen from Houtbosch in the Transvaal seems to be rather different from the Knysna plant, and a study of the Transvaal plant is desirable. It may represent a distinct species, its leaves being very like those of the species here described.

† Sim, *Forest Flora of Cape Colony*, 289 (1907).



Ocotea Gardneri Hutch. & M. B. Moss. A, flowering shoot. B, outer stamen and calyx-lobe. C, lower surface of leaf. D, flower and bract. E, pistil.

Ocotea Gardneri Hutch. et M. B. Moss, sp. nov.; inter species africanas ob folia magna late vel ovato-elliptica reticulata, petiolos breves, inflorescentias terminales valde distincta.

Arbor magna, trunco stricto et cylindrico; ramuli foliferi breves, breviter appresse pubescentes, internodiis circiter 1 cm. longis. *Folia* alterna, late elliptica vel ovato-elliptica, basi rotundata vel subacuta, apice obtusa, 11-14 cm. longa, 6-9 cm. lata, integra, rigide coriacea, utrinque costa media excepta glabra et conspicue et crebre reticulata, supra nitidula, nervis lateralibus utrinsecus circiter 9 marginem versus evanidis furcatis et ramosis; petioli circiter 1.3 cm. longi, supra latissime canaliculati, infra sicco sulcati et breviter pubescentes. *Paniculae* terminales, breves et pauciflorae, ubique breviter pubescentes; bracteae deciduae, late triangulares, usque ad 4 mm. longae, carinatae; pedicelli 2 mm. longi, crassi. *Receptaculum* basi late turbinatum, 2 mm. longum, calycis lobis 6 ovatis obtusis 2.5 mm. longis 2 mm. latis marginem versus glabrescentibus. *Stamina* fertilia 9; filamenta brevissima; antherae late ellipticae, 4-locellatae, locellis per paria superpositis; staminodia late triangularia, carnosa, glabra. *Ovarium* superum, globosum, glabrum, stylo 1.5 mm. longo, stigmate depresso-globoso. *Fructus* non visus.

TROPICAL AFRICA. Kenya Colony: Ramusambi River, 2600 m., *H. M. Gardner* 1885 (type.); Mt. Kenya, lower forests, *Hutchins.*

Mr. Gardner describes the tree as large, with straight cylindrical bole, said to produce good timber; flowers cream-coloured; rainfall in the district 50 inches.

IX.—THE KAROO GARDEN AT WHITEHILL. R. H. COMPTON.

Professor R. H. Compton, Director of the National Botanic Gardens of South Africa has, at my request, kindly sent the following interesting account of the Karoo Garden at Whitehill for publication in the *Kew Bulletin*.

This Garden is of very great scientific interest to Botanists not only in the Union of South Africa, but throughout the world, and also, owing to the exclusion of animals, is yielding results of considerable value to agriculturists in the more arid regions. It is to be hoped that adequate financial support may be forthcoming to enable this valuable enterprise to be carried on in a thoroughly efficient manner.

The Trustees of the National Botanic Gardens are to be congratulated on having received this splendid bequest of forty acres in the Western Karoo, and the botanical world is greatly indebted to Professor Compton for the able way in which he is developing the area, and taking due care to preserve the native character.

A. W. H.

The physical and climatic conditions of the Union of South Africa are so varied, and the flora is so rich and of so many distinct physiological types that no single botanic garden can be expected to provide perfect habitats for every species. Kirstenbosch, near Cape Town, the headquarters of the National Botanic Gardens of South Africa, probably fulfils the main requirements better than any other site that could be chosen. It is situated in the South West Cape coastal belt, the richest area floristically in the country: and it is therefore favourably placed for the cultivation of the large numbers of Proteaceae, Ericaceae, Iridaceae and other highly interesting and beautiful plants for which the Cape flora is renowned. At the same time, its mild climate, absence of frost and of extreme heat, generous rainfall and reliability of water supply and its variety of soils, altitudes and aspects, make it possible to grow large numbers of species from very distinct associations all over South Africa. Add to this the scenic magnificence of its site, and its proximity to the city and port of Cape Town, it is clear that Kirstenbosch has the fundamentals of a botanic garden not only national but international in its importance. Its chief feature being that it primarily concerns itself with the indigenous plants of South Africa, renders Kirstenbosch of unique interest to the visiting botanist and of special value for the intensive systematic study of the flora.

At the same time it has always been clear that in order to provide optimum cultural conditions for a varied flora, a chain of gardens should be established in a variety of climates, to supplement the work of Kirstenbosch. The most obvious need was a garden in an arid climate to provide for the cultivation of that vast section of the South African flora native to habitats with, say, less than 10 inches of rain annually. A site was accordingly chosen in 1920 at Whitehill, near Matjesfontein in the Western Karoo, forty acres of land being presented to the Trustees of the National Botanic Gardens by the late Mr. J. D. Logan. The site adjoins the railway station and has a frontage of half a mile along the main line from Cape Town to Johannesburg. The distance from Cape Town is 198 miles by rail, and the Garden is thus reasonably accessible.

At the outset the area was enclosed by a goat-proof fence, but owing to financial difficulties it was not possible to undertake regular work for some years. In 1925, however, Mr. J. Archer, an enthusiastic collector and grower of succulent plants, was appointed Curator and steady development began. A water system was installed, paths were laid out and a geographical system of arrangement was adopted, different parts of the Garden being allocated for material from the different areas of the Union and South West Africa.

The Karoo Garden lies on Dwyka Conglomerate rocks (a glacial tillite), with inclusions of massive quartzite. The flora of this type

PLATE III

of country is usually rich,* and in the Garden site itself a large number of interesting species are included. Except for path making, the plants growing in open formation in the enclosure have not been removed, specimens brought from outside being planted amongst them. In this way there has been a minimum disturbance of the ground and the general aspect of the Garden remains natural: another result is that there are practically no weeds, which means a great saving of labour and expense. The soil is generally shallow, but the rock formation provides innumerable pockets and crevices in which small succulent plants find suitable homes. Large specimens have sometimes to be accommodated in holes blasted out with dynamite.

The rainfall at Whitehill has been recorded for only a few years, which have been actually years of drought; it is probable however, that the average over a long series would be about 5 inches per annum. This falls chiefly in winter, June to August, and in consequence the vegetation shows similar seasonal features to that of the South-Western Cape coastal districts. During the summer the greater part of the flora exists in a resting condition, high temperatures (frequently reaching and exceeding 100° F. in January-April), coinciding with an extreme dryness of soil and atmosphere, which prevents vegetative activity. If an inch or two of rain falls in May or June the succulent plants swell out and grow, innumerable seeds of annual plants germinate and the deep-rooting shrubs commence growth shortly afterwards. In a very few weeks flowers appear, and should there be a further rainfall remarkable colour effects may be produced in September and October, the numerous species of Mesembryanthemum and allied genera taking the chief part in this display.

The Garden lies at an altitude of about 2900 feet above sea level, and this combined with the distance from the coast results in great differences between the day and night temperatures. Sharp frosts occur frequently during the winter nights, though the days are usually bright and warm; it is remarkable that in this season of active growth the night frosts rarely cause any injury to the plants.†

The arid districts of South Africa in which there is a winter rainfall, for instance, the south-west corner of the S.W. African Protectorate, Little Namaqualand, the Western Karoo, the Little Karoo and the Robertson Karoo, are those in which the majority of species of succulent plants are to be found; and Whitehill is therefore well situated for the purpose of a Karoo Garden. With suitable

* I have collected approximately 400 species of flowering plants and ferns in the Garden enclosure or in the immediate vicinity on Karoo rocks. It may be mentioned that on the Witteberg mountains, a range of hard sandstone 3 miles away, a totally distinct flora occurs, belonging to the "Cape" type.

R.H.C.

† For a general account of Karoo vegetation, with special reference to the Whitehill area, see an article by the author in "the Botanical Features of the South Western Cape Province," Speciality Press, Cape Town, 1929.

R.H.C.



Karoo Garden, Whitehill. In the foreground *Aloe ferox*, *A. microstigma*; Witteberg Mountains in the distance.



Karoo Garden, Whitehill. *Pleiospilos Bolusii*, *Euphorbia obesa*, *Gasteria* sp.

also succeed in cultivation at Whitehill.

Chief attention has been given at the Karoo Garden to the succulent flora, in which South Africa is so amazingly rich. Efforts are being made to collect as many indigenous species as possible of this type and also to propagate them. In many instances succulent plants have been kindly contributed by correspondents, as has been the case at Kirstenbosch. The South African Railways very generously convey botanical specimens free to Whitehill, and in various other ways have been of great assistance to the Garden.

As an indication of the content of the Garden in succulent plants some of the principal genera may be mentioned. Among the Liliaceae there are numerous species of *Aloe*, *Gasteria*, *Haworthia* and *Aprica*. The Aizoaceae include a very large number of species of Mesembryeae, special attention being given to the so-called "stemless" types belonging to such genera as *Pleiospilos*, *Didymaotus*, *Gibbaeum*, *Fenestraria*, *Lithops*, *Conophytum*, *Muiria*, *Fritillaria*, *Punctillaria*, *Cheiridopsis*, *Faucaria*, *Rhinephyllum*, etc.; and a large number of shrubby and trailing species are also grown. The Portulacaceae are represented by species of *Anacampseros* and *Portulacaria*. The Crassulaceae include a host of *Crassulas* and *Cotyledons*; and it may be mentioned that no fewer than 32 species of *Crassula* and 13 species of *Cotyledon* are actually native to the Whitehill Karoo. Among the Geraniaceae are several succulent-stemmed species of *Pelargonium* and *Sarcocaulon*. There are eight local succulent species of *Euphorbia* and a large number of others have been introduced. Succulent Asclepiadaceae are richly represented in the Whitehill district by species of *Stapelia*, *Caralluma*, *Huernia*, *Picramnia*, *Pectinaria*, *Duvalia* and *Trichocaulon*; and many other species of these and other genera such as *Hoodia*, *Tavaresia* and *Sarcostemma* have been successfully planted. Apocynaceae are represented by the remarkable *Pachypodium namaquanum*, a difficult subject which has been successfully established; Vitaceae by thick-stemmed *Cissus* spp. from S. W. Africa; Dioscoreaceae by species of *Testudinaria*; Zygophyllaceae by *Augea capensis*. Finally the Compositae are represented by many succulent species of *Senecio*, *Kleinia* and *Othonna*.

The propagation of most of these species is carried out both by seeds and by cuttings. It is found that the seeds of the majority of the succulents are set abundantly without special attention and give copious and rapid germination. From a single capsule of a *Pleiospilos* or a *Didymaotus*, a hundred seedlings frequently result. The absence of weeds greatly facilitates these and other gardening operations. Cuttings give equally successful results in most cases, even in such difficult subjects as *Trichocaulon* and *Hoodia*; and such plants as *Gasteria* and some Crassulaceae can readily be propagated by leaf-cuttings.

In the planting of the Garden every effort is made to secure a natural and informal appearance. The site is a natural rock garden,

and any tendency to rectilinear planting is strictly avoided. The requirements of each species are studied as far as possible with regard to aspect, shelter and the season for watering. The species are fully labelled and their localities and names of the donors are also given.

An interchange of plants takes place between Whitehill and Kirstenbosch to the advantage of both gardens. The work of determining the plants grown at Whitehill is undertaken by the Bolus Herbarium (University of Cape Town), situated at Kirstenbosch; and a considerable number of new species, especially of Mesembryaceae, have already resulted.

Another aspect of the Karoo Garden is that, owing to its enclosure, the effects of the grazing of sheep, goats and donkeys, which are so marked on the karoo veld outside, are obviated in the Garden area. The result is that many species which are rarely able to produce full-length shoots or to flower under the conditions which obtain outside the fence do so freely inside. About one-third of the area is kept as a small 'Nature Reserve,' no plants being either removed thence or planted therein; and the contrast between it and the grazed karoo outside is noteworthy. The edible species of plants which are usually prevented by grazing from setting seed, are able to do so within the enclosure; and the idea of a "seed-camp," adopted by some progressive stock-farmers, thus receives a practical demonstration at Whitehill.

During the meetings of the British Association in South Africa in 1929 an excursion to Whitehill was organised for the Botanical Section, and many visiting botanists were thus enabled to make acquaintance with the Karoo vegetation.

In conclusion a few words may be said about the finance of the Karoo Garden. From the outset it has been supported entirely by private subscriptions. Its funds are kept separate from those of Kirstenbosch, and no public body makes any contribution to its support. The result is that progress is slow and the future precarious. There is no building on the spot, and the Curator is compelled to live at Matjesfontein, four miles away. The provision of adequate funds is the chief necessity for the continued existence and development of what may be regarded as a uniquely interesting experiment in botanic gardening.

X.—ADDITIONS TO THE FLORA OF BORNEO.

H. N. RIDLEY.

LINACEAE.

Ixonanthes reticulata Jack.

SARAWAK. Banjermassin, Motley 26. "A large tree with hard white wood: flowers greenish."

Ixonanthes grandifolia Ridley sp. nov.; ab *I. reticulata* Jack, cui affinis, foliis multo majoribus rigidioribus differt.

Arbor glabra. *Folia* rigide coriacea late obovata apice rotundata saepe retusa basibus angustatis, nervis 12-paribus reticulationibus

laxis, 9–13 cm. longis 5–9.5 cm. latis, *petiolis* 1–2 cm. longis. *Flores* in cyma densa ramis 5 mm. longis, *pedunculo* 5–11 cm. longo validi, *sepalis* oblongis obtusis costatis 2 mm. longis, *petalis* coriaceis obovato-oblongis costatis 5 mm. longis, *staminibus* 10 capilliformibus 2 cm. longis, *stylo* gracili 2.5 cm. longo. *Capsula* oblonga acuta 5-valvata 2.5 cm. longa, *seminibus* anguste oblanceolatis 1 cm. longis, ala 1 cm. longa 3 mm. lata.

BRITISH NORTH BORNEO: Beccari 3674; Port Myburgh, Sandakan and Gaya (type), Creagh.

This species is distinguished by its very large stiffly coriaceous obovate leaves and few rather large flowers in the head.

Ixonanthes multiflora Stapf MS. sp. nov.; ab *I. reticulata* Jack, cui affinis, foliis obtusis, floribus minoribus densis, capsulis minoribus obtusis distincta.

Arbor. *Folia* elliptica vel oblanceolata obtusa apicibus rotundatis basibus cuneatis, 5–15 cm. longa 3.5–8 cm. lata, nervis 6–8-paribus utroque latere elevatis reticulationibus conspicuis, *petiolis* 2–3 cm. longis superne canaliculatis. *Cyma* densa multiflora 2–3 cm. longa et aequae lata, *pedunculo* 7–8.5 cm. longo valido, *floribus* parvis, *pedicellis* 1 mm. longis, *sepalis* ovatis rotundatis 2 mm. longis, *petalis* oblongis truncatis 3 mm. longis, *staminibus* 10 brevibus 4 mm. longis. *Capsula* oblonga obtusa 1.5 mm. longa.

"BORNEO": Teysmann 10864. SARAWAK: near Kuching, Haviland 1979; Haviland and Hose 3384, 3385 (type), 3386.

As in all species of *Ixonanthes* the leaves vary a good deal in size according to the age of the branches. This species is allied to *I. reticulata* Jack, but differs in the form of the leaf, smaller flowers, denser inflorescences and short blunt capsules.

OXALIDACEAE.

Biophytum sensitivum L.

SARAWAK: Banjermassin, Motley 399.

Connaropsis (Sarcotheca) *grandiflora* Ridley sp. nov.; a *C. Griffithii*, cui affinis, foliis tenuioribus floribus multo majoribus differt.

Arbor parva ramulis velutino-puberulis. *Folia* bijuga petiolis 1 cm. longis glabris basibus incrassatis, *foliolis* chartaceis subtus glaucis elliptico-lanceolatis cuspidatis, inferioribus 6.5 cm. longis 3.5 cm. latis, terminali 11 cm. longo 5 cm. lato, nervis 3-paribus gracilibus subtus elevatis, marginibus undulatis, *petiolulis* incrassatis 5 mm. longis. *Panicula* terminalis 5 cm. longa pubescens ramulis 1 cm. longis vel brevioribus, *bracteis* lanceolatis acutis 1 mm. longis, *pedicellis* pubescentibus 5 mm. longis, *sepalis* ovatis obtusis subtruncatis glabris kermesinis 3 mm. longis, *petalis* atro-kermesinis oblongis 1 cm. longis obtusis, *staminibus* brevioribus filamentis filiformibus, *stylo* hirtio quadrifido. *Bacca* subglobosa.

SARAWAK: Kuching, Haviland 1786. "Small tree."

This species is distinct in the thinner leaflets, the two lower ones much smaller than the upper, and the large flowers.

OCHNACEAE.

Ouratea angustifolia (Vahl) Baill. (*Gomphia angustifolia* Vahl) is not a native of the Malay regions; it was based on one of Koenig's Indian plants. The Philippine plant so labelled is quite different. I have not seen the specimens quoted by Merrill for *O. angustifolia* but doubtless the identification is incorrect.

Ouratea sumatrana Jack, given as Bornean by King, is also an error.

***Ouratea borneënsis* Van Tiegh.** This is based on two specimens of Beccari's, one of which, no. 3138, I have seen. It appears to be common in Borneo.

SARAWAK: Saribas, Paku, *Haviland and Hose* 3179; Banjermassin, *Motley* 823; Pontianak, Sungei Kantu, *Beccari* 3414. BRITISH NORTH BORNEO: Marop, *Beccari* 3138; Sandakan, *Mrs. Clemens* 9519, 9438.

Motley describes it as a small tree with yellowish white flowers. Van Tieghem also describes the petals as white, which is unusual in the genus. The leaves are never denticulate as they are in the true *O. angustifolia* (Vahl) Baill. and in *O. oblongifolia* Ridl. of the Malay Peninsula.

***Ouratea megacarpa* Ridley sp. nov.**; ab *O. sumatrana* Hook. fil., cui affinis, foliis coriaceis integris, drupis multo majoribus distincta.

Frutex glabra. *Folia* coriacea lanceolata acuminata acuta haud denticulata basibus attenuatis, 10-25 cm. longa 4-7.5 cm. lata, nervis plurimis, intramarginalibus 2, altero 1 mm. altero 5 mm. a margine remotis, reticulationibus minutis, marginibus undulatis, *petiolis* crassiusculis 2-5 mm. longis. *Panicula* laxa elongata 15 cm. longa validula ramis paucis remotis 2-6, *floribus* remotis 2-4 in glomerulis, *bracteis* 1 mm. longis papyraceis lanceolatis vel ovatis carinatis, marginibus denticulatis, *pedicellis* gracilibus 1-1.5 cm. longis, *sepalis* elliptico-lanceolatis acutis 7 mm. longis, *petalis* obovato-oblongis 1 cm. longis, *staminibus* acutis 5 mm. longis; *drupis* reniformibus crassis 1 cm. longis 8 mm. latis cyaneis, *sepalis* persistentibus haud deflexis.

SARAWAK: Matang, *Ridley* (type); Sepudang, *Haviland*; Rejang, Belaga, *Haviland* 2130; Santubong, *Haviland*; Upper Baram, Gunong Temabok, *Moulton* 6665. BRITISH NORTH BORNEO: Sandakan, *Creagh*.

This plant has the largest leaves and fruit of any Asiatic species. It is nearly allied to *O. sumatrana* Hook. fil. but the leaves are more coriaceous and entire, with very small close reticulations, and the drupes much larger. From *O. neriifolia* Van Tieghem it differs in the shorter more branched panicle and blunt sepals.

***Schuermansia borneënsis* Ridley sp. nov.**; a *S. elegans* Bl. differt foliis lanceolatis petiolatis, staminodiis brevibus spathulatis, antheris oblongis obtusis distincte bilocularibus cum cuspe intermedia.

Arbor parva glabra. *Folia* membranacea elliptica obtusa apice rotundato vel retuso, basibus angustatis, 16-18 cm. longa 7-7.5 cm. lata, costa crassa elevata, nervis parallelis tenuibus copiosissimis, *petiolis* crassiusculis 5 cm. longis. *Panicula* 20 cm. longa 16 cm. lata, *floribus* dissitis 4 mm. latis, *pedicellis* 2 mm. longis, *sepalis* 5 ovatis acutis 2 mm. longis, *petalis* oblongo-obovatis obtusis contortis 4 mm. longis, *staminodiis* compluribus spathulatis 1 mm. longis, *staminibus* 5 superantibus, filamentis brevibus antheris oblongis obtusis, apice abrupte acuto, 2 mm. longis, *pistillo* conico in stylum attenuato petalis paullo brevioribus; *capsula* immatura e basi angustata superne dilatata subabrupte cuspidata acuta 1 cm. longa.

SARAWAK: Braang, 1400 ft., *Haviland* 500. "Small tree."

This is the furthest westerly species of this genus, which is mainly found from Papua to Amboina. It differs from most species in having lanceolate petiolate leaves, but there is a fruiting specimen of a plant from Amboina (*Robinson* 2036) which resembles it, both in foliage and in the form of the fruit. From *S. elegans* Blume it differs, besides in the foliage, in the short spathulate staminodes and in the oblong anthers with a sharp central point between the two cells. Indeed in this point it differs from all species I have seen, or of which the flowers have been described.

RUTACEAE.

***Evodia alba* Hook. fil.**

SARAWAK: *Beccari* 471; Limbang, *Haviland* 559.

***Evodia robusta* Hook. fil.**

SARAWAK: Kuching, *Ridley* 12270. BRITISH NORTH BORNEO: Sandakan, *Elmer* 20100.

***Evodia malayana* Ridley.**

SARAWAK: *Haviland* 559a.

This I suppose is what Merrill calls "*E. lunu-ankenda* (Gaertn.) comb. nov."*, a Ceylon plant entirely differing from anything in the Malay region. What Hooker calls *E. Roxburghiana* (which Merrill gives as a synonym) is another species again. *E. malayana* is certainly near *E. aromatica* Bl. (*E. Marambong* Miq.) but that is described as a tree, which this is certainly not, being only a bush.

***Evodia triphylla* DC. var. *pubescens* Ridl. var. nov.**, paniculis elongatis laxis pubescentibus.

BRITISH NORTH BORNEO: East Coast, *Creagh*. SARAWAK: Banjermassin, *Motley* 681. Flowers white; common. Malay name "Sampahon," a medicinal plant with natives; appears to have some trifling tonic properties.

* Based upon *Fagara Lunu-ankenda* Gaertn.

The type of this species is a Philippine plant which differs from the Bornean one in the panicle branches being glabrous whereas those of the latter are distinctly pubescent. The panicles too in the latter plant are much elongated and spreading, in those of Creagh's specimen as much as 15 cm. long; in fact the whole plant is much bigger. The flowers of both appear to me to be identical.

Evodia concinna Ridley sp. nov.; ab *E. aromatica* Bl., cui affinis, foliolis ellipticis obtusis laevibus, panicula laxa foliis brevior, sepalis glabris distincta.

Arbor parva. *Folia* triphylla glabra membranacea, petiolis 3-3.5 cm. longis puberulis, foliolis ellipticis obtusis (junioribus pubescentibus), 5-9 cm. longis 2.5-3.2 cm. latis subaequalibus, nervis gracilibus 10 vix elevatis reticulationibus laxis, petiolulis 2 mm. longis. *Panicula* 9-12 cm. longa laxa, pedunculo 4.5-8 cm. longo, ramis 2-5 cm. longis pubescentibus, floribus albis, pedicellis sepalis ovato-rotundatis liberis 1 mm. longis, petalis ovatis obtusis 2 mm. longis, staminum filamentis crassis subaequilongis antheris oblongis majusculis, disco hirta, stylo glabro crasso breve.

SARAWAK: Mt. Buan, limestone, Haviland 2039. "Small tree, petals white."

Perhaps nearest to *E. aromatica* Bl., from which the small blunt leaves smooth above, the whitish pubescence on the petiole and peduncle, and the lax branched panicle, at once separate it.

Evodia obtusifolia Ridley sp. nov.; ab *E. glabra* Bl., cui affinis, foliis multo minoribus obovatis apicibus rotundatis, floribus minoribus, staminibus petala multo superantibus differt.

Arbor? *Folia* triphylla, petiolis validis 5-6.5 cm. longis, scabro-pubescentibus, foliolis obovatis vel ellipticis obtusis glabris coriaceo-membranaceis, 6-9.5 cm. longis 4-6 cm. latis, apicibus rotundatis ad bases cuneatis, nervis subtus elevatis 8-9-paribus, petiolulis lateralibus .5 mm. terminali 1 cm. longis. *Paniculae* breves compactae 5-7 cm. longae pubescentes, pedicellis 2 mm. longis, sepalis ovatis longioribus 3 mm. longis filamentis gracilibus antheris ellipticis, disco hirta.

SARAWAK: Baram, Hose 512.

Tetractomia parviflora Ridley sp. nov.; a *T. Beccarii* Hook. fil., cui affinis, floribus multo minoribus copiosis, coccis parvis, distincta.

Arbor parva. *Folia* coriacea rigida oblongo-obovata rarius lanceolata obtusa vel breviter subacuta basi acuminata, 9-15 cm. longa 5.5-7 cm. lata, nervis tenuibus usque 13-paribus, costa subtus elevata, petiolis 5 cm. longis. *Paniculae* subterminales multiflorae patentes 3-7 cm. longae, pedunculis 1.5 cm. longis ramis pedicellisque puberulis, bracteis minutis lanceolatis acutis puberulis, floribus parvis 2 mm. diametro viridibus, pedicellis 1 mm. longis, sepalis ovatis puberulis, petalis ovatis obtusis vel acutiusculis, staminibus

brevioribus filamentis planis superne attenuatis; coccis oblongis obtusis 5 mm. longis 2 mm. latis.

SARAWAK: near Kuching, Haviland 2842, 2243 (type); Haviland and Hose 3359. "Small tree; flowers green; ovary sunk inside the disc, 4-celled, with 2 collateral ovules in each cell."

Allied to *T. Beccarii* Hook. fil., but the flowers and fruit are about half the size, and the flowers are much more numerous in a number of subterminal panicles, which are shorter than the leaves.

Tetractomia latifolia Ridley sp. nov.; a *T. Beccarii* Hook. fil., cui affinis, foliis multo majoribus coriaceis, nervis paucioribus, floribus minoribus omnino glabris differt.

Arbor parva. *Folia* opposita coriacea obovata vel oblonga abrupte acute cuspidato-acuminata, basibus attenuatis, 9.5-17 cm. longa 7-9 cm. lata, nervis tenuibus 8-paribus intra margines in-arcuantibus, costa subtus elevata, petiolis crassis superne dilatatis 2-3.5 cm. longis. *Paniculae* usque 7 cm. longae ramis et pedicellis pubescentibus, floribus viridibus congestis, pedicellis 2 mm. longis, sepalis 4 ovatis acutis 2 mm. longis, petalis 4 triangularibus acutis 3 mm. longis, staminibus fertilibus 4 filamentis planis superne attenuatis, staminodiis 4, disco glabro, stylo 3 mm. longo, stigmatibus obscure lobato; fructu bicocco, coccis lanceolatis 1 cm. longis 3 mm. latis acutis.

SARAWAK: Kuching, Haviland 2140 (type); Haviland and Hose 3358. "Small tree, flowers green."

This differs from *T. Beccarii* Hook. fil. in the larger more coriaceous leaves with fewer nerves and smaller quite glabrous flowers.

Tetractomia montana Ridley sp. nov.; foliis parvis spathulatis, floribus 3 majusculis in cymis axillaribus ab omnibus differt.

Arbor parva glabra. *Folia* spathulata, apicibus rotundatis basibus gradatim attenuatis, 4 cm. longa 1.5 cm. lata, nervis obscuris tenuibus 5-paribus, margine incrassato, petiolis 4 mm. longis. *Cymae* axillares triflorae, pedicellis 4 mm. longis, sepalis brevibus rotundatis, petalis triangulari-ovatis acutis viridibus 2 mm. longis, staminibus 4 aequilongis filamentis a basi attenuatis, staminodiis 4; coccis 2 oblongis obtusis 5 mm. longis 3 mm. latis, seminibus oblongis 2 mm. longis, alis 3 mm. longis 2 mm. latis inaequilateralibus ovatis obtusis, basi unilateraliter producto.

SARAWAK: Mt. Bongo, near Tegora, Haviland 2050. "Small tree, flower green."

Glycosmis. Merrill in his list gives only one species, *G. cochinchinensis* (Lour.) Pierre, under which he includes such different species as *G. pentaphylla* Correa and *G. citrifolia* Lindl. The genus has been revised lately by T. Tanaka, with whose identifications in the Kew Herbarium I cannot always agree.

Glycosmis citrifolia Lindl.

SARAWAK: Beccari 1759; Banjermassin, Motley 271. BRITISH NORTH BORNEO: Kudat, Fraser 75. "Small shrub; flowers white, fruit translucent flesh-coloured."

Glycosmis chlorosperma Spr.

SARAWAK: *Haviland* 616; *Beccari* 772; Kuching, *Haviland and Hose* 616 ("Flowers pale green, stamens 10") and 3727; Niah, on limestone, *Haviland and Hose* 3666. BRITISH NORTH BORNEO: Tuahang Gunong, near Kudat, *Fraser* 142; Sandakan, *Elmer* 20186.

Most of these specimens are of the compact many-flowered panicked form.

Glycosmis cyanocarpa Spr.

SARAWAK: Banjermassin, *Motley* 381.

Glycosmis Oliveri Stapf MS. sp. nov.; floribus in panícula valida maximis ab omnibus distincta. A *G. chlorosperma* Spr. differt foliis minoribus, floribus majoribus.

Frutex glaber. *Folia* uni-vel bijuga 18 cm. longa, *foliolis* ellipticis acuminato-cuspidatis obtusis, 7-12 cm. longis 3-5 cm. latis, nervis 5-paribus subtus elevatis, *petiolis* 5 mm. longis. *Panicula* subterminalis validula rufo-furfuracea 5 cm. longa, ramis inferioribus 2 cm. longis, *bracteis* furfuraceis triangulari-ovatis acutis 1 mm. longis, *pedicellis* 2 mm. longis crassis, *sepalis* 5 ovatis rotundatis, *petalis* 5 oblongis obtusis glandulosis 5 mm. longis intus puberulis, *staminibus* 10, filamentis crassis 1 mm. longis, antheris lanceolatis 2 mm. longis.

SARAWAK: *Beccari* 2595.

This is totally unlike any other species in its very large flowers.

BURSERACEAE.

Canarium parviflorum Ridley sp. nov.; nulli arcte affinis, omnino glabra paniculis brevibus paucifloris, floribus parvis, distincta.

Arbor glabra. *Folia* 1-2-juga, 15 cm. longa, *foliolis* coriaceis ellipticis vel oblongis cuspidato-acuminatis, basibus rotundatis, 9-12.5 cm. longis 4-8 cm. latis, nervis 8-paribus superne inconspicuis subtus elevatis, nervulis tenuibus irregularibus, *petiolulis* 1 cm. longis ad basin et apicem incrassatis. *Paniculae* parvae breves pauciramosae pauciflorae 3 cm. longae, *pedicellis* 1 mm. longis, *calyce* patelliformi 1 mm. longo margine sinuato, *petalis* ovatis obtusis 2 mm. longis, *staminibus* 6 petalis brevioribus extra discum ortis, antheris ellipticis.

SARAWAK: near Kuching, *Haviland* 2878.

I can find nothing quite like this plant. It is remarkable for its very short panicles with only 2 branches at the base, the upper flowers being in pairs on the terminal branch. The whole plant appears to be quite glabrous.

Canarium pauciflorum Ridley sp. nov.; affinis *C. Kipella* Miq., foliis bijugis, petalis longioribus, staminibus ad bases haud dilatatis differt.

Arbor glabra. *Folia* 1-2-juga 30 cm. longa (*petiolo* 9 cm. longo) glabra, *foliolis* ovatis vel lanceolatis cuspidatis 10-12 cm. longis 4-5.5 cm. latis, basibus acuminatis nervis 9-paribus subtus elevatis,

nervulis haud parallelis irregularibus reticulationibus subtus conspicuis, *petiolulis* 5 mm. longis crassis rugosis. *Paniculae* puberulae 5-9 cm. longae, ramis superne brevibus 1 cm. longis vel brevioribus, inferioribus 5 cm. longis paucifloris, *floribus* subsessilibus, *pedicellis* 1 mm. longis vel brevioribus, *calyce* urniformi subglabro 2 mm. longo margine undulato, *petalis* 3 triplo longioribus sericeis oblongis, *staminibus* 3, filamentis antheris longioribus, basibus haud dilatatis, disco glabro.

SARAWAK: Kuching, *Haviland* 1864 (type); *Haviland and Hose* 3181.

Allied to *C. Kipella* Miq., but the leaves have only 2 pairs of leaflets, the petals are longer and the stamens not dilated at the base.

Canarium caudatum King.

SARAWAK: Kuching, *Haviland* 2877. "Flowers yellow."

The flowers are rather smaller than in the type from the Malay Peninsula and the calyx is often quite entire, but it is otherwise the same. I found it also in Sumatra on the Kelantan river in Siak.

Canarium flavum Ridley sp. nov.; a *C. secundo* Benn., cui affinis, floribus multo minoribus calyce integro distincta.

Arbor. *Folia* trijuga 13-18 cm. longa, *foliolis* ovatis acuminatis basibus rotundatis superne laevibus glabris subtus minute hirtis, 5.5-9 cm. longis 3-4 cm. latis, nervis superne depressis subtus elevatis 11-paribus, nervulis transversis elevatis, reticulationibus conspicuis, *petiolulis* 3 mm. longis. *Paniculae* 15-18 cm. longae pubescentes ramis 2-5.5 cm. longis paucifloris remotis rufo-tomentosis recurvis, *floribus* sessilibus, *bracteis* parvis ovatis rufo-tomentosis, *calyce* urniformi tomentoso viridi 3 mm. longo, margine integro vel undulato, *petalis* 6 mm. longis oblongis obtusis sericeis, *staminibus* 3 e disco ortis 3 mm. longis, disco glabro lobato, *ovarum* rudimento conico.

SARAWAK: Kuching, *Haviland* 2850. "Calyx green, corolla yellow."

Certainly allied to *C. secundum* Benn., but the flowers are very much smaller.

Canarium latistipulatum Ridley sp. nov.; a *C. legitimo* Miq., cui affinis, foliis denticulatis, stipulis latis squamiformibus denticulatis distincta.

Arbor parva. *Folia* 5-juga 30 cm. longa, *stipulis* orbiculari-ovatis coriaceis denticulatis 2 cm. longis 1.7 cm. latis, *foliolis* elliptico-oblongis cuspidatis basibus cuneatis marginibus denticulatis, subcoriaceis glabris, 7-13 cm. longis 4.5-5.2 cm. latis, nervis 10-paribus subtus elevatis nervulis transversis subtus conspicuis reticulationibus minutis copiosis, *petiolulis* 1 cm. longis, *stipellis* 2 ad basin 5 mm. longis obovatis. *Paniculae* puberulae 15-29 cm. longae laxae, ramis remotis 2-10 cm. longis, *floribus* subsessilibus in glomerulis, *bracteis* minutis lanceolato-acuminatis caducis, *calyce* rufescente urniformi dentibus 3 acutis sericeo-pubescente 3 mm. longo 4 mm. lato,

petalis 8 mm. longis oblanceolato-oblongis obtusis sericeis flavis, *staminibus* 6 liberis *petalis* brevioribus.

SARAWAK: near Kuching, Haviland 2275. "Small tree; calyx reddish, corolla yellow."

This species, of which I have only male flowers, seems most nearly allied to *C. legitimum* Miq. but has by no means entire leaves, for they are conspicuously toothed especially on the long cusp. The stipules at the base of the leaves are very broad, rounded and toothed. Above the basal ones are two smaller ones and a pair at the bases of the branches of the long panicle. The flowers are crowded in tufts of 4 to 7 at the ends of the branches, which are 3 cm. apart.

Canarium micrantherum Stapf MS. sp. nov.; affinis *C. rubiginoso* Benn. sed foliis pilosis, foliolis subtus hirtis, nervis pluribus, petiolulis brevioribus, *petalis* glabris differt.

Arbor. Folia 4-juga 22-27 cm. longa hirta, foliolis elliptico-oblongis coriaceis cuspidatis basibus rotundatis, 10-12 cm. longis 4.5-6.5 cm. latis, nervis 20-paribus subtus elevatis pilosis, costa superne et subtus pilosa, petiolulis 5-7 mm. longis. Panicula 20 cm. longa pilosa, ramis 2-5.5 cm. longis, ramulis 5 mm. longis densifloris, pedicellis 1 mm. longis, bracteis oblongis pilosis, calyce patelliformi parvo hirtulo, *petalis* 3 ovatis 2 mm. longis, *staminibus* 4 brevioribus in disco infra marginem insertis, pistillodio immerso.

SARAWAK: Kuching, Haviland 1889.

This is allied to *C. rubiginosum* Benn. but the leaflets are longer, hairy beneath and on the midrib above, the petiolules are longer, and the petals are quite glabrous, not silky hairy as in *C. rubiginosum*.

Canarium fusco-calcinum Stapf MS. sp. nov.; *C. Vrieseano* Engl. approximata, sed foliolis brevioribus ovato-lanceolatis usque oblongo-lanceolatis, calyce tubuloso subglabro differt.

Arbor ramis pilosis. Folia 2-3-juga, petiolis hirtis, foliolis rigide coriaceis oblongo-lanceolatis vel ovato-lanceolatis acuminatis basibus rotundatis vel breviter cuneatis (siccis virescentibus), 7.5-11 cm. longis 4-6 cm. latis, nervis 10-12-paribus subtus cum nervulis transversis et reticulationibus elevatis hirtis, costa superne hirta, petiolulis hirtis 5 mm. longis. Paniculae 12-15 cm. longae, ramis paucis dissitis hirtis, floribus subsessilibus (alabastris ellipticis), bracteis ovatis acutis hirtis ferme 1 mm. longis, calyce cylindrico 4 mm. longo puberulo trilobo, lobis ovatis intus sericeis, *petalis* 3 oblongis paullo longioribus sericeis, *staminibus* 6 in tubum brevem connatis.

SARAWAK: Kuching, Haviland 1981.

Perhaps most nearly allied to *C. Vrieseanum* Engl., but the leaflets are ovate-lanceolate, much shorter, and the calyx nearly glabrous.

Canarium costatum Ridley comb. nov.; *Santiria costata* Benn. in Hook. fil. Fl. Brit. Ind. i. 537.

SARAWAK: Beccari 240.

The fruits of a specimen of Kunstler's collected at Gunong Bubu, Perak, Malay Peninsula, are undoubtedly those of a *Canarium*. They are oblong, 1.6 cm. long and 1 cm. in diameter. I transfer this plant therefore to the genus *Canarium*.

Canarium Moultonii Ridley sp. nov.; affinis *C. costato* (Benn.) Ridley sed haud ferrugineo-tomentosa, calyce distincte tubuloso *petalisque* pubescentibus differt.

Arbor ramis furfuraceo-pubescentibus. Folia bijuga, petiolis pubescentibus 4 cm. longis, foliolis coriaceis lanceolatis cuspidatis cuspidate obtusa 1 cm. longa basibus angustatis obtusis, glabris superne nitidis, 10-13 cm. longis 4-6 cm. latis, nervis 8-paribus valde elevatis, nervulis transversis paucis irregularibus, costa elevata ad basin furfuraceo-pubescente, petiolulis 1 cm. longis furfuraceo-pubescentibus ad apices incrassatis. Paniculae laxae pauciramosae pubescentes 8 cm. longae foliis breviores, floribus singulatim dissitis parvis, bracteis lanceolatis acutis pubescentibus parvis, pedicellis 2 mm. longis pubescentibus, calyce campanulato trilobo, lobis ovatis, pubescente 1 mm. longo, *petalis* 2 mm. longis ovatis obtusis extra pubescentibus, *staminibus* 3 e disco ortis, ovario conico glabro, stigmatibus magno trilobo.

SARAWAK: Gunong Tenabok, Upper Baram, 3000 ft., Moulton 6767.

This species is allied to *C. costatum*, but it is not ferrugineo-tomentose in any part, only palely stiffly pubescent; the calyx is deeply lobed and the petals ovate, silky pubescent; the pedicels of the flowers are shorter and the leaves are not finely reticulate.

Canarium expansum Ridley sp. nov.; nulli arcte affinis, ab omnibus differt *petalis* tenuibus haud coriaceis expansis vel reflexis, *staminibus* longioribus erectis.

Arbor parva. Alabastra rufo-furfuracea. Folia 4-juga glabra, foliolis coriaceis oblongo-lanceolatis cuspidato-acuminatis basibus cuneatis, 21 cm. longis 7.5 cm. latis, nervis 10-paribus superne depressis reticulationibus majusculis, petiolulis 3 cm. longis ad apices et bases incrassatis et transverse rugosis. Paniculae laxae 18 cm. longae ramis remotis 2-9 cm. longis, floribus pallide viridibus, pedicellis 7 mm. longis, calyce campanulato breviter trilobo 2 mm. longo, *petalis* tenuibus oblongis obtusis expansis 4 mm. longis, *staminibus* 6 extra discum glabrum ortis filamentis elongatis linearibus antheris oblongis brevioribus.

SARAWAK: Kuching, Haviland 2271. "Small tree; perianth pale green, disc yellow."

This is quite unlike anything known to me. The petals are quite thin and spread out in flower, being almost reflexed, while the long stamens stand erect.

Canarium reticulatum Ridley sp. nov.; affinis *C. Kadondon* Benn. sed panicula multo longiore floribusque multo majoribus differt.—*C. rostriferum* Miq. var. *cuspidatum* Engl. in DC. Mon. Phan. iv. 137.

Arbor ramis crassis. *Folia* 3-5-juga glabra, 45 cm. longa, *petiolis* validis 15 cm. longis inclusis, *foliolis* coriaceis ellipticis usque ovato-ellipticis breviter acutis vel cuspidatis cuspidate 1.5 cm. longa 12-13 cm. longis, 6-7 cm. latis, basibus latis vel angustatis, nervis 11-paribus subtus elevatis superne tenuibus, nervulis transversis subtus elevatis, reticulationibus minutis in utraque pagina conspicuis, *petiolulis* 1-1.5 cm. longis. *Paniculae* 15-30 cm. longae ramis 4-8 cm. longis dissitis ramulis 3 cm. longis ferrugineo-pubescentibus, *pedicellis* 2-3 mm. longis, *calyce* cupulato hirtio trilobo 1 mm. longo; *petalis* ovato-rotundatis hirtis 2 mm. longis, *staminibus* brevibus, filamentis antheris longioribus. *Drupa* 3 cm. longa oblique oblonga.

SARAWAK: Beccari 2909, 2176; Miri river, Hose 677.

Engler referred Beccari's specimen 2176 to a variety of *C. rostriferum* Miq.—var. *cuspidatum* Engl. (*Dracontomelum cuspidatum* Bl. Mus. Bot. Lugd. Bat. i. 232). *C. rostriferum* Miq. is only known from leaf specimens collected by Teysmann in the Lampongs, Sumatra, and is entirely different from Beccari's plant. The *Dracontomelum cuspidatum* Bl. was also based on a leaf specimen which I have not seen. The description is very incomplete and it is impossible to guess what Blume had before him, but from what description there is it was certainly not *C. reticulatum* Ridl. nor *C. rostriferum* Miq. Merrill has called Engler's plant *C. cuspidatum* (Bl.) nov. comb. Engler's description of the flowers of the *C. rostriferum* in DC. l.c. is taken from those of *C. reticulatum* Ridl., i.e. from Beccari's specimens.

The species is allied to *C. Kadondon* Benn., but the panicle is much longer and the flowers larger. It resembles *C. hirtipetalum* Ridl. in general habit, but the glabrous leaves finely reticulate on both sides, and round (not oblong) white hairy petals distinguish it from that.

Canarium hirtipetalum Ridley sp. nov.; affinis *C. reticulato* Ridl., sed nervis magis prominulis et subtus hirtis, furfuraceo-rufescentibus, nervulis transversis conspicuis, petalis oblongis subtruncatis dense appresse albo-hirtis distincta.

Arbor ramis validis. *Alabastra* rufo-furfuracea. *Folia* bi- vel trijuga 20 cm. longa, *foliolis* coriaceis ovatis vel oblongo-ovatis, basibus breviter angustatis apicibus acutis, 10-13 cm. longis 4.5-5.5 cm. latis, superne glabris costa immersa stellatim albo-hirsuta, subtus nervis cum costa rufescenti-furfuraceis albo-pilosis 10-13-paribus elevatis, *petiolulis* 1 cm. longis subtus pilosiusculis. *Panícula* valida 20 cm. longa, *pedunculo* 8 cm. longo albo-pubescente, ramis 3-8 cm. longis, *floribus* in apicibus ramulorum congestis, *pedicellis* 2 mm. longis, *calyce* ferme ad basin in lobos ovatos tres rufescenti-scabridos fisso, *petalis* vix longioribus oblongis obtusis albo-pubescentibus, *staminibus* 3 brevioribus extra discum ortis.

SARAWAK: Baram, Haviland and Hose 3183.

Allied to *C. reticulatum* Ridl., but the nerves are more prominent and hairy beneath with rufescent scurf, the transverse nervules conspicuous, the petals oblong subtruncate and densely covered with white appressed hairs longest on the keel.

Santiria mollissima Ridley sp. nov.; affinis *S. multiflorae* Benn., sed foliis bijugis, foliolis ovatis cuspidatis, floribus paucioribus in paniculis laxis, recedit.

Arbor ramis hirtis. *Folia* bijuga 18 cm. longa, *petiolis* 4-6 cm. longis villosis, *foliolis* ovatis vel ellipticis cuspidatis basibus rotundatis vel breviter acuminatis, superne glabris costa villosa excepta, subtus in nervis reticulationibusque hirtis, 6-15 cm. longis 4-9 cm. latis (cuspidate 5 mm.—1 cm. longa), nervis 8-9-paribus prope margines inarcuantibus, *petiolulis* 5 mm.—1 cm. longis hirtis. *Paniculae* graciles 7-15 cm. longae ramis 5-6 remotis brevibus 1 cm. longis, *floribus* viridibus paucis in cymulis, omnino hirtis superne viscidis, *pedicellis* 1 mm. longis, *calyce* cupuliformi obscure trilobo hirtio, *petalis* 3 ovatis parce hirtulis 2 mm. longis, *staminibus* 6 in disco; *drupa* elliptica glabra inaequilaterali 1 cm. longa.

SARAWAK: Kuching, Haviland 1819. "Flowers green, petals 3, valvate. Stamens 6, seated on disc. Ovary 1 carpel with 1 ovule."

Allied to *S. multiflora* Benn. which it much resembles in the flowers, but the leaflets are fewer and widely ovate, not oblong narrow, the whole plant more hairy and the panicles slender, lax and few-flowered.

Santiria Havilandii Ridley sp. nov.; affinis *S. montana* Bl. sed foliis haud minute reticulatis cuspidate brevioribus haud ad apicem dilatata, floribus paniculisque minoribus, calyce majore trilobo petalisque brevioribus differt.

Arbor ramulis puberulis. *Folia* 2-3-juga, 28 cm. longa, *foliolis* coriaceis oblongis cuspidato-acuminatis basibus angustatis, glabris costa in utraque pagina puberula excepta, 6-12 cm. longis 4-5 cm. latis, nervis tenuibus 12-13-paribus nervulis intermediis ferme aequae conspicuis intra margines arcuantibus, *petiolulis* puberulis 1 cm. longis ad apices incrassatis. *Paniculae* complures pubescentes rufescentes 5-12 cm. longae ramis brevibus compluribus, *floribus* 3-4 in apicibus congestis, *bracteis* minutis lanceolatis pubescentibus, *pedicellis* 1 mm. longis, *calyce* cupulato trilobo lobis rotundatis 1 mm. longis, *petalis* ovatis rotundatis 2 mm. longis pubescentibus, *staminibus* 3 brevioribus, filamentis brevibus antheris subglobosis.

SARAWAK: Kuching, Haviland 1821. "Inflorescence reddish, disc yellow." Rejang River, Sib, Haviland (type).

Near *S. montana* Bl. of Borneo and Sumatra, but the leaves are not minutely reticulate as in that species nor have they a long cusp dilated at the tip; the flowers and panicles are smaller, the calyx proportionally larger, distinctly 3-lobed, and the petals shorter.

Santiria latifolia Stapf ms. sp. nov.; affinis *S. oblongifoliae* Bl. sed foliis majoribus ovatis ellipticis crasse coriaceis, floribus majoribus paniculis longis patentibus differt.

Arbor parva. *Folia* bijuga, *petiolis* et *rhachidibus* glabris, *foliolis* rigide coriaceis ovato-ellipticis basibus breviter subacutis apicibus breviter obtuse cuspidatis, superne glabris subtus rufescenti-furfuraceis, 13–18 cm. longis 8.5–11 cm. latis, nervis 9–10-paribus subtus elevatis nervulis transversis conspicuis interruptis reticulacionibus conspicuis costa in utraque pagina elevata crassa, *petiolulis* crassis 2.5 cm. longis. *Paniculae* validae patentes scabridae 2.4 cm. longae costatae, ramis remotis 2–3 cm. dissitis 6 cm. longis validulis, ramulis subterminalibus 5 mm. longis scabridis, *pedicellis* 2 mm. longis *calyce* cupulato lobis 3 brevibus rotundatis 1 mm. longis, *petalis* ovatis rotundatis vix longioribus, *staminibus* brevioribus 3.

SARAWAK: Penrissen Road, *Haviland* "c.o.z.z." "Small tree."

A very distinct plant from its large stiff ovate leaflets and wide spreading lax panicle with a stout ribbed peduncle and branches. The indumentum consists of scurf-like minute processes. It is allied to *S. oblongifolia* Bl. but the leaflets differ in their shape, being quite ovate, stiffly coriaceous and much wider.

Santiria rubra Ridley sp. nov.; affinis *S. laevigatae* Bl. sed foliolis crassis coriaceis ovatis, paniculis brevioribus gracilioribus distincta.

Arbor magna glabra. *Folia* bijuga, *petiolis* 8–12 cm. longis, *foliolis* coriaceis ovatis cuspidato-acuminatis basibus rotundatis, 13.5–15 cm. longis 7–8 cm. latis, nervis 7-paribus tenuibus inarcuantibus, *petiolulis* 1.5 cm. longis. *Paniculae* axillares multiramosae 12 cm. longae glabrae multiflorae ramulis brevibus tenuibus, *floribus* copiosis, *pedicellis* 2 mm. longis, *calyce* patelliformi obscure trilobo *petalis* rotundatis 2 mm. longis rubris, *staminibus* 6 brevibus extra discum ortis.

SARAWAK: near Kuching, *Haviland* 2269. "Large tree, petals red."

This plant is nearly completely glabrous, the ultimate branches of the panicle being obscurely puberulous only. It is allied to *S. laevigata* Bl. but the leaflets are quite rounded and the panicles shorter and more slender.

Santiria parviflora Engl. This is based on Beccari's specimen 3706 which is identical with *Haviland* 922, "Three miles from Kuching," and with 1865 from Rejang, Sib. Engler does not describe the petals, which are short, ovate, blunt and silky pubescent outside. To Beccari's number 3706 he adds a fruiting specimen 3319 to which his description of the drupes of *S. parviflora* appears to belong, but this fruiting specimen belongs to a different though allied plant.

Santiria pedicellata Ridley sp. nov.; a *S. parviflora* Engl. differt floribus omnino glabris pedicellis longis.

Arbor glabra. *Folia* trijuga usque 18 cm. longa, *foliolis* oblongis cuspidato-acuminatis obtusis basibus angustatis, 7–11 cm. longis 2–4 cm. latis, nervis tenuibus circiter 15-paribus, nervulis intermediis subaeque conspicuis, *petiolulis* 1 cm. longis crassiusculis. *Paniculae* 7–12 cm. longae laxae ramulis 2 cm. longis, glabris, *floribus* parvis, *pedicellis* 3 mm. longis, *calyce* patelliformi trilobo marginibus ciliatis, *petalis* 3 rotundatis 1 mm. longis, *staminibus* brevibus 3, *petalis* brevioribus, *antheris* globosis e disco ortis, *pistillo* conico brevi, stigmate capitato; *drupa* oblongo-globosa 1 cm. longa in pedicello elongato 1 cm. longo gracili, *calyce* explanato trilobo lobis rotundatis.

SARAWAK: Sib. Rejang River, *Haviland* 2374, 1878 and 1866 (type); near Kuching, *Haviland* 2264; *Beccari* 3319.

Very distinct from *S. parviflora* Engl. in its long-pedicelled glabrous flowers. There is a small amount of scurfiness on the young parts of the leaves, rhachis and petiolules, extending sometimes up the costa beneath, but otherwise the foliage is glabrous.

Santiria minimiflora Ridley sp. nov.; a *S. caudatae* Laut., cui affinis, foliis ovato-ellipticis caudatis (nec lanceolato-caudatis), reticulationibus laxis (nec minutis) conspicuis differt.

Arbor glabra. *Folia* 8 cm. longa, 2–3-juga, *foliolis* coriaceis ovato-ellipticis caudatis 4.5–5 cm. longis 1.5 cm. latis, nervis tenuibus circiter 15-paribus paullo elevatis, *petiolulis* gracilibus 4 mm. longis. *Paniculae* breves laxae 3 cm. longae, *floribus* minutis 1 mm. longis, alabastris globosis, *pedicellis* 2 mm. longis, *calyce* campanulato lobis 3 rotundatis, *petalis* vix longioribus rotundatis, *staminibus* 3, filamentis brevissimis antheris longioribus subrotundis.

SARAWAK: near Kuching, *Haviland* 1703.

This species is remarkable for its small leaflets and minute flowers. It is certainly closely allied to *S. caudata* Lautenberg of New Guinea. The flowers are very similar, but the leaves of the latter are longer, caudate and very finely reticulate. It differs from *S. pedicellata* Ridl. in its much smaller and more ovate leaves.

Santiria fasciculata Benn.

SARAWAK: Path from Matang to Kuching, *Haviland* 617.

This is the long-leaved and long-panicled form which occurs in Perak.

XI.—MISCELLANEOUS NOTES.

Fifth International Botanical Congress, 1930.—The Preliminary Programme of the Congress has now been published, and copies may be obtained from the Hon. Secretaries, Mr. F. T. Brooks, Botany School, Cambridge, and Dr. T. F. Chipp, Royal Botanic Gardens, Kew. A summary of the more important features of the Programme is given below.

The Congress will be held at Cambridge from August 16th to August 23rd, under the Presidency of Professor A. C. Seward, F.R.S.

Any person interested in Botany may become a member of the Congress on payment of the subscription of £1. Subscriptions should be paid by 1st April, 1930, to the Hon. Treasurer, Dr. A. B. Rendle, British Museum (Natural History), London, S.W.7. Letters to the Treasurer should be marked "Fifth International Botanical Congress" on the outside.

A reception of members of the Congress will be held at the Imperial Institute, South Kensington, London, S.W.7, at 8.30 p.m. on Friday, August 15th.

Hotel accommodation in London and in Cambridge must be booked by members for themselves, but accommodation in Colleges and houses in Cambridge will be available. Further information on this point is contained in the Preliminary Programme.

PROVISIONAL SECTIONAL PROGRAMME.

The Congress will be organised in eight sections (not seven as indicated in *Kew Bulletin*, 1927, p. 224). These sections, with their Presidents and Recorders, are as follows:—

SECTION B. BACTERIOLOGY.

President; Prof. R. E. Buchanan, Department of Bacteriology, Iowa State College, Ames, Iowa, United States.

Recorder; Mr. E. G. D. Murray, Department of Pathology, Cambridge, England.

SECTION E. PHYTOGEOGRAPHY AND ECOLOGY.

President; Prof. H. C. Cowles, The University, Chicago, United States.

Recorder; Prof. A. G. Tansley, Department of Botany, Botanic Garden, Oxford, England.

SECTION G. GENETICS AND CYTOLOGY.

President; Prof. O. Rosenberg, Botaniska Institutet, Stockholms Högskola, Stockholm, Sweden.

Recorder; Prof. R. R. Gates, King's College, Strand, London, W.C.2.

SECTION M. MORPHOLOGY (INCLUDING ANATOMY).

President; Prof. J. C. Schoute, Zuiderpark 2, Groningen, Holland.

Recorder; Prof. F. E. Fritsch, Danesmount, Tower Hill, Dorking, Surrey, England.

SECTION MY. MYCOLOGY AND PLANT PATHOLOGY.

President; Prof. L. R. Jones, University of Wisconsin, Madison, Wis., United States.

Recorder; Dr. E. J. Butler, Imperial Bureau of Mycology, 17, Kew Green, Kew, Surrey, England.

SECTION P. PLANT PHYSIOLOGY.

President; Dr. F. F. Blackman, Botany School, Cambridge, England.

Recorder; Prof. W. Stiles, Department of Botany, The University, Birmingham, England.

SECTION PB. PALAEOBOTANY.

President; Dr. D. H. Scott, East Oakley House, Basingstoke, England.

Recorder; Dr. H. Hamshaw Thomas, Botany School, Cambridge, England.

SECTION T. TAXONOMY AND NOMENCLATURE.

President; Prof. Dr. L. Diels, Botanischer Garten und Botanisches Museum, Berlin-Dahlem, Germany.

Recorder; Dr. A. W. Hill, Royal Botanic Gardens, Kew, Surrey, England.

Communications may be made to the Congress in English, French or German.

Abstracts, not exceeding 300 words, of communications to be made to the Congress should be sent to the Recorder of the appropriate Section by May 1, 1930.

All communications relating to Sectional Programmes should be sent to the Recorders.

The subjects indicated in the Preliminary Programme have already been chosen for discussion. Evening lectures of general interest will be given. The complete programmes will be issued shortly before, or at, the opening of the Congress.

The official opening of the Congress will take place on the evening of Saturday, August 16th, 1930.

A number of sectional excursions have been planned for members of the various sections, and other general excursions for members as a whole are being arranged to take place after the Congress.

Arrangements for attending the Congress may be made with Messrs. Thos. Cook & Son, Ltd. (Berkeley Street, London, W.1), Messrs. Dean & Dawson, Ltd. (7, Blandford Square, Marylebone, London, N.W.1), and The American Express Co. (6, Haymarket, London, W.1), and their branches throughout the world have kindly promised to facilitate as much as possible the travelling arrangements of members of the Congress. Messrs. Sir Henry Lunn, Ltd. (5, Endsleigh Gardens, Euston, London, W.C.1) have similarly promised to assist the travelling arrangements of members of the Congress resident in North America and in France.

Flora of the Sudan.*—Although much of the flora of the Eastern Sudan was made known to us quite early by the explorations of Kotschy, Schweinfurth and others, no account of the flora of the

*Flora of the Sudan, by A. F. Broun and R. E. Massey. The Controller, Sudan Government Office, Wellington House, Buckingham Gate, London, S.W.1, 1929, pp. 502. Price 10s.

Anglo-Egyptian Sudan as a whole has ever been published. This has now been remedied by the almost simultaneous publication of two books, one by Mr. A. F. Broun, formerly Director of Woods and Forests, assisted by Mr. R. E. Massey, the present Government Botanist, and the other by Mrs. G. M. Crowfoot.

As Mr. Broun states in the preface of the Flora of the Sudan, mainly compiled from the Flora of Tropical Africa, the short descriptions have been adapted from that work. As there are no keys to the genera (except for the grasses) or species, however, their determination will often be difficult to all but the expert with a considerable knowledge of the flora as a whole. The artificial key to the families has been extracted from Hutchinson's Families of Flowering Plants, the families being arranged after the sequence adopted in that work and in the Flora of West Tropical Africa. When the latter is completed a close floristic comparison will thus be possible between these two vast and interesting regions. A comprehensive list of native names arranged under the various tribal dialects is added to the work. The authors are to be congratulated on the production of a neatly printed handbook which should prove of service to those interested in the flora of the Anglo-Egyptian Sudan.

Mrs. Crowfoot's work* is a book of illustrations of the flowering plants of the Northern and Central Anglo-Egyptian Sudan. It consists of a number of photographs and of 163 black and white sketches of individual species with floral details. With the aid of these illustrations the visitor to the country should have little difficulty in determining a large number of the commoner species, and Mrs. Crowfoot, by the preparation of this book, has thus greatly increased the usefulness of the descriptive volume by Broun and Massey, for which it is intended to be a companion.

J.H.

The Fungi of Manitoba.†—This little book is a welcome new departure in the preparation of regional fungus floras. It is the product of many years work by three well-known Canadian botanists, on the fungi of an area of considerable ecological interest. The combination of plant-pathologist, physiologist and taxonomist has resulted in an interesting general account of the fungi, which will appeal to a much wider public than does the usual bare list of species and localities.

The actual list of species enumerates about two thousand fungi and lichens, 45 of which are new. It is preceded by thirteen sections in which are discussed various aspects of the fungi in the area

*Flowering Plants of the Northern and Central Sudan, by Grace M. Crowfoot, with an introduction by A. F. Broun. The Orphans' Printing Press, Limited, 10 & 12, Broad Street, Leominster, pp. xxv. + 163 illustrations.

†The Fungi of Manitoba, by G. R. Bisby, A. H. R. Buller and J. Dearness. Longmans, Green and Co., 1929, pp. viii and 194, 1 map. Price 7s. 6d.

concerned, such as geographical distribution, seasonal prevalence, habitats and the relative numbers of fungi and other groups of plants. At the end are indices to hosts and substrata which will be of great use to the field worker, to whom also the convenient size and clear print will appeal.

There are some cases of inconsistency in methods of citation and a few actual errors, while the names used are sometimes those valid according to the American Code, and sometimes those which follow the International Rules of Nomenclature. In the case of the Operculate Discomycetes the authors have explained that they are following the nomenclature used by Seaver in his recent book, but the origin of other names will not be so obvious to the general reader. It would be advisable, in the event of a second edition, that the list should be revised in this respect.

E.M.W.

Orris Root.—Orris Root of commerce, used at the present time in the perfumery industry and in the preparation of toilet articles and dentifrices, consists of the dried rhizomes of three species of *Iris*, chiefly *I. pallida* Lam. and *I. florentina* L., and to a less extent *I. germanica* L. The Florentine hills in Tuscany are the chief source of production of the root, San Polo being the centre of the Tuscan industry. Cultivation is also carried on in other European countries and in Morocco and parts of Kashmir. Owing to less perfect methods of drying, however, the product from most of these countries is generally inferior to the Florentine article. *Iris pallida* yields the finest root and constitutes the bulk of the "Florentine" orris root of commerce.

Great care is exercised in the type of soil chosen for the cultivation of orris root, for soil conditions are liable to have a profound bearing on the nature and quality of the roots. With very rich or heavily manured soils, the roots, though well developed, are prone to possess little or no fragrance and to shrivel considerably on drying, which renders them almost valueless. In very loose sandy soils the roots are found to be lacking in compactness and to possess less odour. The stony mountain soils of Florence are well adapted to the successful growth of the crop. Deep ploughing and careful preparation of the soil are regarded as essential for good results. A spring green-manuring crop to precede planting is recommended. Planting is carried out in Tuscany in August or September, or possibly October, rhizomes being planted about 16 inches apart in rows, approximately 80,000 plants going to the acre. Growth commences almost immediately and the plants are kept well weeded and the ground is periodically hoed. It is not until the second or third year from planting that the rhizomes reach a suitable state for harvesting. In the fresh state they are almost odourless, but the characteristic violet odour soon develops on drying. Irrigation is regarded as more harmful than beneficial, as a tendency for the rhizomes to rot

is set up by it, and the rhizomes from moist soils are generally inferior to those from drier situations.

The usual period for harvesting mature rhizomes is soon after the withering of the flowers, and commences generally in August. In harvesting the rhizomes are dug up with a fork, freed of adherent soil as much as possible, and carted to a shed or shelter to be peeled. The quantity of rhizomes dug in any one day is never more than can be peeled in the following day, for the fresh roots quickly deteriorate if any lapse of time occurs between harvesting and peeling and drying. The peeling of the rhizomes, which is done by hand with a special knife, is a laborious and tedious process in which men, women, and children of all ages take part. To facilitate peeling the rhizomes are first immersed in water. Owing to the variable and fantastic shapes of the rhizomes no type of machinery has yet been devised that can be substituted for hand-peeling. After decorticating the roots are well washed and then sun-dried for a period of five to eight days. In drying the roots are spread on matting consisting of thin bamboo rods strung together and placed on wooden stages about eighteen inches from the ground. Means are provided for protection in the event of rain. The roots are not allowed to dry completely in the sun but are taken indoors and spread on a cool, dry, tiled floor for the final drying, which generally takes another five to eight days. Though every care is taken to keep the roots clean they are sifted after the final drying to remove any foreign matter that might be present. This is followed by a final picking over in which the roots are sorted into qualities, a task calling for no small amount of judgment and patience. As the odour of the root is reputed to improve with keeping, the prepared product is frequently stored for some time before being put to actual use.

Though rarely employed in medicine at the present time orris root was at one time commonly used for its curative properties. Its use in perfumery and medicine can be traced to very early times. In Eastern European countries, to which the plant is native, its properties and uses were well known to the Ancients. It is recorded as in use in England as a perfume for linen as far back as the fifteenth century. In the Georgian period it was a common constituent of hair powders and when mixed with starch constituted what was known as violet powder. Pieces of the root specially shaped were at one time commonly used for infants when teething, and "Issue Beads," small spherical pieces of the root, placed in open wounds for a time to keep them healthy and cause quick healing. A custom in former times was to place a piece of orris root in home-brewed beer to prevent it becoming stale. Wines and brandies were perfumed with it in like manner.

The violet-like odour of orris root is due to the presence of the ketone Irone. Towards the end of last century, Ionone, a substance with an odour even more like that of violets than Irone, was discovered. It grew to be largely used in the perfumery trade in

making toilet waters and handkerchief extracts. It was thought by many that this synthetic substance, which can be produced comparatively cheaply, would entirely take the place of orris root in commerce. This has, however, never occurred, and at the present time quite a keen demand exists for orris root, as the following statement indicates. "The rise witnessed for nearly two years in the price of orris roots still continues this year, and has reached a level that nobody dared to predict. In effect, the roots cost from 15 to 16 francs per kilo, and they are very difficult to obtain. This advance, which has had its repercussion on the price of the concrete and absolute orris oils, has necessarily restricted the consumption of these products which are, however, of the utmost importance in perfumery."*

F.N.H.

A Textbook of Tropical Agriculture.†—The first English edition of this work appeared in 1892, an earlier edition having been published by the Government of Jamaica in the previous year. Since then much has happened in agricultural research in the tropics, and a great extension of cultivation of economic plants beyond their original habitat has occurred. Moreover most British Colonies have now progressive Agricultural Departments with native assistants and learners requiring guidance. An up-to-date revision was therefore long overdue, and this has been ably carried out by Mr. Holland.

The work is divided into two parts. Part i presents the Elements of Agriculture, and includes chapters on soils as the pioneer finds them, and soils as the wise agriculturist treats and improves them, and on plant physiology and its applications in propagation by practical methods both natural and artificial (budding, grafting, etc.). Brief chapters on climate, irrigation, &c., are supplemented by references to modern sources of information, a useful feature appended to most of the chapters throughout the revised edition.

Part ii deals with Agricultural Products. There are five new chapters on fodder plants (demanded by the development of stock-breeding in the tropics), rubber, fibres and oils—fixed and volatile. Several fruits (grape-fruit, avocado, mango, date, &c.) and drugs (camphor, kola, papain, &c.) are dealt with for the first time, as well as pulses amongst the food plants, and the few tanning materials worthy of cultivation in the tropics, gambier, divi-divi and wattle bark.

These additions along with the numerous illustrations—213 as compared with the 16 woodcuts of the original—bring the book up to just twice the size. The illustrations include many photographs taken in the field as well as figures of agricultural implements and machinery for preparing produce.

* Perfumery and Essential Oil Record, Oct. 1929, p. 411.

† By H. A. Alford Nicholls, revised by J. H. Holland. Macmillan and Co., Ltd., St. Martin's Street, London, W.C.2, 1929, pp. 639, ill. 213. Price 15s.

Originally intended as a text-book for schools and colleges in the West Indies and for the use of settlers, small-holders, etc., it was adopted more widely. In the preface to the original edition the author claimed that it was not a compilation but a record of experience gained by study, observation and experimental cultivations. It is well, therefore, that the reviser has retained—and judiciously supplemented—the original text, which, with its simple teaching clearly expressed as befits a “guide to the young and unlearned,” kept always practical ends in view. In its enlarged and revised form the book should be a valuable manual for the instruction of learners in the numerous Schools of Agriculture now in being in all our tropical dependencies, and in the elementary Industrial or Junior Trade Schools, as well as of practical help to both European settlers or planters and educated native cultivators anywhere in the tropics.

J.M.D.

Mangosteen Shipment.—During the periods December to March of 1927-28 and 1928-29, trial shipments of Mangosteen fruit (*Garcinia Mangostana* L.) were made from Java to Holland. The trials* were inaugurated at the instigation of the Commercial Museum of the Colonial Institute at Amsterdam, in co-operation with the Agricultural Department in Java and with shipping companies. The fruit, which had been grown at the Government Fruit Experiment Station at Pasar Minggoe in West Java, was shipped at Batavia and landed at Amsterdam, the voyage occupying approximately 33 days. In all, nine separate shipments of fruit in cold storage were made—four in the first and five in the subsequent season—with various methods of packing.

The first consignment, consisting of four dozen boxes each with 28 fruits packed in coconut fibre and stored at a temperature of $+3^{\circ}\text{C}$., was found to be in quite good condition on arrival at Genoa after 24 days. On arrival at Amsterdam, however, 10-11 days later, the fruit had become over-ripe and had considerably deteriorated. The white flesh of the fruit had become grey-brown in colour with a strong odour of fermentation; while the shell of the fruit, which is normally soft and easily cut with a knife, had become stone-hard. Other methods of packing and of storage were tried with subsequent shipments, but in almost all cases equally disappointing results were obtained. In the last shipment, in which the fruits were first covered with rubber latex before shipment, a slightly higher proportion of sound fruit was obtained.

The conclusion arrived at was that the period taken for the voyage from Java to Holland—nearly 5 weeks—was just too long for successful transportation of the Mangosteen. The trials have

* “Beschrijving van enkele verzendingsproeven met manggistans van Java” by Ir. W. Spoor. Berichten van de Afdeling Handelsmuseum van de Kon. Vereeniging Koloniaal Instituut, No. 45. (Druk J. H. de Bussy, Amsterdam, 1929.)

shown, however, that this fruit can be successfully shipped over distances necessitating a voyage of even 3-4 weeks without noticeable or appreciable detriment.

The results draw attention to the possibility of the Mangosteen, which is regarded by many as the choicest of tropical fruits, being grown in tropical countries more closely situated to Europe than Java for export to the United Kingdom or European markets. According to a statement by Heyl* in 1906 occasional small consignments of Mangosteen were despatched from Martinique to France and carried well, the voyage taking 12 days. No mention is made as to the conditions of storage under which the fruit was placed.

F.N.H.

The Flora of the Indus Delta.†—This Flora is now available in book form, being reprinted from the pages of the Journal of the Indian Botanical Society, in which it appeared in parts during the past three years.

The region covered comprises the whole of the Delta of the Indus south of a line drawn through Karachi, an area of about 2500 sq. miles.

The volume starts with a list of the flowering plants collected during a visit by two of the authors, Father Blatter and Mr. McCann. Short notes are given as well as the general distribution of each species and the collection number. Vernacular names are quoted when known. A detailed description of the Physical Aspects of the region follows under the headings:—Water Conditions, Geology, Soil and Climate.

The next part is concerned with Plant-Geographical considerations, in four sections:—Statistical Notes, Geographical Distribution, Origin of the Flora, and Comparison with the vegetation of the Sundribans. The last section was inspired by the statement made by the late Sir J. D. Hooker, in his Sketch of the Flora of British India, that “The Indus Delta repeats the vegetation of the Sundribans of Bengal, with a greatly reduced number of species.” At the time this statement was made, and indeed until the work under review was undertaken, a very imperfect knowledge of the vegetation of the Indus Delta was available. The authors disagree with the statement quoted above and demonstrate their view by a list of genera and species indigenous to both areas, which shows a marked divergence, with totals of 279 species for the Indus Delta and 304 in the Sundribans, of which but 52 appear in both areas. Moreover it is to be noted that even now the botanical exploration of the Indus area is less advanced than that of the Sundribans.

* Bull. Kol. Museum Haarlem, No. 37, p. 109 (1907).

† By E. Blatter, C. McCann and T. S. Sabnis. The Methodist Publishing House, Madras, for the Indian Botanical Society, 1929; pp. vi. + 173; plates, figs. and graphs 76. Price Rs. 7, 10s., or \$2.50.

A short chapter presents some ecological notes and the last 52 pages are devoted to "descriptive notes of systematic value on the anatomical features" of a number of the plants in the area. This chapter is the work of Mr. Sabnis.

Fifty photographs, many good but some rather poorly reproduced, give a very fair idea of the region and its types of vegetation. There are also 18 graphs elucidating climatic, distributive and ecological factors, and 8 plates of woodcuts from camera lucida drawings of anatomical details to illustrate the last section.

The work is a valuable contribution towards a fuller knowledge of the Indian Flora and some of its problems, and is another contribution in the series of local floras that should eventually cover the whole of the Peninsula.

C.E.C.F.

Portrait of Sir David Prain.—During last summer a very fine tinted crayon portrait of Sir David Prain was executed by Miss F. A. de Biden Footner at the instance of a number of Sir David's friends. The portrait was presented to him in November, and at the same time the desire was expressed that ultimately it might find a permanent home at Kew. Sir David and Lady Prain have most generously acted on the suggestion without delay, and the portrait has now been hung with those of the former Directors of Kew in the waiting room at the Herbarium.

A New Textbook of Botany.*—In the preface to this book the authors say that it is not written for students intending to specialize in Botany, but that it attempts to present the fundamental biological principles to those taking a general course in biology. However, as the book is primarily for American students, many of the examples cited are unknown to British students and also are not readily accessible. In view of this and of the rather unorthodox treatment of the subject matter the book will probably be of more use in America than elsewhere.

The book contains a number of very useful illustrations, the text figures in general being very good, particularly the three-dimensional drawings of anatomical details in perspective, which should prove of great help to the student. The half-tone reproductions, however, appear often to have been made from negatives of poor quality. As far as the format is concerned, the book is an excellent example of modern text-book production.

* Botany; a text-book for College and University Students, by W. J. Robbins & H. W. Rickett. Macmillan & Co. Ltd., London, 1929, pp. xxiii. + 535, figs. 384. Price 16s.

BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1930 ROYAL BOTANIC GARDENS, KEW

XII.—A VISIT TO KILIMANJARO. A. D. COTTON.

It is impossible for a botanist to visit or pass through Moshi in northern Tanganyika without experiencing an overwhelming desire to see something of the wonderful mountain of Kilimanjaro, which towers above him to the north. Its magnificent snow-clad dome, rising from arid plains to a height of 19,720 feet, is only 3 degrees south of the equator, so that its slopes exhibit extreme contrasts as to climate and provide one of the finest examples of tropical African mountain vegetation. It was fortunate, therefore, that whilst I was travelling in company with Dr. A. S. Hitchcock from Amani to Nairobi, the bi-weekly train service allowed us sufficient time to break the journey at Moshi and make a partial ascent of the mountain and yet fulfil our engagements at Nairobi.

Before describing this excursion and the vegetation as we saw it, it will be useful to make a brief statement as to the mountain itself and its botanical exploration in the past. As is well known, Kilimanjaro is the highest mountain in Africa. It is an extinct twin volcano consisting of the more ancient crater of Mawenzi, 17,570 ft., and the larger and more recent Kibo, 19,720 ft. (Strictly speaking it consists of three volcanoes, a still older crater of Shira having existed to the west.) The crater of Mawenzi is now a mass of ruins and consists of gaunt, jagged pinnacles and lava slopes of extreme steepness with little or no snow. Kibo on the other hand appears as a beautiful white dome. It is in reality a cone truncated as a crater, the inner central cone of which is now only warm enough to melt the snow which falls within it and prevent the formation of ice. The two peaks are separated by the "saddle" and are about five miles apart. Numerous small "parasitic cones" occur on the saddle and, especially on the south side, at various levels on the mountain mass and right down to the plain below. The general phanerogamic vegetation ceases between 13,000 and 14,000 ft., but lichens and occasional odd flowering plants occur as far as the saddle.

Though several references to mysterious snow mountains in East Africa occur in Arab writings, it was the missionary, Johann Rebmann, working for the C.M.S., who in 1848 first discovered and clearly described Kilimanjaro. Its earliest explorer was Baron der Decken, who made attempts to reach the summit in 1861 and 1862. He described in detail the dome-shaped crater of Kibo to the west, and the black jagged Mawenzi to the east. During his second

attempt he reached a height of 14,000 ft., and states that the general vegetation ceased at 12,000 ft. His plants are in the Berlin Herbarium, and he is commemorated in the name of the remarkable giant *Lobelia Deckenii* (Bot. Zeit. 1869, p. 71).

In 1871 the British missionary, Charles New, set out from Moshi and likewise made two attempts to attain the summit. On the second occasion he reached the snow line and collected a number of plants, amongst others the beautiful white *Helichrysum Newii*. He is stated to have "never dried a plant before," but was asked by Sir John Kirk "to do him the favour of cramming into any old book what he could of the highest vegetation of the mountain." A bundle of the "Guardian" served this purpose and his collection, which was presented to Kew, was described by Sir J. D. Hooker (Journ. Linn. Soc. xiv. pp. 141-146, 1874).

The geologist, Joseph Thomson, visited Moshi in 1883, and explored the Shira ridge to the west of Kibo, reaching a height of 9000 ft. In addition to his valuable geological contributions he made a collection of plants (now at Kew) which was the subject of a communication by Oliver and Hooker in the Journal of the Linnean Society (vol. xxi. pp. 392-406, 1885). His name is commemorated in the beautiful large white *Anemone* which is such a characteristic species in the high mountain meadows not only of Kilimanjaro but of Mt. Kenya and Mt. Ruwenzori.

Sir Harry Johnston's expedition of 1884, on behalf of the Royal Geographical Society and the British Association, was of more extended duration, since he stayed six months in the neighbourhood of the mountain. He brought home a large amount of material from the forest zone, but considering the time at his disposal he did not collect a great number of mountain species. A list of his plants, which are preserved at Kew, was published by Oliver (Trans. Linn. Soc. ser. 2. vol. ii. pp. 327-355, 1887). The most noteworthy of the novelties was the arborescent *Senecio* named in his honour, the first representative to be discovered of that remarkable group of African plants.

Bishop Hannington, when sent out by the Church Missionary Society to form a Mission Station at Moshi, made collections in the Chagga region, but the most valuable of these were apparently lost. In a letter quoted in the story of his Life and Work, he states, "I have to-day sent to the British Museum a box of butterflies and a box of mosses from Kilimanjaro. . . . My plants all got spoilt with the intense rain, ferns and all, the mosses running a narrow shave." A few of his flowering plants from lower levels are to be found in the Kew Herbarium. Some botanical collections were also made by the Hungarian Expedition of Count Teleki and L. von Höhnelt, and these, which were worked out by Schweinfurth, were presented to Berlin. According to Hans Meyer, the American naturalist Abbott reached, in 1888, the saddle plateau between Kibo and Mawenzi, and added to our knowledge of the flora and fauna.

The most notable scientific explorations of Kilimanjaro are those of the famous German traveller, Hans Meyer, who, at his own expense, made three separate expeditions from Europe in order to carry out geographical research and to conquer the peak which had hitherto defied all attempts. Reports on various aspects of his explorations are recorded in a number of works and papers. The most useful botanically is that dealing with his final and successful ascent which is found in the volume entitled "Across East African Glaciers; an account of the First Ascent of Kilimanjaro" (a translation by E. H. S. Calder from the German, 1891). This volume, in addition to providing an historical and critical account of previous explorations and a full biography, includes a chapter on the physical geography with references to zones of vegetation, and provides as appendices systematic lists, by various German botanists, of flowering plants, lichens, mosses, and Hepaticae. His collection, which approached 500 numbers, is preserved at Berlin.

The expeditions of G. Volken in 1893 and his subsequent account in the volume entitled "Der Kilimandscharo," 1897, are of special value since this explorer was a professional botanist who was already celebrated for his researches on the Egyptian desert. He gives a general account of the vegetation and distinguishes the following zones, which appear to be more natural than those proposed by Hans Meyer:—Steppe, Cultivated land, Mixed Forest, Forest Belt, Mountain Meadows and Lichen Region. His collection consisted of 800 numbers (Engler Bot. Jahrb. 18: Beiblatt 46, p. 16, 1894), and was presented to Berlin, though very valuable series of duplicates are to be found in the Kew and British Museum herbaria. No enumeration of his plants appears to have been published, but the new species discovered are described in various works and especially in Engler's *Pflanzenwelt Ost Afrikas* (Teil C. Systematisches Verzeichniss, 1895).

In his monumental work "Die Pflanzenwelt Afrikas," Engler gives a comprehensive summary of the vegetation of German East Africa, and includes an account of the Kilimanjaro region, which had in the meantime been investigated by various German botanists, notably by himself and Uhlig (Band 1, Heft 1, pp. 226-345, 1910). Incidentally it may be mentioned that the finest photograph of a group of Kilimanjaro *Senecios* which has yet been published is to be found as Plate xviii. Later, in the section dealing with general geographical relationships, mention is also made of the subalpine and alpine regions of this area (pp. 935-936).

A series of excellent photographs of the cultivated belt, the forest belt and the mountain meadows, accompanied by a useful text, is provided by F. Tobler and G. Tobler-Wolf in Karsten and Schenk's *Vegetations Bilder* (Reihe xii. Taf. 7-18, 1915).

In the more detailed description of the African vegetation which Engler published in 1925, a considerable amount of space is devoted to Kilimanjaro, which he states is the best-explored mountain region

of East Africa (Die Pflanzenwelt Afrikas, Band v. pp. 250-267). He divides the vegetation into altitudinal "regions" and these, which differ slightly from the classification of Volken's, are as follows:—

1. The Steppe Region.
2. The Region of Mixed Forest.
3. The Region of Cultivated Land (extending from 1250-1720 m. on the south-east and west, and from 1700-1900 m. on the south).
4. Forest Belt (reaching up to 2700 m. on the east and up to 3000 m. on the south side, subdivided into a lower zone up to the commencement of *Podocarpus*, and a higher zone up to the *Ericinella* formation).
5. Subalpine Region, 2600-2400 m. (mountain meadows and "forest islands").
6. Alpine Region (lower zone 3400-3600 up to 4200-4500 m.; tufted grasses and cushion plants. Higher zone, 4200-4500 up to 5000 m.; mosses, lichens and hydatophilous phanerogams in snow-water).

After a general account of each "region" Engler supplies a systematic list of species, and these lists (though they may require revision in the light of further research) provide the most complete and critical account of the flora yet published.

Several other smaller collections have been made during recent years, by far the most important so far as Kew is concerned being those of Mr. A. E. Haarer, an Agricultural Officer stationed at Moshi, who has during various periods of local leave studied not only the forest flora between Marangu and Bismarck Hut (8500 ft.), but also that of the Shira ridge on west Kilimanjaro, which rises to 11,000 ft. His collections have included several novelties and run into many hundred numbers. Miss E. Stuart-Watt also presented a small collection made in 1927, which is interesting in having been gathered from the slopes of Mawenza.

For a critical review of the various ascents to the summit and for a recent summary of our present knowledge of the mountain, reference may be made to W. Methner's paper, "Die Besteigungen des Kilimandjaro, Ein Historischen Überblick" (*Mitt. aus der Deutschen Schutzgebieten* Bd. 34, Berlin, 1926-27, pp. 87-99), and to E. Klute's volume "Ergebnisse der Forschungen am Kilimandjaro" (Berlin, 1920) respectively, though botanical matters are but briefly touched on. Critical notes on various ascents will also be found in *The Alpine Journal*, vol. xl. pp. 77-84.

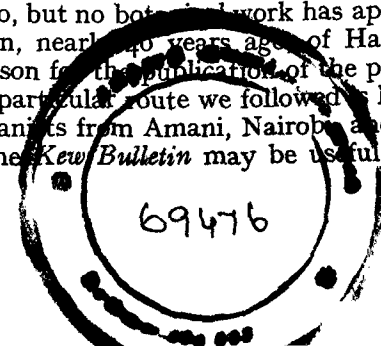
A very interesting and valuable account by Mr. C. Gillman, Chief Engineer of the Tanganyika Railways, will be found in the *Journal of the Royal Geographical Society*, vol. lxi, pp. 1-27 (1923). This deals primarily with an ascent he led to the crater rim in 1921. It contains many geographical and geological notes as to the mountain itself and numerous references to plants and vegetation. Mr. Gillman emphasises the immense economic significance of the

forest belt. He points out that the innumerable streams, some of which are of considerable size, which flow down the mountain and fertilize the cultivated Wachagga zone and the European plantations at Taveta and elsewhere, are only to a small extent glacier-fed. The meteorological records show this clearly. The function of the forest in condensing the vapour brought by the Trade winds from the Indian Ocean and storing the moisture in the layer of humus is infinitely more important than the relatively small precipitation on the rocky slopes above the forest or the moisture stored in the ice-cap of Kibo. In the interests of both European and native cultivation, the importance of preserving the forest belt cannot be over-emphasised. As Mr. Gillman says, "every further acre cleared up there means irrevocable distress further down in years to come."

The opportunity of ascending Kilimanjaro during my official tour was quite unexpected, but having the chance of doing so I resolved to take full advantage of the occasion and to see as much as possible of the mountain itself and its remarkable flora. The ascent can be most easily made from the village of Marangu in the Chagga country on the south side of the mountain, where there has now been opened a small but comfortable hotel (about 4000 ft.). Starting from that elevation with four days at our disposal we were able to reach an altitude of over 12,000 ft. (Dr. Hitchcock to nearly 14,000), and to return to Marangu without undue fatigue. The ascent as far as the saddle is gradual and perfectly easy, and with another day there would have been no difficulty in more thoroughly exploring the limit of phanerogamic vegetation.

With no equipment but a press borrowed from Amani, and with no expert knowledge of the flora, I anticipated that four short days would only permit one to gain some first-hand knowledge of the vegetation and collect a few specimens for the Kew Herbarium. These expectations were, however, more than fulfilled. The small collection of 80 numbers made from 8500 ft. upwards not only added specimens of species sparsely represented in the Herbarium, but supplied material of several others not represented at all, and also three species and one variety which are described as new in the following pages, though two of these were already known but had not been recognised as distinct. In addition seeds of various species, and living plants of a new giant *Senecio*, were brought home to be grown at Kew.

As will have been noted from the historical résumé, there are several recent accounts in German works of the flora and vegetation of Kilimanjaro, but no botanical work has appeared in English since the translation, nearly 40 years ago, of Hans Meyer's work. An additional reason for the publication of the present paper lies in the fact that the particular route we followed is likely to be used in the future by botanists from Amani, Nairobi and elsewhere, and hence a record in the *Kew Bulletin* may be useful. Owing to the much



steeper slopes and lower rainfall on the north side of the mountain, the vegetation belts are much narrower and less luxurious than on the south side, hence the ascent outlined below, in addition to being the more easy, is also much more interesting botanically.

The recently opened "Kibo Hotel" at Marangu serves as an excellent base. The proprietor owns the two rest houses or huts on the mountain, namely Bismarck Hut at 8500 ft. and Peter's Hut at 11,500 ft. altitude, built in 1910 by Dr. Foerster, a Moshi settler. He provides all that is necessary in the way of a guide, porters, food, and blankets, also donkeys if required. Expert advice moreover can be obtained from Dr. Richard Reusch, of the Leipsiger Lutheran Mission, who has ascended the summit no fewer than eight times. Our retinue consisted of a cook, and four porters, who marched erect and with ease with 40 lbs. loads balanced on their heads.

On leaving Marangu the path traverses a wide belt of native cultivation which with the fertile soil and regular rainfall, aided by an elaborate system of irrigation, is remarkably luxuriant and healthy. It consists, as seen from the path, chiefly of banana, coffee, maize, cassava, pawpaw and *Ricinus*. A little yam, sugar cane, millet and *Eleusine* (for brewing) are also grown, and the coffee is interplanted with dwarf beans. Amongst the native flora a bramble and the common bracken were abundant, and the beautiful large-flowered *Hypericum lanceolatum* occurred in quantity. A striking feature is the use of *Dracaena Steudneri* planted so closely as to form hedges around the plantations. The Wachagga people (allied to the Masai) who in their beehive huts inhabit this country are prosperous and contented, and, owing to the civilizing influence of the German missions and European administration, their condition differs markedly from that described by Sir Harry Johnston.

After about 1½ hours' walk, the native cultivation ceases and one plunges into the primeval forest. With an altitude approaching 6000 ft. the conditions are those of a temperate rather than a tropical rain-forest. At first there is little undergrowth, but the ground vegetation soon becomes thick, and is, but for the path, almost impenetrable. The tall trees consist of a variety of species and intertwined amongst them are lianes and creepers, the whole being festooned with a great variety of epiphytes. Beneath the trees is a mixed undergrowth in which Piperaceae, *Begonia*, *Cyathea* and *Marattia* are conspicuous. The growth of immense quantities of *Adiantum*, *Hymenophyllum* and other ferns, and long streamers of mosses, testify to the cloud-belt and abundant precipitation. The ground is carpeted with sheets of *Selaginella* and Lycopods, through which push the flowers of various small Balsams and *Gesneriaceae*. In the moss on the trees, orchids and the small violet-coloured *Streptocarpus montanus* were abundant, and along the path isolated

specimens of the common British *Sanicula europaea* were observed.* A noteworthy feature of the Kilimanjaro forest is the entire absence of the bamboo belt (*Arundinaria alpina*) which is such an interesting feature of the vegetation of Mt. Kenya, Mt. Elgon, Mt. Ruwenzori, and many other African mountains.

About half way through the forest belt the epiphytic ferns gradually gave place to lichens, especially *Usnea barbata* and other well-known species, and these continued to festoon the upper branches of the trees until the forest was succeeded by mountain meadows. As the forest growth became less dense, more attention could be given to the individual trees. A species of *Podocarpus* (probably *P. milanjanus*) and *Hagenia abyssinica* were noticeable, and shortly afterwards *Erica arborea* and a very tall growth of *Hypericum lanceolatum* were abundant. Open patches (possibly representing clearings due to burning by natives) became frequent, and in one, particularly, the tall spikes of a bright crimson *Gladiolus* (*G. Quartinianus*?) against a background of tall green grass made a charming picture. That this habitat was the natural one for this species of *Gladiolus* was evident from its vigorous and deep green leaves, which were in marked contrast to plants of the genus often seen at home. Other plants in flower in the long grass were a dark blue *Sisyrinchium*, *Tritonia Thomsonii*, and several ground orchids. As the track approached Bismarck Hut most of the trees and plants hitherto met with disappeared and almost pure communities of *Erica arborea* and *Hypericum lanceolatum*, with tussocks of *Festuca*, constituted the dominant vegetation.

Bismarck Hut (8500 ft.) was reached at 2 p.m. after five hours' easy walking. A dense, driving wet mist then set in, but specimens of plants (excluding trees) were collected, principally in the more open ground immediately in front of the hut. These consisted of the following species in addition to those plants mentioned in the last paragraph:—*Blaeria glutinosa* (4)†, *Philippia keniensis* (6), *Stoebe kilimandscharica* (2), *Hebenstreitia dentata* (41), *Helichrysium abyssinicum* (11) not in flower, and the beautiful rose-coloured *H. Meyerijohannis* (13).

The stone-built Bismarck Hut is provided with two rooms, four iron bedsteads and a stove, with a separate room for porters. It was

* This plant is noteworthy as being the only flowering plant noticed (Engler lists also *Anthriscus silvestris*), amongst the vast assemblage of unfamiliar species in the forest, which appeared to be the same as anything known in Britain. The species as at present understood is well known to have a very wide distribution and the specimen brought home is regarded as identical with British material. It has been recorded from the Himalayas, the mountains of Yunnan, Manchuria and Corea and from the Malay Islands. In Africa apparently the same species has been collected at altitudes varying from 4000 to 10,000 ft. in the Cameroons, Fernando Po, Abyssinia, Uganda, Kenya, Usambara, Nyasaland and Gazaland, and has been recorded also at lower altitudes in Madagascar and S. Africa.

† The collection is deposited in the Herbarium at Kew. The numbers in brackets after the botanical names refer to the serial field numbers of the collection.

dry and clean though sparsely furnished, thefts in the past not encouraging the hotel proprietor to supply tables or chairs. It proved a welcome retreat that evening, our most vivid recollection of the exterior being the long streamers of *Usnea*, on *Brayera* and *Podocarpus*, blown almost horizontally in the driving rain.

By morning, only mist prevailed, and a start was made for Peter's Hut. The track, which passed through another patch of forest, was steep and slippery. A great number of additional plants, chiefly herbaceous, were observed, but since our object was to collect on the higher ground and to reach Peter's Hut, practically no specimens were taken. Plants of *Plectranthus*, *Pycnostachys*, *Pentas carnea* and *Geranium vagans* (8), were, however, specially noted, and *Viola abyssinica* var. *Eminii* (12) in abundance. After about half an hour open ground was reached again, though islands of forest continued to occur. Owing to the mist, the general view of the vegetation and of the grandeur of the scene was lost.

The mountain meadows consisted of tussocks of *Festuca* and other grasses, the bulk of which were not in flower. Scattered between the grass tussocks were a number of brightly coloured flowers, notably *Antholyza* and *Gladiolus* (probably *G. Quartianus*), *Helichrysum Meyer-Johannis*, *Dierama cupuliflorum* (17), in varying shades of pink and mauve, *Anemone Thomsonii*, with its white perianth suffused with rose on the outside, and *Tritonia Thomsonii*, specimens of which were dried, only to fall to pieces after a few days. In the short grass on the track itself were the gentian-like *Swertia crassiuscula* (39), the colour of which varied from a deep blue to dirty white, and the exceedingly delicate *Wahlenbergia kilimandscharica* (14).

At this level also (about 9500 ft.) *Protea kilimandscharica* was observed for the first time. It occurred in groups or extensive societies usually in company with ericaceous or other woody plants, and was met with up to the level of Peter's Hut. The largest plants noted were about 8 ft. high. Severe dying back of the branches was very characteristic, and was probably due to the effect of intense wind coupled with physiological drought. A few flowers, creamy white in colour, were noted at intervals during the day.

The grassland vegetation of the mountain meadows was interrupted here and there by extensive tracts of ericaceous scrub. The dominant species appeared to be the *Protea* referred to, *Erica arborea* and *Adenocarpus Mannii* (42), with lesser quantities of *Blaeria glutinosa*. The general habit of *Adenocarpus* much resembles *Gorsia* (*Ulex europaeus*), and the likeness extends to its yellow flowers, small black pods, and narrow pointed leaves. Another striking plant in the scrub vegetation was *Anthospermum usambarensis* (23), it dark, stiff, erect shoots resembling in miniature those of a Cypress. Scattered amongst the scrub were odd specimens of *Artemisia afr.* (43), *Hebenstreitia dentata*, and *Scabiosa Columbaria* (29).

The plants for which Kilimanjaro is most noted, the giant *Lobelia Deckenii* and the giant *Senecio*, began to appear at about

10,000 ft. The former occurred plentifully as scattered plants in the scrub, and the latter always in damp ground. *Lobelia Deckenii* was not in flower at the time of our visit but occurred as short rosettes about 1 ft. high, though some plants bore old inflorescences from which seed was taken for Kew. *Lobelia Volkensii*, which occurs in the forest belt at the lower elevations, was not seen. (See R.E. and Th. C. E. Fries, Die Reisen-Lobelien Afrikas, in Svensk Botanisk Tidskrift, xvi, pp. 383-416, 1922.)

The arborescent *Senecios* are even more impressive and singular in appearance. Isolated examples 8-10 ft. high in ravines or beside streams were first noted. These were unbranched, with trunks, owing to the presence of persistent leaf bases, nearly 2 ft. in diameter. Higher up they occurred in groups and were repeatedly forked and very much taller. One particularly large colony occurred in a bog to the left of the track. The bog consisted of coarse grass-tussocks and was carpeted with dense sheets of *Alchemilla argyrophylla* (observed first at this level). It was traversed by deep winding channels which were so completely hidden by the grass and *Alchemilla* as to be dangerous, and an hour was spent in endeavouring to get sufficiently near the *Senecios* in order to take photographs. (Plate IV, fig. 1*). The trunks were even thicker than those previously seen and in several cases the leaf-bases and bark had rotted away and only gaunt, smooth, woody cylinders, forked 2 or 3 times, and 15 ft. in height, remained. No flowers were present, and owing to their inaccessibility specimens of leaves were not collected. We assumed the species to be the "berühmter *S. Johnstonii*" of which we had heard so much at Marangu. The view from this spot was finer and more rugged than hitherto and the hillside well furnished with interesting plants, so that the swamp with its colony of arborescent *Senecios* and background of *Ericaceae* and *Protea* stands out in our memories as one of the most majestic and interesting features of the climb.

The mist had now entirely dispersed from the higher altitudes and for the rest of the day there was brilliant sunshine. Since the afternoon was wearing on and we were uncertain as to whether further delays might be incurred we pushed on to Peter's Hut, not pausing to collect. The grassland gradually ceased, giving way to rugged ground consisting of blocks or slabs of lava with patches of scrub which became ever shorter as the climatic conditions became more severe. A considerable amount of colour was added by the increase in the number of both species and individuals of *Helichrysum*, and the area around Peter's Hut was as gay with flowers as any part of the mountain. On the way Mt. Meru, some 70 miles to the south-west, was sighted and some fine views were obtained of the old broken-down crater of Mawenzi, to the north.

* Acknowledgments are due to the United States Department of Agriculture for the three photographs illustrating this paper, which were taken by Dr. A. S. Hitchcock.

The hut itself (11,500 ft.), which was reached at 4.30 p.m., is a well-built wooden and galvanised iron structure consisting of one large room with four beds arranged bunk fashion, and separate accommodation for porters at the rear. The hut faces down the mountain to the south or south-east, and Mt. Kibo is clearly visible at the back in a north-westerly direction. Being on the open mountain-side away from the gloom of the forest and the cloud belt, it is a much more cheerful spot to encamp in than Bismarck Hut. About 6.15 darkness fell suddenly, but before this there was a magnificent sunset effect. The vast billowy waste of clouds below us, which hitherto had been white, suddenly became bright pink, and, as the light faded, turned rapidly grey.

The next morning brought another transformation. All the cloud had gone and a map of Africa appeared to be spread out in front of the hut, or rather as if it stood up before us in the sky. On turning out at 7 a.m. to wash in the stream close by, the ground was found to be coated with a firm crust due to frost, and the leaves of a giant *Senecio*, which proved to be a new species, were stiff and coated with rime. A remarkable sight also was the blaze of colour shown by the yellow *Helichrysum*s and other plants against a background of black lava rocks and white hoar frost.

The day was spent collecting in the neighbourhood of the hut and up to about 500 ft. above it. The dominant plants amongst the lava blocks around the hut are *Helichrysum*s and other composites, and of these by far the most striking is *Euryops dacrydioides* (60) with bright yellow flowers and lycopodioid foliage. Other conspicuous species were two white *Helichrysum*s, *H. Newii* (18) and *H. Hoehnelii* (19), the beautiful yellow *H. abyssinicum*, and *Senecio Schweinfurthii* (24), with Coltsfoot-like yellow flowers and the scent of *Petasites fragrans*. Another woolly, yellow species, *H. fruticosum* var. *compactum* (22), was still plentiful and in flower at this altitude (which was not the case at lower levels), and also the yellow-brown *H. Kilimanjari* (52) which, according to New, reaches right up to the snow line. *Hebenstreitia dentata* (23), first observed below Bismarck Hut, also occurred here in quantity, though shorter in height and exhibiting various shades of colour, chiefly pink or with a deep crimson blotch as noted by Sir H. Johnston. Two prostrate plants were abundant amongst the rocks, *Alchemilla Johnstonii* (46), a woody species with few very inconspicuous flowers, and *Geranium kilimandscharicum* (29), with small pink flowers and brilliant crimson foliage. Occurring as scattered individuals amongst this vegetation were *Tritonia Thomsonii*, *Valeriana kilimandscharica* (50), *Bartsia Petitiana* (37) and *B. kilimandscharica* (38), *Micromeria biflora* (53), *Selago Johnstonii* (47) and *Scabiosa Columbaria* (26). The scrub amongst the windswept lava blocks around Peter's Hut was dwarf and exhibited much dying back of the branches. It consisted of *Erica arborea*, *Blaeria Meyeri-Johannis* (31), both of which were in flower, and *Philippia Johnstonii*

(30) with dead flowers, and much weather-worn *Protea kilimandscharica*, which occurred occasionally as a pure community and displayed old flower-heads even at 12,000 ft.

The same type of flora persisted above the hut, the limit of general vegetation, according to Dr. Hitchcock, being about 13,500 ft. No additional species other than grasses were observed by him in the higher levels. Giant *Senecios* were seen on the sides of a stream and Miss E. Stuart-Watt informs me that she has seen, well above the hut, a considerable quantity of this plant, and also *Lobelia Deckenii* in wet ground, the water of which was covered with ice. On reaching the edge of the plateau, before the saddle, only a few grasses and species of *Helichrysum* remained. According to Hans Meyer an odd species of *Euryops* was found at 14,210 ft. (op. cit. p. 139) and a *Helichrysum* at 15,260 ft. (p. 152). The "lichen region" of Volkens sets in at about 13,500 ft., and Hans Meyer found lichens on Kaiser Wilhelm's Peak at the actual summit (p. 324).

Whilst Dr. Hitchcock proceeded on the rough ground to the plateau, I examined the flora of the ravine close to the hut, working upwards in the morning and downwards after lunch. As shown by the bed of the stream the volume of water coming down was obviously less than it had been but probably not so slight as at certain seasons. In the grass sward in and at the sides of the stream several water-loving plants were found. Young specimens and also old inflorescences of *Peucedanum Kerstenii* (32) were common. Amongst the smaller species two of the most conspicuous were plants of rosette habit with bright yellow flowers, the rosettes being as closely adpressed to the ground as in *Pinguicula*. The most common was *Ranunculus oreophytus* (51), the peduncle of which after flowering is positively geotropic and pushes the young achenes down on to the soft ground. The other proved to be an undescribed species of *Landtia*, since named *L. kilimanjarica* Hutch. and Moss. It was found subsequently that the same plant had been collected on the Shira Mountains of Kilimanjaro in 1928, by Mr. A. E. Haarer, and also by Volkens in 1894 when it had been named by Engler *Arctotis Rueppellii* O. Hoffm. It grows on slightly drier situations than the *Ranunculus* and like that plant is very firmly anchored in the ground by means of a few long, strong, fleshy roots. Other small plants in the ravine were *Senecio sympodialis* (54), *Swertia crassiuscula* (40), *Arabidopsis Thaliana* (55), and an *Arabis*, much resembling the common *A. alpina* of Europe, which was found to be *A. cuneifolia* var. *meruensis* (49). These were flanked on the sides by the same species of *Anemone* and *Scabiosa* which occurred below. On rocky ledges, a few plants were seen which had not been noted before, namely, a yellow *Sedum*, *S. Meyeri-Johannis* (61), an elegant yellow *Cineraria*, *C. kilimandscharica* (28), and the exceedingly beautiful pink *Helichrysum Lentii* (21), a species very much resembling *H. Meyeri-Johannis* of the lower altitudes. The widely distributed fern *Asplenium praemorsum* was also prevalent. At slightly lower

levels a few specimens of *Trifolium Johnstonii* were noted, and the rosette Umbellifer *Trachydium abyssinicum* (48) was abundant in short grass in the damp areas.

The new arborescent *Senecio*, named *S. Cottonii* Hutch. & Taylor, grows on rocky ground (Plate IV, fig. 2, Plate V). It was at the time regarded as *S. Johnstonii*, but was recognized by Mr. Hutchinson as differing from that species in the leaves having a permanent thick coat of woolly hairs, an entire instead of strongly toothed margin, a rounded instead of markedly cordate base, and in possessing a broad and downy petiole. The capitula differ moreover in being larger and containing fewer ray florets. It is in reality more closely allied to *S. Battiscombei*, which occurs at similar altitudes on Mount Kenya; from this it differs in the very short ligulate florets. The plant from which the leaves were collected (35) was from a group in the ravine above the Peter's Hut level, and the young living plants (36) which were brought home to Kew* were in the immediate vicinity of these large specimens. The inflorescence (34) was collected from a plant at a higher level by Dr. Hitchcock.

As this *Senecio* was not at the time recognised as distinct from *S. Johnstonii* it is unfortunately not possible to state its exact altitudinal distribution. It is, however, almost certainly a high mountain plant and occurs at a higher level than *S. Johnstonii*. No specimens which can be referred to it were to be found in the Kew Herbarium, or in the incorporated collections of the British Museum. It is not, moreover, represented in the Kilimanjaro material at Berlin kindly sent on loan by Dr. Diels. After Mr. Hutchinson's description had been drawn up, Mr. G. Taylor, of the Natural History Museum, brought specimens of the same species to Kew for comparison. This gathering, which from the literature he had decided was an undescribed species, was made on Kilimanjaro by Messrs. Piemeisel and Kephart on behalf of the U.S. Department of Agriculture in August, 1927. The material of the two gatherings agrees precisely, and since Mr. Taylor's decision was practically simultaneous with Mr. Hutchinson's, joint authorship for the description was decided upon. Further notes on *S. Cottonii* and on the other species of arborescent *Senecios* are given by Mr. Hutchinson on pp. 117, 118.

The present account and the list which follows, by adding a few new facts, aim only at carrying our knowledge of the flora and vegetation of African mountains a step farther and thus stimulating further investigation. No attempt is made at generalizations or speculations as to the origin of the flora or succession of the vegetation units. The most striking general features of the mountain are the coarse nature of the plant-covering and the extreme paucity of

* The young plants were dug up with a good ball of earth, packed with leaves upright in a flat tin and were kept (whenever possible) in light but shady conditions for the next 12 days, when they were placed in cool storage on the steamer at Mombasa. After 19 days in complete darkness they were unpacked at Kew and were apparently in a perfectly healthy condition.

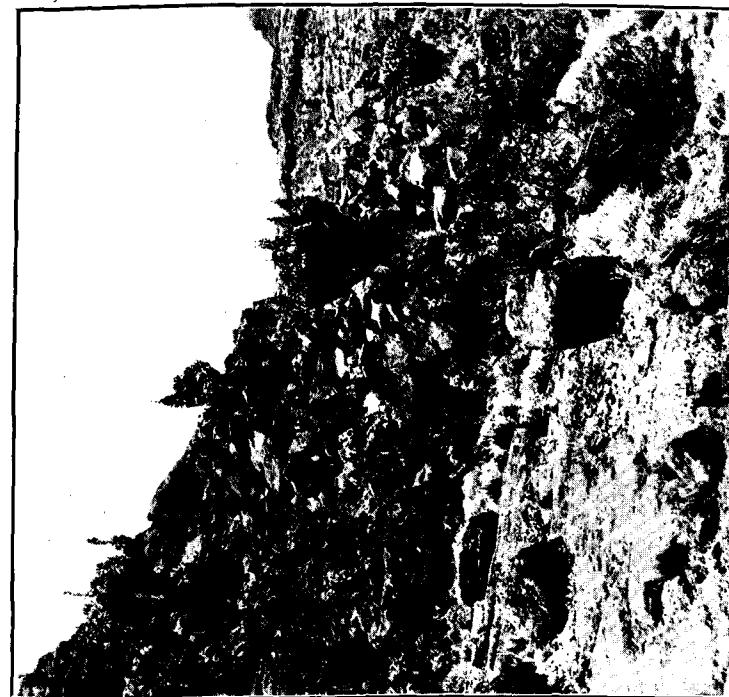


FIG. 2. *S. Cottonii* on rocky ground at about 13,000 ft.
Photos: A. S. Hitchcock.

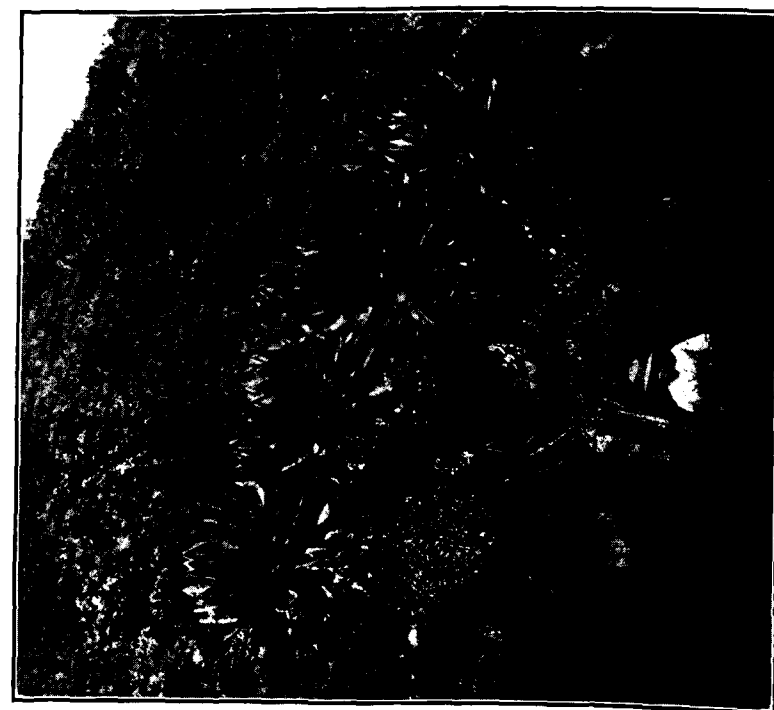


FIG. 1. *Senecio Johnstonii* in channels in marsh at about 11,000 ft. Ericaceae and Protea Scrub in background.



Senecio Cottonii on rocky ground at about 13,000 ft. Plant about 14 ft. high, base of stem not visible.

Photo: A. S. Hitchcock.

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species of the subalpine and alpine "regions" (*sensu* Engler) as compared with the mountains of Europe and other temperate regions. Of great interest also are the presence of Cape types such as *Protea*, the Mediterranean element represented by *Erica arborea*, the examples of the giant *Lobelias*, whilst the duldest imagination cannot fail to be stirred by the presence of the extraordinary, and almost uncanny, arborescent *Senecios*.

SYSTEMATIC LIST.

The following enumeration of specimens which were dried and brought home has been prepared by Miss M. B. Moss (*Gramineae* by F. Ballard) of the Herbarium, Royal Botanic Gardens, Kew. (The Dicotyledons are arranged according to Hutchinson's "Families of Flowering Plants.")

For reference purposes the Flora of Tropical Africa is abbreviated to "F.T.A.", and Engler's *Hochgebirgsflora des Tropischen Afrika* to "Engler." The notes as to distribution have been obtained from specimens in the Kew Herbarium, the collections from Kilimanjaro consisting of those of New, Thomson, Johnston, Volkens and Haarer.

Although the collection is quite a small one it is sufficient to show certain interesting facts in regard to distribution. Of the plants listed eleven species have been found only on Kilimanjaro. Most of the others have hitherto been found only in the East African mountains. Thirty-one are found on the Aberdares (the nearest mountain range to the north), twenty-three on Mt. Kenya and twenty-seven on Mt. Elgon, fourteen on Ruwenzori, thirteen on the mountains to the south, whilst fifteen occur also in Abyssinia.

Apart from the very widely distributed *Sanicula europaea*, only four species are known to be common to Kilimanjaro and to the far distant Cameroons mountain. These are *Adenocarpus Mannii* Hook. f., a papilionaceous shrub, *Bartsia Petitiana* Hemsl. (*Scrophulariaceae*), *Micromeria biflora* Benth. (*Labiatae*), and *Koeleria corymbosa* Hochst. (*Gramineae*).

RANUNCULACEAE.

***Ranunculus oreophytus* Del.**—F.T.A. 1: 10; Engler 220.

Wet ground in ravine above Peter's Hut, between 11,000 and 12,000 ft., No. 51.

Recorded from the mountains of Abyssinia, Aberdares (10,000–12,600 ft.), Elgon (near summit, 13,500 ft.), Ruwenzori (9000–11,000 ft.).

The peduncle, after flowering, curves down and the fruit becomes buried in the soil.

***Anemone Thomsonii* Oliv.** in Journ. Linn. Soc. 21: 397 (1885); Engler 217.

In the grass slopes, scattered between 9000 and 11,000 ft., Nos. 15 and 16.

Also from Mt. Chillalo in Abyssinia (10,000–12,000 ft.), Aberdare Range and base of Kenya (10,000 ft.), and Elgon (12,000–13,000 ft.).

CRUCIFERAE.

Arabis cuneifolia Hochst. var. **meruensis** O. E. Schulz in Notizbl. Bot. Gart. Berl. 9 : 1106 (1927).

In ravine on ground near Peter's Hut, 11,500 ft., No. 49.
Recorded from Abyssinia, Kenya (from 10,000–13,200 ft.) and the Aberdares (9000 ft.).

Arabidopsis Thaliana Heynh.—O. E. Schulz in Engl. Pflanzenr. 4, 105 : 270 (1924). *Sisymbrium Thalianum* Gay et Monn.—F.T.A. 1 : 63.

Near Peter's Hut, 11,500 ft., No. 55.
Also recorded from Abyssinia (6000–6600 ft.); common in Europe and temperate Asia, occurring in N. America, Australia and at the Cape.

VIOLACEAE.

Viola abyssinica Steud. var. **Eminii** Engl. Pflanzenw. Ost-Afrikas C : 276 (1895).

Very abundant in forest around Bismarck Hut, 8000–9000 ft., No. 12.

This rounder-leaved variety is also recorded from the Aberdare Range and base of Kenya, from Elgon (9000–10,000 ft.), and Ruwenzori (11,000 ft.).

CRASSULACEAE.

Sedum Meyeri-Johannis Engl. Hochgebirgsfl. Trop. Afrika 229 (1892)—ex descriptione.

On rocky ledge in ravine at Peter's Hut, only specimen seen, No. 61.

Apparently confined to Kilimanjaro; the original was collected by Hans Meyer about 8400 ft. growing amongst moss, but has since been found at higher levels.

GERANIACEAE.

Geranium vagans Baker in Kew. Bull. 1897 : 246.

In forest around Bismarck Hut, 8500 ft., No. 8.
Originally described from the Nyika Plateau in Northern Nyasaland (6000–7000 ft.), and lately also collected from Bismarck Hut by Haarer No. 181. The whole plant is viscid and has an unpleasant odour.

G. kilimandscharicum Engl. Hochgebirgsfl. Trop. Afrika 274 (1892)—ex descriptione.

Abundant below and around Peter's Hut, 10,500–11,500 ft., foliage brilliant crimson, flowers small, pale pink, No. 29.

Recorded from the Shira Mountains (12,000 ft.) by Haarer No. 1142, and from the Aberdares by Dowson No. 99.

PROTEACEAE.

Protea kilimandscharica Engl.—F.T.A. 4, 1 : 198; Engler 195.

Near Peter's Hut at 11,500 ft., extends from 9000 to 11,500 ft., No. 70.

This species, closely allied to the more widespread *P. abyssinica* Willd., has also been recorded from Elgon, Rutundu slopes and N.E. Kenya, covering large areas (9000–11,000 ft.), and the Kyimbila District, north of Lake Nyasa.

ROSACEAE.

Alchemilla argyrophylla Oliv. in Trans. Linn. Soc. Bot. Ser. 2, 2 : 333, and in Hook. Ic. Pl. t. 1505; Engler 237.

In wet ground, near group of giant *Senecio*, 10,500 ft., No. 45.
Recorded from the Aberdares (9500–11,100 ft.), the Kenya moors, making a dense covering over large areas, and the Shira Mountains (10,000 ft.).

According to J. C. Rammell the Kikuyu vernacular name for this plant is "Kitamuhera," so called because if trodden on it rises again after the foot has been taken away.

Alchemilla Johnstonii Oliv. in Trans. Linn. Soc. Bot. Ser. 2, 2 : 333, and in Hook. Ic. Pl. t. 1504; Engler 237.

Below Peter's Hut, and very abundant from about 10,500 to 11,500 ft., No. 46.

Apparently this species has not been recorded from any other locality.

PAPILIONACEAE.

Adenocarpus Mannii Hook. f.—F.T.A. 2 : 47; Engler 249; Hutch. et J. M. Dalz. Fl. West Trop. Afr. 1 : 399.

In heather association between 10,000 and 11,000 ft., No. 42.

Recorded from the Aberdares (7000–9000 ft.), Ruwenzori (7000–8000 ft.), the Shira Mountains (9000 ft.), Pare District (6500 ft.) and the mountains of Nyasaland; this species is also abundant in West Tropical Africa, on Cameroons Mountain above the forest line (up to 12,000 ft.), Fernando Po (9000 ft.), and also on Bambuto Mountains, Cameroons.

Trifolium Johnstonii Oliv. in Trans. Linn. Soc. Bot. Ser. 2, 2 : 331; Engler 252.

Found at 11,000 ft., No. 59.
Apparently fairly widely distributed in the mountains of East Africa, but the species of this genus require critical study. A good stock food.

UMBELLIFERAE.

Sanicula europaea L.—F.T.A. 3 : 8; Engler 316.

In rain forest between 6000 and 8000 ft., No. 1.
Occurring in forests, open glades and damp places in the mountains of tropical South Africa, in moist situations in Europe (see footnote on p. 103).

Trachydium abyssinicum Benth. et Hook. f.—F.T.A. 3 : 10; Engler 317.

Forming flat rosettes on bare ground below Peter's Hut at an altitude of 11,000 ft., No. 48.

Found on the mountains of Abyssinia, the Aberdares, summit of Kinangop Mountain and Nandi Plateau, and on the Shira Mountains.

Peucedanum Kerstenii Engl. in Bot. Jahrb. 19, Beibl. 47 : 43 (1894). *P. dissectum* Dawe, nomen.

In ravine near Peter's Hut, No. 32. Young plants and plants bearing old inflorescences found at about 12,000 ft.

Also recorded from the Aberdare Range (11,000 ft.), Ruwenzori (9000-11,000 ft.) and the Shira Mountains (approximately 10,000 ft.).

ERICACEAE.

Erica arborea L.—F.T.A. 3 : 483 ; Engler 324.

Extends from below Bismarck Hut in pure communities, reaching a height of 20 ft., to just above Peter's Hut at nearly 12,000 ft., Nos. 5 and 58.

A widespread species, found also in Abyssinia (up to 10,500 ft.), British Somaliland and Eritrea, in the mountainous regions throughout East Tropical Africa (6900 to 13,000 ft.), the Atlantic Islands and South Europe.

Philippia keniensis S. Moore in Journ. Bot. 1901 : 259. *Ericinella Mannii* Auct. non Hook. f.

Tall and abundant below Bismarck Hut, at 8500 ft., reaching a height of 15-20 ft., No. 6.

Also collected from the Aberdare and Kinangop Mountains (10,000 ft.). Fries points out that the "*Ericinella Mannii*" of Kilimanjaro referred to by previous writers is quite distinct from the true *E. Mannii* which is confined to W. Africa.

Philippia Johnstonii Engl. Pflanzenw. Ost-Afrikas C. : 302 (1895). Scarce in flower above Peter's Hut, 12,000 ft., No. 30.

Recorded also from Mount Kirungu (*Kassner*) and Ruwenzori (in open places in bamboo forest at 8600 ft. and reaching an altitude of 12,000 ft.).

Blaeria glutinosa K. Schum. et Engl. in Engl. Hochgebirgsfl. Trop. Afrika, 327 (1892).

Tall bushes in flower near Bismarck Hut, 8500 ft., and extending to Peter's Hut, 11,500 ft., also in flower, Nos. 3 and 4.

Apparently confined to Kilimanjaro; collected by *Volkens* (No. 939) from the Kifinika volcano at an altitude of 9300 ft., and below Kibo (10,500-14,000 ft.) by *Hans Meyer* Nos. 100 and 235.

Blaeria Meyeri-Johannis K. Schum. et Engl. in Engler 326. Peter's Hut, 11,500 ft., No. 31.

This species has previously only been collected from Kilimanjaro slopes by *Volkens* and from the Shira Mountains (12,000 ft.) by *Haarer*.

RUBIACEAE.

Pentas carnea Benth.—F.T.A. 3 : 46 ; Engler 398. In forest clearings at 8000 ft., No. 7.

From Abyssinia, Uganda, common on the Aberdares and Mount Kenya, and also from Ruwenzori (amongst heather, 9000 to 11,000 ft.).

Anthospermum usambarense K. Schum. in Engl. Bot. Jahrb. 28 : 112.

Of erect stiff habit, scattered in *Erica* scrub from 10,000 to 11,000 ft., No. 23.

This heath-like plant has been recorded from Mount Kineti, Southern Sudan, where it forms the highest scrub on the mountain top, 10,500 to 11,000 ft. (*Kew. Bull.* 1929 : 191); also from the Aberdares, in moorland or outside forest at 9000 ft., and on the highest ground on Mau Plateau (8500-9500 ft.).

VALERIANACEAE.

Valeriana kilimandscharica Engl. Bot. Jahrb. 19, Beibl. 47 : 48. Below Peter's Hut, 11,000 ft., No. 50.

Found on Elgon (13,000-14,000 ft.), and also on the Shira Mountains (about 13,000 ft.).

DIPSACACEAE.

Scabiosa Columbaria L.—F.T.A. 3 : 252 ; Engler 404.

Below Peter's Hut, 11,000 ft.

Common in the higher parts of Africa and the East, Europe, etc.

COMPOSITAE.

Conyza apiculata Hutch. et M. B. Moss, sp. nov.; aspectu *C. ruwenzoriensis* R. E. Fries, sed affinis *C. incanae* Willd., foliis haud lobatis basi late auriculatis supra subglabrescentibus capitulis numerosioribus differt.

Herba erecta, parce ramosa; caules longitudinaliter striata, laxe lanato-tomentosa. *Folia* lineari-lanceolata ad lanceolata, acuta et acute apiculata, sessilia et basi late auriculata, marginibus recurvatis, 2.5-4 cm. longa, circiter 5 mm. lata, utrinque praesertim infra laxe lanata, supra subglabrescentia. *Inflorescentia* terminalis, cymoso-paniculata, usque ad 8 cm. diametro. *Capitula* cupularia, circiter 8 mm. diametro. *Involucri bractee* lanceolatae, acutae, circiter 4 mm. longae, marginibus et costa media dorso longe lanatae. *Flores* ♀ 2 mm. longi; ligulae minutae, circiter 1 mm. longae. *Flores* ♂ numerosi; antherae basi integrae. *Achaenia* parce pubescentia. *Pappus* minute scabridus.

Tanganyika Territory: Kilimanjaro; in open ground below Bismarck Hut, 8500 ft., *Cotton* No. 9; *Volkens* No. 1299; upper margin of forest above Kiboscho, 9300 ft., *Volkens* No. 1517; Shira Mountains, approximately 10,000 ft., *Haarer* No. 1147 (type).

Helichrysum Meyeri-Johannis Engl. Hochgebirgsfl. Trop. Afrika 427 (1892).

In open ground round Bismarck Hut at an altitude of 8500 ft., No. 13. *Johnston* No. 16; *Volkens* No. 778.

This beautiful pink species occurs also on Elgon where it is frequent on moorland round the crater at 13,500 ft. It is a much smaller plant than the closely allied species *H. Lentii*, and differs from it by the rosette habit, creeping branchlets, smaller spatulate leaves, and the capitula smaller and fewer in each inflorescence.

Helichrysum Lentii Volk. et O. Hoffm. in Engl. Pflanzenw. Ost-Afrikas C: 410 (1895).

In ravine below Peter's Hut, 11,500 ft., No. 21.

Closely allied to the last species, this plant has been recorded previously from Mount Kenya and Ruwenzori.

Helichrysum Newii Oliv. et Hiern.—F.T.A. 3: 349; Engler 425. Around Peter's Hut at 11,500 ft., No. 18. Found also on Kilimanjaro by C. New, H. H. Johnston No. 112, and by A. E. Haarer No. 1135 on the Shira ridge.

On the summit of the Kinangop Mountain (12,000 to 12,750 ft.), on Mount Kenya, frequent on moorland round the Elgon crater (13,500 ft.). According to Meyer the straw-coloured flowers of this species gathered at 14,200 ft. represent the last flowering plants seen on Kilimanjaro.

Helichrysum Hoehnelii Schweinf. ex Engl. Hochgebirgsfl. Trop. Afrika 426 (1892).

Around Peter's Hut, 11,500 ft., No. 19.

Recorded from the Kinangop Mountain (on the summit of the Poriy Rock at 12,760 ft.), this species grows abundantly on the moorland round the crater of Elgon (13,500 ft.), and is also found on the Shira Mountains (14,000 ft.).

Helichrysum abyssinicum Sch. Bip.—F.T.A. 3: 351; Engler 428.

Bismarck Hut, No. 11, extending to Peter's Hut, 11,500 ft., No. 20.

Commonly occurring in the mountains of Abyssinia.

Helichrysum fruticosum Vatke var. **compactum** Vatke in Linnaea 39: 491 (1875); Engler 430.

Around Peter's Hut, 11,500 ft., No. 22.

Recorded also from Abyssinia, Elgon (13,000 ft.), the Aberdares, West Kenya Mountain and summit of Kinangop (12,750 ft.), and from the Shira Mountains (13,000 ft.).

Helichrysum Kilimanjari Oliv. in Trans. Linn. Soc. Bot. Ser. 2, 2: 338; Engler 429.

Around Peter's Hut, 11,500 ft., No. 52. Only represented with certainty from Kilimanjaro (Johnston No. 36) and Shira Mountains (Haarer Nos. 2, 349). Welwitsch records (Cat. p. 562) the same species from Angola, but the Angola specimen in the Kew Herbarium, which has been examined, must be regarded as a distinct though allied species.

Stoebe killimandscharica O. Hoffm. in Engl. Pflanzenw. Ost-Afrikas C: 411 (1895).

Near Bismarck Hut at 8500 ft., material not in flower, No. 2.

Frequent on Elgon in the heath zone, bush and forest land, (8000–12,000 ft.), also on Mount Kenya in the Giant Heath association (10,000 ft.).

Artemisia afra Jacq.—F.T.A. 3: 400; Engler 438.

Between 9000 and 10,000 ft., not common, No. 43.

Occurring on the Aberdares (10,000 ft.) and Kenya moors (12,000 ft.), on rocky ledges and thickets on Elgon (13,500 ft.), Ukambane (5000–6000 ft.), also in Southern Rhodesia, Angola, and extending to South Africa.

Cineraria kilimandscharica Engl. Hochgebirgsfl. Trop. Afrika 439 (1892).

In ravine just below Peter's Hut, growing on moist rocks, at 11,500 ft., No. 28.

Recorded from the Imatong Mountains at 8744 ft. (Kew. Bull. 1929: 192), the Aberdares (up to 10,000 ft.) and Nandi Plateau, also with a local distribution on Elgon (12,000–13,000 ft.), the Nyika Plateau (7000 ft.), and Shira Mountains (12,000 ft.).

Senecio Schweinfurthii O. Hoffm. in Engl. Pflanzenw. Ost-Afrikas C: 417 (1895).

Growing around Peter's Hut, 11,500 ft., No. 24. The flowers are fragrant, with the scent of *Petasites fragrans* (Cotton).

Has been found on the Aberdares, and on the Shira Mountains (12,000 ft.). According to H. Meyer and von Höhnelt, this species is one of the last flowering plants to occur in the highest zone on Kilimanjaro.

Senecio Cottonii Hutch. et Taylor,* sp. nov.; distinctissima aspectu *S. Battiscombei* R. E. & Th. Fries, sed foliis longe petiolatis integris, bracteis inflorescentiae haud lanatis, capitulis majoribus, ligulis minoribus differt.

Arbor usque ad 5 m. alta; caulis simplex, foliis emarcidis dense obtectus. *Folia* caulis apicem versus conferta longe petiolata, oblongo-vel ovato-elliptica, basi rotundata, apice subacuta, circiter 35 cm. longa et 18 cm. lata, coriacea, integra, supra primum lanata demum glabrata, infra dense et crebre albo-lanata (costa longe sericeo-lanata), nervis lateralibus utrinque 15–18 utrinsecus leviter elevatis a costa primum ascendentibus demum patulis marginem versus evanidis et ramosis; petioli complanati, circiter 23 cm. longi, dense et longe lanati, superne circiter 2 cm. basin versus 7 cm. lati et intra glabrescentes. *Inflorescentia* paniculata, plus minusve

* Described in collaboration with Mr. G. Taylor, of the Botanical Department, British Museum (Natural History), who had simultaneously determined Messrs. Piemeisel and Kephart's specimen to be a new species.



Senecio Cottonii Hutch. et Taylor. A, Leaf. B, Lateral branch of inflorescence. C, Rayflower. D, Disc-flower. E, Pappus seta.

pyramidalis, ramis lateralibus circiter 40 cm. longis et 30 cm. latis; axis et pedunculi dense albo-lanati, bractee inferiores oblanceolatae, usque ad 15 cm. longae et 3 cm. latae, superiores lineari-lanceolatae, extra tenuiter lanatae, intra subglabrae conspicue longitudinaliter striatae. *Capitula* radiata, aperte campanulata, circiter 2 cm. longa et 4 cm. diametro. *Involucri bractee* 2-seriatae, oblongo-lanceolatae, acutae, 2 cm. longae, 7 mm. latae, extra fere glabrae; involucelli bractee circiter 10, lineares, 1-1.5 cm. longae, glabrae. *Flores radii* pauci et inconspicui; ligula lineari-oblonga, apice biloba vel integra. *Flores disci* 1.5 cm. longi; corollae tubus inferne cylindricus, superne leviter ampliatus. *Achaenia* circiter 6 mm. longa, striata, glabra. *Pappus* barbellatus, albidus, circiter 1 cm. longus.

Tanganyika Territory: Kilimanjaro; about Peter's Hut, 11,500-13,000 ft., Sept. 1, 1929, Cotton & Hitchcock No. 34 (type), No. 35, No. 36 (seedling); about 9000 ft., Aug. 1927, R. L. Pehmeisel and L. W. Kephart No. 435.

[Besides dried herbarium specimens Mr. Cotton also secured a number of young plants which are now growing at Kew; these have long-petiolate oblong-elliptic almost glabrous leaves.

Up to the year 1921 we knew only three species of arboreal *Senecio*, *S. adnivalis* Stapf, from Ruwenzori, *S. Johnstonii* Oliv., from Kilimanjaro, and *S. keniensis* Bak. f.* from Mt. Kenya, the last mentioned being imperfectly known and proving later to be a mixture. In that year the brothers R. E. and Thore C. E. Fries investigated these interesting plants in Eastern Africa, and through their careful researches we now know as many as nine species. Until recently only one species, *S. Johnstonii* Oliv., was known to occur on Kilimanjaro, and it came as a great surprise to find that Mr. Cotton, on a flying visit to the mountain, gathered what appears to be a very distinct new species (see notes on p. 108).

Below I give a list of the chief mountains of East Africa with the species known to occur on them. It will be observed that the Central group of mountains, the Aberdares and Mt. Kenya, harbour the greatest number of the species, and it is of considerable interest to note that in these mountains the intermediate habit-type, the "cabbage-like" forms, *S. brassicaeformis* and *S. Brassica* are found. It seems probable, therefore, that the peculiar and weird growth-form of these tree *Senecios* originated in this central range. Further investigation of the mountains between Lake Tanganyika and Lake Albert might possibly bring to light more of these interesting types of plants, and collectors in these regions should pay special attention to them.

* According to R. E. & Th. Fries this was a mixture; they now refer the trunk to *S. keniodendron* R. E. & Th. Fries, the inflorescence and the flowers to *S. Brassica* R. E. & Th. Fries, whilst the leaves of the latter had been included in the description of *Lobelia Gregoriana* Bak. f.

See R. E. & Th. Fries, *Über die Riesen-Senecionen der Afrikanischen Hochgebirge*, in *Svensk Botanisk Tidskrift* 16: 321-340, figs. 1-9 (1922).

Mt. Ruwenzori : *S. adnivalis* Stapf.

Volcano Region (Mt. Ninagongo) : *S. Erics-Rosenii* R. E. & Th. Fries.

Mt. Elgon : *S. elgonensis* Th. Fries.

Aberdares : *S. aberdaricus* R. E. & Th. Fries ; *S. Battiscombei* R. E. & Th. Fries ; *S. brassicaeformis* R. E. & Th. Fries.

Mt. Kenya : *S. keniodendron* R. E. & Th. Fries ; *S. Battiscombei* R. E. & Th. Fries ; *S. Brassica* R. E. & Th. Fries.

Mt. Kilimanjaro : *S. Johnstonii* Oliv. ; *S. Cottonii* Hutch. & Taylor. J.H.]

Senecio sympodialis R. E. Fries in Acta Horti Bergiani 9, 6 : 153 (1928)—ex descriptione.

Near Peter's Hut, 11,500 ft., Nos. 54 and 56.

This species, previously unrepresented at Kew, was described from the Aberdares, growing on the summit of Sattima at 12,000 ft. It is closely allied to *S. Meyeri-Johannis* Engl. from Kilimanjaro, from which it can readily be distinguished by the absence of dense indumentum on stem and leaves.

Euryops dacrydioides Oliv. in Trans. Linn. Soc. Bot. Ser. 2, 2 : 340 ; Engler 447.

Around Peter's Hut at 11,500 ft., very abundant. Of erect Cupressus-like habit and very conspicuous by reason of its showy yellow flowers, No. 60.

Confined to Kilimanjaro (10,000–14,000 ft.) and Shira (12,000 ft.).

Tripteris Volkensii O. Hoffm. in Engl. Pflanzenw. Ost-Afrikas C. : 419 (1895)—ex descriptione.

Bismarck Hut, 8500 ft., scrambling plant, very glandular, No. 10. Also collected by Johnston at 8500 ft., Thomson at 10,000 ft., and Volkens Nos. 857, 1142.

Landtia kilimanjarica Hutch. et M. B. Moss, sp. nov. ; affinis *L. Rueppellii* Benth. et Hook. f., sed foliis crasse dentatis (nec crenatis) supra glabris differt.

Herba humilis, rhizomate brevi et crasso radicibus crassis usque ad 12 cm. longis. *Folia* radicalia ovato-elliptica ad obovata, utrinque leviter angustata, apice obtusa vel subacuta, basi leviter decurrentia, 3–6 cm. longa, 2–3 cm. lata, supra viridia et glabra, infra crebre albo-lanata, marginibus crasse et irregulariter acute dentata, nervis lateralibus utrinsecus circiter 4 subito ascendentibus supra profunde impressis infra elevatis ; petioli lamina aequilongi, complanati et alati, basi vaginati, glabri vel pilis longis lanatis induti. *Capitula* subsessilia vel pedunculo usque ad 5 cm. longa, solitaria, circiter 4 cm. diametro. *Involucri bracteae* biseriatae, exteriores lineari-lanceolatae, circiter 1.5 cm. longae, extra leviter lanatae, interiores oblongae, apice acutae, 1 cm. longae et 3 mm. latae, glabrae. *Flores radii* circiter 1.7 cm. longi ; ligula oblonga, 5 mm. lata, apice 3-dentata. *Achaenia* glabra. *Pappi squamae* minutae, 1-seriatae.

Tanganyika Territory : Kilimanjaro, in wet places at 11,000 ft., Sept., Cotton No. 44 (type) ; above Kiboscho, 9400 ft., Jan., Volkens No. 1551. Shira Mountains, west Kilimanjaro, 12,000 ft., Feb., Haarer No. 1106.

This species has been found by previous collectors but has been referred to *L. Rueppellii* Benth. et Hook. (= *Arctotis Rueppellii* O. Hoffm.), a native of Abyssinia, from which it differs in the coarsely dentate leaves which are completely glabrous on the upper surface.

GENTIANACEAE.

Swertia crassiuscula Gilg.—F.T.A. 4, 1 : 576.

Growing between grass tussocks above Bismarck Hut at 9000 ft., the flowers a pale grey-blue, while at 11,500 ft. in the ravine below Peter's Hut the flowers are a darker blue, Nos. 39 and 40.

From the Aberdares (10,000 ft.) and base of Kenya (a larger-flowered form), in short grass and bush land on Elgon (8000–10,000 ft.), and also from the Shira Mountains (12,000 ft.).

CAMPANULACEAE.

Wahlenbergia kilimandscharica Engl. Hochgebirgsfl. Trop. Afrika 412 (1892).

Growing between grass-tussocks above Bismarck Hut, No. 14.

Known only from Kilimanjaro ; Johnston No. 155 ; Volkens No. 866 ; Haarer No. 179.

SCROPHULARIACEAE.

Bartsia Petitiona Hemsl.—F.T.A. 4, 2 : 460 ; Engler 384.

Growing near Peter's Hut at 11,500 ft., No. 37.

From various localities in Abyssinia reaching an altitude of 12,000 ft. on Mount Chillalo, the Aberdares (10,000 ft.), western Kenya and the Laikipia escarpment (a sweetly scented pink-flowered herb growing in grass at 7600 ft.), and Elgon (12,000–13,000 ft.) where the flowers are said to be purplish. According to Johnston the same species occurs on the upper slopes of Cameroons Mountain, with bluish-mauve flowers, at 8000 ft. altitude.

Bartsia kilimandscharica Engl.—F.T.A. 4, 2 : 461 ; Engler 384.

A yellow-flowered herb growing below Peter's Hut from 10,500 ft. to 11,000 ft., No. 38 ; Volkens No. 1178 ; Johnston No. 125.

Growing in short grass land at 11,000 ft. on Elgon (Snowden No. 458) ; the species is also found on the Shira Mountains (Haarer No. 1115).

SELAGINACEAE.

Hebenstreitia dentata L.—F.T.A. 5 : 265 ; Engler 378.

Frequent from 8500 ft. and extending to Peter's Hut, 11,500 ft., Nos. 33 and 41 ; also a rose-coloured form found high up near Peter's Hut, No. 25.

A very variable and widespread species occurring throughout Abyssinia (9665 ft. on Mount Zuquala), in Eritrea, on Mount Kineti in the Southern Sudan (18 inches high growing in mountain meadows

between 8000 and 10,000 ft.); common on the Aberdare Range (7000–14,000 ft.) and Kinangop, where it is a bush 3½ ft. high, Ruwenzori, Karagwe (4000–5000 ft.) and Elgon (10,000 ft.).

On Kilimanjaro (12,000 ft.) *Johnston* reports two forms: the most frequent has whitish pink flowers with a crimson dash in the centre, while the other, doubtless a variant, has deep mauve flowers. The same species occurs in Nyasaland on the Nyika Plateau (8000 ft.) and Milanje, in Southern Rhodesia and Angola, and is widespread throughout South Africa.

Selago Johnstonii Rolfe.—F.T.A. 5: 269; Engler 379.

Below Peter's Hut, 11,000 ft., No. 47.

A low herb with pinkish flowers; this species is only known from Kilimanjaro and was collected at 11,000 ft. by *Johnston* in 1884.

LABIATAE.

Micromeria biflora Benth.—F.T.A. 5: 452; Engler 364.

Near Peter's Hut, between 11,000 ft. and 11,500 ft., No. 53.

Widespread throughout Abyssinia and Nubia from sea level to 9665 ft. on Mount Zuqala, collected from Eritrea at 6000 ft. on Mount Bizen, the Red Sea Hills (3600 ft. at Erkowit, a small bush rather like a whortle-berry) and Somaliland; very common on Jebel Marra on the great central plateau, 9000 ft., and higher zones, 9500 ft., this was one of the few flowering plants collected from the top of Mount Kineti at an altitude of 10,414 ft. (*Kew Bull.* 1929: 193). In East Tropical Africa the plant occurs on Kinangop (8500 ft.), Ruwenzori (up to 7000 ft.), and the mountains of Uganda, Kenya, Tanganyika and Nyasaland, extending to Southern Rhodesia and Angola. The species is also reported from the Cameroons Mountain up to 10,000 ft.

IRIDACEAE.

Dierama cupuliflorum Klatt in Decken Bot. Ost-Afr. 73, t. 3; see N. E. Brown in Journ. Roy. Hort. Soc. 1929: 200.

In grass meadows just above forest zone at 9000 ft., No. 17.

Kilimanjaro: Marangu, 8100 ft., *G. Volkens* No. 983; 8300 ft. and 10,000 ft., *H. H. Johnston* No. 22; *Haarer* No. 1594; Nyika Plateau, 6000–7000 ft., *A. Whyte* No. 250.

GRAMINEAE. (Det. F. Ballard).

Anthoxanthum nivale K. Schum. in Engl. Pflanzenw. Ost-Afrikas C. 107 (1895).

Near Peter's Hut, 11,500 ft., *Cotton & Hitchcock* No. 62.

Found also by *Johnston* No. 127 at 13,200 ft., *Volkens* No. 973 at 9000 ft.; and in the Shira Mountains at 10,000 ft., *Haarer* No. 1122.

Occurs also in the Aberdares, Mount Kenya and in W. Ruwenzori. J. C. Rammell states that in the Aberdares the plant is worn around the neck for its scent.

Koeleria convoluta Hochst. ex Steud. Syn. Pl. Glum. 1: 293 (1854).

Near Peter's Hut, 11,500 ft., *Cotton & Hitchcock* No. 63.

Found also at Mawenzi at 13,000 ft. by *Volkens* No. 1351; Marangu at 7300 ft., No. 921; on the Kifinika Volcano at 10,000 ft., No. 1855, and in the Shira Mountains at 10,000 ft., by *Haarer* No. 1122A.

Occurs also in the Cameroons, Abyssinia, Aberdare and Kenya Mountains and in Uganda on Mount Elgon. Mr. D. K. S. Grant (Kenya) states that this is a good fodder grass.

Pentaschistis borussica Pilger in Notizbl. Bot. Gart. Berlin 9: 517 (1926).

Near Peter's Hut, 11,500–12,500 ft., *Cotton & Hitchcock* No. 66.

Found also at Mawenzi at 13,000 ft. by *Volkens* No. 1368; in the Shira Mountains at 12,000 ft. by *Haarer* No. 1130.

Occurs also in Kenya Colony, on the west side of Mt. Kenya, and in Uganda on Mt. Elgon.

Pentaschistis borussica var. **minor** Ballard et Hubbard, var. nov.; a typo panicula contracta, ramificationibus vix glandulosis vel eglandulosis, spiculis aristisque minoribus differt.

Foliorum laminae marginibus eglandulosis scaberulisque vel levissime glandulosis. Panicula angusta, contracta, erecta, 5–7 cm. longa, ramificationibus levissime glandulosis vel eglandulosis atque laevibus. Spiculae 4.5–5.3 mm. longae; lemmata ad 2.5 mm. longa, setis lateralibus ad 2 mm. longis, arista ad 5.5 mm. longa.

Kilimanjaro: near Peter's Hut, 11,500 ft., Sept. 1929, *Cotton & Hitchcock* No. 64.

Agrostis Volkensii Stapf in Kew. Bull. 1897: 289.

Near Peter's Hut, 11,500–12,500 ft., *Cotton & Hitchcock* No. 69.

Found also on Kifinika Volcano at 10,000 ft. by *Volkens* No. 1856; in the Shira Mountains at 13,000 ft. by *Haarer* No. 1129.

Agrostis trachyphylla Pilger in Notizbl. Bot. Gart. Berlin 9: 512 (1926).

Near Peter's Hut, 11,500 ft., *Cotton & Hitchcock* No. 65.

New to Kilimanjaro; occurs also in Kenya Colony, on the west side of Mt. Kenya.

Poa leptoclada Hochst. ex A. Rich. Tent. Fl. Abyss. 2: 422 (1851).

Near Peter's Hut, 11,500–12,500 ft., *Cotton & Hitchcock* No. 68.

Found also at 9000 ft. by *Volkens* No. 1117.

Occurs also in Kikuyu, the west side of Mt. Kenya and Aberdares in Kenya Colony, Abyssinia, and Kiyimbila in Tanganyika Territory.

Festuca abyssinica Hochst. var. **intermedia** St. Yves in Notizbl. Bot. Gart. Berlin 9: 1132 (1927).

Near Peter's Hut, 11,500–12,500 ft., *Cotton & Hitchcock* No. 67.

Found also by *Johnston* No. 151, at 13,000 ft.; and in the Shira Mountains at 12,000 ft. by *Haarer* No. 1131.

Occurs also in Kenya Colony, Mts. Aberdare and Kenya.

XIII.—ON THE FLORA OF THE NEARER EAST: V.*
W. B. TURRILL.

Oxytropis olympica Turrill, sp. nov.; ab *O. Pallasii* Pers. floribus purpureis distinguitur.

Planta perennis, caulibus vix elongatis numerosis e radice lignosa caespitosis patentissime denseque albo-pilosis. *Folia* omnia evoluta usque ad 6 cm. longa, longe sericeo-pilosa, foliolis circiter 8-jugis in foliis primariis ellipticis vel oblongo-ellipticis 5–6 mm. longis et 3 mm. latis in foliis secundariis oblongo-linearibus usque ad 9 mm. longis 2–2.5 mm. latis; petiolus 1.5–2.3 cm. longus; stipulae lanceolatae vel lanceolato-ovatae, herbaceae, 6 mm. longae. *Capitula* usque ad 2.1 cm. longa et 1.6 cm. lata. *Pedunculi* 3–4 cm. longi, patentissime denseque albo-pilosi vel pilis paucis sub capitulo et in inflorescentia fusciscentibus instructi. *Bracteae* lanceolatae, 5 mm. longae, albo-nigroque pilosae. *Calycis* fere tubuloso-campanulati albo-nigroque pilosi tubus 5 mm. longus; dentes subulati 4 mm. longi. *Vexillum* 14 mm. longum, lamina late ovata 9 mm. lata leviter retuso-emarginata purpurea. *Alae* 12.5 mm. longae, inaequaliter retuso-emarginatae. *Carina* 12 mm. longa, in mucronem 2 mm. longum subito contracta. *Carpellum* fere cylindricum 9 mm. longum, dense adpresse sericeo-villosum, 22-ovulatum. *Legumen* immaturum in calyce omnino sessile dense albo-sericeum.

Thessaly: Mt. Olympus, 2740 m., 26.6.1929, *Giuseppi* 47.

This taxonomically and phytogeographically interesting species is so closely related in all morphological characters to *O. Pallasii* Pers., that it is described as a new species with some hesitation. In addition to the obvious difference in flower colour our specimens differ from those of *O. Pallasii* in having the stems somewhat less developed (though individuals of *O. Pallasii* are sometimes depauperated in this respect), the bracts on the whole slightly broader, the standard, including the claw, somewhat broader, and the carpels with (at least sometimes) more ovules. It is, however, impossible to say whether these are relatively constant distinctions or mere individual fluctuations.

Apparently no species of *Oxytropis* has been previously recorded from the Thessalian Olympus, and all the species of this genus hitherto known from the Balkan Peninsula occur to the north or west of Thessaly.

O. Pallasii Pers. is known from the Crimea (Tauria), Caucasus, and Transcaucasus (Georgia), and has also been recorded, somewhat doubtfully, from Bessarabia. The isolated geographical position of *O. olympica* suggests that we have here one more relict type of a flora rich in old or relict species, of which *Ramondia* (*Jankaea*) *Heldreichii* Benth. et Hook. fil. is the best known example.

Asperula arvensis L.

Seeds of this species were collected by B. Gilliat-Smith near Tabriz, N. Persia, and sown in the Herbarium Experimental

* Continued from *K.B.* 1929, p. 235.

Ground at Kew in the spring of 1928. Two weeks after sowing the seedlings had the following characters: *Primary root* 2–3 cm. long, dull yellowish in colour, much branched. *Hypocotyl* erect, terete, white below, pale greenish or tinged with purple anthocyanin above, 2–3 cm. long, glabrous. *Cotyledons* with blades very broadly ovate to practically orbicular, 3 to 4 mm. long and 3 to 4 mm. broad, glabrous, apex rounded, usually very slightly retuse, petioles to 2 mm. long, midrib and lateral veins not visible above, just distinguishable below.

Campanula hercegovinica Degen et Fiala in Oesterr. Bot. Zeitschr. xlv. 303 (1894).

Hercegovina: roadside on way to Mt. Prenj, 150 m., 1929, *Giuseppi* 78.

This species, so far as is known, is endemic to Hercegovina, but has hitherto only been recorded from much higher altitudes (1150 to 2000 m.), except for one collection by K. Maly [Wiss. Mitt. Bosn. u. Herz. xii (1912)]. *Giuseppi*'s material emphasizes the close relationship between *C. hercegovinica* and *C. crassipes* Heuff. from the Banat and Serbia.

Heliotropium europaeum L. var. ?

Thessaly: Lithochoron, sea-level to 300 m., *Giuseppi* 70.

This widely distributed species has not yet been subjected to adequate taxonomic analysis. The various floras refer to the ovary or nutlets as glabrous to hispid. The specimen from Thessaly quoted above has the nutlets more densely hairy than in any specimen of the species at Kew or the British Museum. It may possibly be included in the var. *tenuiflorum*, as understood by Boissier [Flor. Or. iv. 130 (1879)], whose nutlets are described as "magis hispidae." Gussone in his original description [Fl. Sic. Prodr. i. 205 (1827)] does not describe the nutlets.

Anchusa officinalis L. var. **ochroleuca** Boiss. Flor. Or. iv. 152 (1879).

N. Macedonia, Babuna Pass, S.E. of Bitolia, roadside, 800 m., 19.6.1929, *Giuseppi* 11.

This very definite colour variety is known only from Macedonia. Possibly de Fredrichsthal's material collected "inter Istib et Perlepe (substr. tertiar.)" and recorded by Grisebach [Spic. flor. rumel. et bithyn. ii. 98 (1844)] as *A. ochroleuca* M. Bieb. belongs to the same variety [see Gussone, Die europäischen Arten der Gattung *Anchusa* Linné 31 (1927)].

Convolvulus lanatus Vahl Symb. i. 16 (1790).

This species is known to be fairly common in Lower Egypt and in parts of Arabia and Syria. The only record for the Balkan Peninsula is that given by Sibthorp [Prodr. i. 136 (1806), Fl. Gr. t. 202 (1819)] for Crete, without exact indication of the locality. Thanks to the kindness of Dr. G. C. Druce I have been able to

examine at Kew the specimens of *Convolvulus* from the Sibthorp herbarium. There are two sheets of *C. lanatus* Vahl in the collection, but nothing to indicate whence they came. The figure in the *Flora Graeca* was surely made from a living specimen and this might quite well be one of those now preserved in the Sibthorp collection. The locality is very definitely printed as "In Cretae collibus siccis," though the species has not since been found in Crete. If it really is a Cretan species it is interesting as being one of the very few definite floristic links between the Balkan Peninsula and Egypt. There is an undecipherable word on the label which may be the name of a locality.

***Linaria peloponnesiaca* Boiss. et Heldr. var *parnassica* Hal.** Oesterr. Bot. Zeitschr. xlvii. 324 (1897).

Thessaly: Mt. Olympus, 900 to 2400 m., 26.6.1929, *Giuseppi* 30. Attention is called to the very considerable range in indumentum quantity and kind in this species as understood by Halácsy, Hayek, and other authors. The specimen from Mt. Olympus quoted above is remarkable for the long, distinct, white hairs, giving the inflorescence axis and calyces a shaggy appearance. It may well be that further collecting would suggest a greater subdivision of the species than is at present reasonable.

***Wulfenia Baldacii* Degen** in Oesterr. Bot. Zeitschr. xlvii. 408 (1897). N. Albania: deep gorge and rocks on Cafa Stogut, 9.7.1929, *Giuseppi* 76, 76a.

The specimens under the former number grew on the north-facing side of the gorge and agree with the original specimens of Baldacci as preserved at Kew and the British Museum. On the other hand the specimens under 76a were found in cracks of the cliff face on the side facing south. They may be characterized in the following words; a planta typica foliis longioribus in parte inferiore gradatim attenuato-cuneatis fere integris superiore lobulis acutius dentatis, calycis segmentis longioribus, corolla brevior praecipue differt. Since there are specimens in the British Museum collected by Dörfler which are intermediate between these and the typical plants collected by Baldacci, the former are considered as only a habitat form. The phytogeographical interest of the genus has been considered in Turrill, *The Plant Life of the Balkan Peninsula* 296, 459 (Oxford, 1929).

***Carpinus orientalis* Mill.**

Seeds of this species, collected near Varna, Eastern Bulgaria, by B. Gilliat-Smith, were sown in the Herbarium Experimental Ground in pots in the cold frame on 24.3.1925. One seed germinated in the spring of 1926 and 7 in the spring of 1927. Primary root of the seedling about 3 cm. long, tapering, whitish, giving off few lateral roots. Hypocotyl 2-2.2 cm. long, terete, minutely pubescent, reddish. Cotyledons dark glossy green above, pale dull green below, very broadly obovate, completely rounded at the apex, with a marked

sagittate base, 6-7.5 mm. long, 4.5-6 mm. broad, with a short petiole 1-1.5 mm. long, glabrous except the petiole which is very finely pubescent and scarcely grooved, rather thick and the veins scarcely visible in the living condition. The first foliage leaves appear early, when the seedlings are 2 to 2.3 cm. high, and though small are very similar to the leaves of the adult tree in shape, nervature, margin, apex, and base. The first two are opposite in a plane at right angles to the cotyledon plane, and they have each a pair of small, membranous, pale brown, pubescent stipules. The stem soon becomes woody, erect, terete, and branches in the second year.

***Carex troodi* Turrill**, sp. nov.; a *C. diluta* M. Bieb. habitu minore, spiculis masculis fructiferisque brevioribus ovatis recedit.

Planta nana, dense caespitosa. *Culmi* usque ad 7 cm. alti, graciles, obsolete triquetri, glaberrimi, longitudinaliter sulcati. *Folia* omnia basalia, lanceolato-lineariter, apice gradatim acuminata, circiter 4 cm. longa, 3 mm. lata, inferne plicata, deinde plana, glauco-viridia, rigida vel subrigida, glaberrima, margine integerrima haud serrulata, vaginis pallidis vel atropurpureis striatis. *Spiculae* 2-4, saepissime infima foemina in foliis occulta; terminalis mascula ovata vel anguste ovata, vix 1 cm. longa, 5-6 mm. diametro, pedicello 1.3-1.5 cm. longo laeve gracile instructa; laterales 1-3 foeminae anguste ovatae, fructiferae 5-9 mm. longae, 3-5 mm. diametro, 5-18-florae, remotae, breviter pedunculatae; bractae inferiores foliaceae anguste lineares, usque ad 2 cm. longae, margine in parte superiore minutissime serrulatae, superiores setaceae, basi vaginatae. *Squamae* masculae obovata-ellipticae, apice rotundatae, haud vel vix mucronatae 4.5 mm. longae, 2.5 mm. latae, castaneae, dorso tricostato pallidae; foeminae ovatae, 3 mm. longae, 2 mm. vel fere 2 mm. latae, e dorso viride tricostato leviter mucronatae. *Utriculi* ellipsoidei, adaxiale plus minusve plani, abaxiale convexi, 3.5 mm. longi rostro bidentato vix scabridulo fere 1 mm. longo incluso, glabri; stylus ramis tribus 2.5 mm. longis inclusis 3.5 mm. longus.

Cyprus: Troodos, Chionistra, 1900 m., sent by the *Forestry Department, Cyprus*, July, 1928, to Dr. G. C. Druce, F.R.S.

This interesting dwarf sedge has been somewhat difficult to classify. It appears to be most closely related morphologically to *C. diluta* M. Bieb., a species with a wide distribution in the Pontic Lands of South Russia, Crimea, Caucasus, Caspian, and Armenia to North Persia, Afghanistan, N. Kashmir, and Central Asia. Varieties of the species are recorded from Morocco, Greece, and Crete [see Kükenenthal in Engler's *Pflanzenr.* iv. 20, 659 (1909)]. Holmboe [Studies on the Vegetation of Cyprus 42 (1914)] records *C. diluta* from "Shrubby places at Vrysi tu Eroton on the peninsula of Akamas," the specimens, which I have not seen, being of his own collecting. The species here described is a dwarf plant, with a habit which is correlated with the high altitude of its habitat. A

remarkable feature is the relatively short, more or less ovate, male spikelets with their glumes tending to spread somewhat. These essentially male spikelets sometimes have a utricle female flower at the base.

Hordeum spontaneum K. Koch Linnaea xxi. 430 (1848). *H. ithaburense* Boiss. Diagn. Ser. i. xiii. 70 (1855).

An interesting extension of the known range of this grass is provided by a specimen collected by M. Gandoger, Herbarium creticum, 1914, No. 638, in Herb. Kew. The specimen is named *Secale creticum* L., and the locality is given as Provincia Sitia, Toplon, 14/9. So far as is known this is the first record of the species occurring wild in Europe. Aznavour [Mag. Bot. Lap. x. 21 (1911)] records the species as having been collected "le long du chemin de fer, à Yarim-Bourgas (non loin de Halkali)." It was almost certainly introduced here from Asia Minor.

The species is known from Asia Minor, Syria, Palestine, Iraq, Persia, Afghanistan, Baluchistan, Transcaucasia, Arabia Petraea, Turkestan, Bokhara, Cyrenaica, and Marmarica. References to the possible connections between *H. spontaneum* and the cultivated barleys are made by Ascherson and Graebner, Syn. Mitteleur. Flora ii. 723 (1901), R. Regel, On the problem of the origin of the cultivated barley, in Bull. Appl. Bot. x. 612 (Leningrad, 1917), and N.I. Vavilov, Studies on the origin of cultivated plants, in Bull. Appl. Bot. xvi. ii. (1926).

XIV.—MISCELLANEOUS NOTES.

C. E. SALMON.—By the death of Mr. C. E. Salmon, at Reigate, on January 1st, British Botany has sustained an irreparable loss and Kew has lost a valued correspondent and generous contributor. Charles Edgar Salmon was born on November 2nd, 1872, and was an architect by profession. He had devoted his leisure hours for most of his life to British field botany and had specialized in his own county. On his last visit to Kew he informed the writer that a considerable proportion of the manuscript for his Flora of Surrey was already set in type. Mr. Salmon was also an authority on the genus *Limonium* (*Statice*), and had latterly taken considerable interest in the study of fruits and seeds. His delightful personality will be greatly missed by all his friends. His herbarium has been bequeathed to the British Museum (Natural History). A photograph, notice, and partial list of his papers have been published in the Journal of Botany, lxxviii., February, 1930. W. B. T.

Botanical Magazine.—Part iii of Vol. cliii (1927) has recently been published and contains the following illustrations:—*Hippeastrum candidum* Stapf (t. 9184), a new species from Tucuman, Argentina, allied to *H. solandriflorum* Lindl.; *Meconopsis betonicifolia* Bailey Cotton (t. 9185), from S.E. Tibet; *Rhododendron Forrestii* Balf. f. ex Diels (t. 9186), a native of the mountains of the frontier

of Yunnan, Tibet and N.E. Burma; *Acradenia Frankliniae* Kippist (t. 9187), the only known member of the genus, which occurs in a small area in Western Tasmania; *Ranunculus psilostachys* Griseb. (t. 9188), a handsome buttercup from the Balkan Peninsula; *Primula Baileyana* Kingdon Ward (t. 9189), from S.E. Tibet; *Rhododendron Wasonii* Hemsl. & Wilson (t. 9160), a native of the high mountains of Western Szechuan; *Sarcopodium Lyonii* Rolfe (t. 9191), from Luzon, Philippine Islands; *Prunus* (*Cerasus*) *pilosiuscula* Koehne (t. 9192), from China; *Tsuga chinensis* E. Pritzl (t. 9193), a native of Central China, and *Orobanche uniflora* Linn., f. *nana* (t. 9194), a native of N. America.

Chinese Medicine in Malaya.*—The author is an accomplished pharmacologist with long experience under the Government of India, and joint author with Dymock and Warden of the *Pharmacographia indica*.

Some 400 vegetable drugs used by the Chinese in the Malay Peninsula, the botanical source of which has been determined, are described, along with a few others unidentified, and about 40 of animal or mineral origin. The material for this study was collected from Chinese druggists in Malaya by Mr. I. H. Burkill when Director of Gardens, Straits Settlements. Modern herbalists in this country collect and sell probably some 170 species, but the Pharmacopœia of the Chinese, like that of the Greeks in the time of Dioscorides, is perhaps still almost coextensive with the vegetable kingdom known to them. Many of the medicines are listed in the annual reports of the Chinese Imperial Maritime Customs, but Chinese residents in Malaya make use also of many Indian and local drugs. The list includes both official drugs of the classical Chinese Herbal (*Pen ts'ao kang mu*), of which the most renowned are the Ginsengs, and very many herbs, roots and fruits of domestic use whose functions are presumably indicated to the herbalist under the doctrine of signatures. Amongst the animal substances the edible birds' nests rank highest, although, being of seaweed origin, they might claim a place in the other kingdom.

The vernacular names are given both in Chinese characters and in Romanized Mandarin script, with in some cases the local equivalents as pronounced in Malaya. There is an adequate index, and references to published works are quoted under each medicine. The information here brought together will thus be of great use to workers in this field of medical research, who have been unfortunately deprived of an expected standard work on the Economic Products of China by the untimely death of Sir Alexander Hosie.

J. M. D.

* On Chinese Medicine: Drugs of Chinese Pharmacies in Malaya, by David Hooper, LL.D., F.C.S.—The Gardens' Bulletin, Straits Settlements, vol. vi, part 1 (Nos. 1-5), Dec. 1929, pp. 1-163. To be purchased at the Botanic Gardens, Singapore, price \$2.50.

Grass Cakes.—The conservation of young grass in a dried and pressed condition for winter use is a development of grassland farming that promises well for the stock-breeder. Recent research has shown that newly-cut grass, three to four inches high, has a nutritive value much greater than that of hay and equal to that of other protein concentrates, such as oil-cake or meal. The botanical composition of the pasture would appear to be a secondary consideration, though a mixture of grasses is desirable. Most grasses suitable for fodder are more palatable in the stage recommended for cutting, and many others are good for feeding in this young condition which become useless or inferior for the purpose when old, as when left to grow for hay. A primary requirement is careful and regular manuring to produce thick and vigorous growth, following the successive mowings at the requisite height.

Cutting and collecting machines are necessary, and another point of economic importance, yet to be decided, is the cost of production and the price at which the cakes can be sold to compete with oil-cakes. They are not yet on the market and it is early to express an opinion as to the possible advantages of their use in hot countries where a long dry season occurs. Favourable results have, however, been obtained in research work at the School of Agriculture, Cambridge, and field work at the Agricultural Research Station of Imperial Chemical Industries, at Jealott's Hill. The grass is pressed into cakes of a density of approximately 56 lbs. per cubic foot or 40 cubic feet to the ton, and the results indicate that, whatever the marketing possibilities may be, the value for stock of young grass, preserved in the form of cake, is established. The fresh grass appears to lose none of its feeding value during drying and pressing.

A similar practice—under perhaps more primitive conditions—appears to have been long established in principle in the grassland husbandry of Switzerland, in the cultivation, cutting (at a height of 4 inches), and harvesting of young and tender herbage for winter use. This provision of winter food for farm animals in most temperate countries is met by the conservation of grass as hay or ensilage, the storage of root crops, and the use of concentrated food such as oil-cakes (including Cotton seed, Soy-bean, Linseed, Groundnut and Coconut) or foods such as "Molascuit," "Molassine" and "Copraline." These patent foods consist of chopped Sugar-cane megasse, Sphagnum moss, and Coconut kernel with sugar-cane, respectively, mixed in the first two cases with molasses and in the third with Demerara sugar.

The subject is more fully discussed in the Essex Farmers' Journal, Feb. 1929, "Dry Grass Cakes," (pp. 568-571); Tropical Agriculture (Trinidad), Dec. 1929, "Conservation of the Produce of Pastures" (in Great Britain), by Dr. H. E. Woodman (p. 332); and in the Journal of Agricultural Science, Jan. 1930, "Nutritive Value of Pasture; Pasture Grass Conservation"—by H. E. Woodman, J. W. Bee and G. Griffith (pp. 53-62).

J. H. H.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1930 ROYAL BOTANIC GARDENS, KEW

XV.—FISH-POISON PLANTS. F. N. HOWES.

In most parts of the world primitive peoples have from time immemorial made use of vegetable products of diverse natures for poisoning or stupefying fish in order to facilitate their capture. The practice is one of great botanical and ethnological interest and has generally attracted the attention of travellers and scientists. With the advance and spread of civilization this method of fishing, condemned on account of the wholesale destruction of fish of all sizes which is involved, has naturally declined, and in some areas, particularly where the practice has been made illegal, it has fallen into complete disuse. In most areas the plants used are collected in the wild state, but there are reasons for supposing that among certain aborigines, particularly in South America and Tropical Africa, the plant or plants used have been cultivated by them for this purpose throughout the ages.

Lists of plants used as fish-poisons have been published by Ernst (1), Radlkofer (2), and Greshoff (3), that of the last-mentioned author containing the largest number of species and being the most generally informative. As these works were compiled for the most part towards the end of last century, some of the less widely spread fish-poison plants are naturally omitted. It is intended in the present article to mention plants more recently recorded as fish-poisons, and also to dwell upon those among the better known ones to which particular interest may be attached.

There is little doubt but that many of these plants are of potential economic value and may in time be put to more profitable use than fish-poisoning. The practical utility of some, notably species of *Derris*, has already been demonstrated in the commercial manufacture of efficient contact insecticides. There are now good reasons for believing that others, especially species of *Tephrosia* and *Lonchocarpus*, could be used equally well for insecticidal purposes if material of the plants were available in sufficient quantity. The number of plants used to any extent as insecticides at the present time is small and comprises probably only Tobacco, Pyrethrum, *Derris* and Hellebore. Apart from toxicity to insects other factors have to be borne in mind when considering the possible use of plants as insecticides. One of the most important of these is whether material is likely to be available in quantity, i.e., whether the plant is comparatively quick-growing and easy of cultivation, for it is

seldom that wild sources are satisfactory and can be relied upon for any length of time. Various technical problems have to be confronted in the actual preparation of the extracts. Among these are the securing of efficient spreading, wetting, and adherence when actually applied.

Apart from use as insecticides the possibility exists, in view of the diverse natures of these plants, that the active principles peculiar to certain of them may prove of further use in pharmacognosy and toxicology.

The fact that certain of the fresh-water snails, known to be hosts of, and essential for the complete life cycle of, the organism responsible for schistosomiasis or bilharzia in man, are sensitive to the influence of fish-poisoning species of *Tephrosia*, suggests the possibility of such plants being of use in those areas where the incidence of the disease is high.

Cawston (4, p. 22), working on schistosomiasis in Natal, states "the crushed roots, unboiled, of *Tephrosia macropoda* or *Tephrosia Vogelii*, are very fatal to fresh water snails, and as one in twenty-five million of the former species is said to destroy fish in one hour the local species . . . would appear to be considerably more effective than copper sulphate in freeing pools . . . of bilharzia infection." It is in the warmer parts of the globe, where irrigation is employed on an extensive scale, that bilharzia is most prevalent and widespread, the extensive stretches of water and irrigation canals, etc., being favourable to the snail. Haslem (4, p. 8), in referring to the disease in the Far East, quotes "Thousands of farmers yearly . . . either succumb to an overwhelming infestation, or are compelled by increasing weakness and disability to become a burden on their families and the community (Houghton, 1920). It has been estimated that schistosomiasis is responsible for 25 per cent. of all deaths in Egypt (Griesinger, 1854). More recent observers, however, give a lower figure." The cultivation of green manure crops is common practice in irrigation areas. Many of the leguminous fish-poison plants are quick-growing, and worthy of serious consideration as green manures, some having already proved themselves of value for this purpose. The cultivation of such plants, with subsequent cutting or turning in, in irrigation areas suggests the possibility of their fulfilling a dual role by acting as manures and at the same time counteracting the snail pest.

The genus *Tephrosia* is quite one of the most interesting genera among fish-poison plants, not only on account of the large number of species of a toxic nature which it contains, but on account of the wide range of the genus throughout both hemispheres. Some individual species have become very widely distributed owing to the influence of man. Among these might be mentioned *Tephrosia purpurea* Pers., forms of which are said to be fish-poisons, which occurs now all over the tropics as a weed, even in out-of-the-way islands and in remote parts. The important species of *Tephrosia*

originally used in fish-poisoning in the different continents are quite distinct botanically, though closely related and possessing similar chemical properties. It is peculiar that the early inhabitants of different continents, far removed from one another without any form of communication, should have domesticated or taken into cultivation similar plants, e.g., *Tephrosia toxicaria* Pers. in South America, *Tephrosia Vogelii* Hook. f. in tropical Africa, and *Tephrosia astragaloides* Benth. in Australia, for one and the same purpose—that of stupefying fish.

The method of using these plants for procuring fish varies a great deal in different countries and is dependent also on the degree of virulence of the plant. All parts of the plant may be used, but in most cases a certain part only, such as the bark or root, in which the toxic principle happens to be chiefly located, is utilized. The usual method is for the plant or parts of the plant, after being mashed between stones or finely broken up, to be thrown into a pool or netted-off section of a stream. The poison acts on the respiratory organs of the fish, producing first a stupefying effect and later death, in the event of escape from the infected water being impossible. There are instances where an extract is mixed with some form of bait and is taken by the fish in the form of food. This custom is, however, far less common than the former method. In cases where the poisoning of the water is practised there appears to be a considerable difference with different plants in the time required for stupefaction or death of the fish to occur. With some of the more active forms such as Malayan "tuba" root (*Derris* spp.) and species of *Tephrosia*, fish are affected almost immediately the water is infected, whereas with others several hours may elapse before the fish rise to the surface. A very slow action is characteristic of some of the plants used by the Australian aborigines in obtaining fish from water-holes; the cut branches and leaves are left in the water-holes from twelve to twenty-four hours before poisoning takes place. With plants of this sort the toxic effect on fish is considered to be due to the presence of tannins or saponins rather than to any glucoside or alkaloid. The injurious effect of tannic acid on fish, acting on the respiratory organs, has long been known. However, with most of the better-known fish-poison plants their deleterious action has been proved definitely to be due to the presence of alkaloidal substances.

There is little definite evidence at the present time as to whether different species of fish are affected in differing degrees by these poisons. It is common knowledge among those who have witnessed the use of them that the small fry and younger fish are affected or killed some time before the larger matured individuals. Brown (5), in discussing the use of the bark of the "Dogwood" (*Piscidia Erythrina* L.) in Jamaica, makes an interesting statement with regard to the eel. He states that after being pounded the bark is "mixed with the water in some deep and convenient part of the river or

creek, etc., from which it may spread itself more diffusely around, and in a few minutes after it is well mingled, you'll see the fish, that lay hitherto hid under the neighbouring rocks or banks, rising to the surface, where they float as if they were dead; in which situation they continue for a considerable time; while the smaller fry are all destroyed, and float upon the surface for some days after. The eel is the only fish I have observed that could not be intoxicated with the common doses of this bark, though it affects it very sensibly, for the moment the particles spread where it lies, it moves off and swims with great agility through the water. I have sometimes seen them chased to and fro in this manner for some minutes without being any ways altered."

The fish obtained by the use of these poisons seem to be in no wise rendered unwholesome for food, though a tendency to putrefy sooner than would be the case with unpoisoned fish is frequently referred to in the literature.

The practice is recorded from both temperate and tropical countries but is more general in the latter. The species recorded are not limited to any one group of families but occur among families widely separated phytogenetically, and range in habit from small herbs to large lianas and trees. The family with the largest number of species is no doubt the *Leguminosae*: the *Papilionatae* in particular providing many of the specially virulent forms. In the following discussion species are dealt with according to the continent in which they occur.

AFRICA.

The genus *Tephrosia* figures conspicuously among African fish-poison plants, with such species as *T. Vogelii* Hook f., *T. macropoda* Harv., *T. densiflora* Hook. f., *T. periculosa* Baker, etc. The first-mentioned is of common occurrence, both wild and cultivated, in Tropical Africa, and is now well known in other tropical countries as a green-manure plant or cover-crop. Its toxic properties have been studied by Hanriot (6), Tattersfield (7), and others. The former worker isolated three substances, among which was a white crystalline compound, tephrosin. This proved extremely toxic to fish, a concentration of one in twenty-five million sufficing to kill roach in one hour. Sea-water fish were found to be on the whole more resistant to tephrosin than fresh-water fish, while other animals such as frogs, crustacea, mollusca, worms, etc., proved to be considerably less sensitive. Rabbits, it was found, ate the leaves of the plant without any ill effects, while dogs could take as much as 1 gm. of tephrosin with their food. Intravenous injections, however, proved fatal to both dogs and rabbits, a dose of 0.01 gm. per kilo. body weight proving fatal to a rabbit. With regard to the insecticidal properties of *Tephrosia Vogelii* Hk., Tattersfield (7) has shown aqueous and alcoholic extracts of the leaves and seeds to be highly toxic to the Bean Aphis (*Aphis rumicis* L.), the toxicity being of the same order as that of nicotine. The seeds of the plant are

regarded as being the most toxic portion, possessing 0.3 per cent. tephrosin as against 0.15 per cent. for the leaves and a considerably smaller percentage for the stem.

Tephrosia periculosa Baker has been recorded for fish-poisoning in parts of Tropical East Africa.

The best known fish-poison plant in South Africa is no doubt *Tephrosia macropoda* Harv. known as "lozane." It is common in the coastal grassveld of Natal and extends irregularly over the greater part of South-East Africa. The plant, which is of a more or less trailing habit, is characterised by a somewhat fleshy variously shaped rootstock. It is this portion of the plant that is used, being merely mashed between stones at the side of a pool or stream before use by the Zulus and other tribes. As legislation now exists against its use in Natal it is not employed as much as it was formerly. An infusion of the roots with water was commonly used by settlers in the early days in Natal as a wash for freeing dogs of fleas and ticks.

Another common Leguminous plant utilized in Africa in fish-poisoning is *Mundulea suberosa* Benth. This species, probably as a result of age-long cultivation, has now a very wide range. Apart from its occurrence in the greater portion of tropical and subtropical Africa, it is to be found in Madagascar, India and Ceylon. In northern Nigeria and the Sudan the plant is, according to Chevalier (8), frequently cultivated. The plant is stated to be the source of the Indian fish-poison known as "Soopli" or "Soopee." Its action on fish is rapid, and according to Greshoff the plant has the same type of active principle as Derris. Both bark and seed are used.

The bark of *Erythrophleum guineense* G. Don., well known as one of the West African ordeal and arrow poisons, is also on record as a piscicide, a decoction of the bark being used. The pods of *Cassia Sieberiana* DC., a tree widely distributed in West Africa, are used as a fish-poison in addition to being used medicinally.

The use of the climber *Ophiocaulon cissampeloides* Mast. in fishing in Nigeria and the Cameroons is quoted by some observers (9), the method of using the plant being to half roast thick pieces of the stem and after pounding to cast them into the pool or stream where fish abound. This is the only instance known of a member of the *Passifloraceae* being used for this purpose. Fickendey (10), regards the plant as effective as a fish-poison owing to the presence of free hydrocyanic acid or a cyanogenetic glucoside.

In the *Sapindaceae* a large number of fish-poison plants occur, particularly in the tropics of the New World and in the East. *Paullinia pinnata* L., though recorded as a fish-poison in parts of South America, does not appear to be used as such in West Africa although very prevalent in some areas. Among species reputed to be used in fishing are the following:—*Phialodiscus unijugatus* Radlk., *Sesbania pubescens* DC., *Pentaclethra macrophylla* Benth.,

Schwenkia americana L., *Pycnocomia macrophylla* Benth., *Paulowilhelmia polysperma* Benth., *Ampelocissus pentaphylla* G. et P., *Balanites aegyptiaca* Delile, *Randia nilotica* Stapf, *Zizyphus jujuba* Lam., and *Diospyros* spp. A number of other plants are recorded as piscicides from other parts of Tropical Africa, among which are several species of *Euphorbia*. *Elaeophorbium drupifera* Stapf, which is a common tree in the savannah forest in parts of the Gold Coast and elsewhere in West Africa, is used in rather a peculiar manner. According to Irvine "the white juice of this tree is collected into small shells which are then dropped into holes in rivers where fish abound [presumably in the dry season]. Fish are killed comparatively quickly in this way. The leaves and fruits are sometimes mashed and used."

In the Sudan two species of *Adenium* are used, *A. Hongkel* A. DC. and *A. speciosum* Fenzl., both being known as "Sim-es-Samak" (poison-the-fish). The root of the former species has been recorded as a piscicide on the Benue River in Northern Nigeria by Dalziel. *Adenium speciosum* Fenzl. is a fleshy thick-stemmed aborescent shrub, up to ten feet in height, the juice of which is said to be used also as an arrow-poison. Burt Davy (1906) records the use of *Adenium multiflorum* Kl., a deciduous tuberous-rooted shrub, as a fish-poison by the natives in the low-veld of the north-eastern Transvaal.

According to Cardoso, one of the best known fish-poisons on the Cape Verde Islands is *Frankenia ericifolia* C. Sm. var. *microphylla*, known locally as "Mato-sagro" or "Mato-salema." The plant is mashed up with shrimps or fish in the form of a thick paste, which is then placed in holes in the rocks [presumably at low tide], and as the fish are overcome they are collected and placed in the baskets. Other plants stated by the same author to be used in a similar manner on these islands are *Statice pectinata* Ait. and *Aizoon canariense* L. *Euphorbia chamaesyce* L. is used, but in a rather different manner. Speaking of this plant, known locally as "Trevinha," Cardoso states that after spring tides, when fish have collected in canals and low-lying areas, villagers cast stems and leaves of the plant into such areas and the following day reap a rich harvest of the poisoned fish. In Madeira species of *Euphorbia* are also used, notably *E. mellifera* Ait. and *E. piscatoria* Ait.

Species of *Verbascum* are much better known as fish-poisons in Europe than in Africa. One species (*V. phlomoides* L.), however, is quoted by Rosenthal (26) as used in Abyssinia.

AMERICA.

South America probably possesses a greater number of recorded fish-poisoning plants than any other continent. A few of the more virulent of these plants, especially those occurring in British Guiana, have in recent years been studied from the biochemical standpoint, with a view to ascertaining their insecticidal value, and have yielded interesting results.

An interesting feature about some of these South American species is that they have not yet been recorded away from the precincts of man, and are known only from aboriginal cultivations, it being common practice among certain tribes to cultivate a few plants round their habitations to supply their wants in fishing. Altson, who has made a special study of these plants in British Guiana, lays emphasis on this fact and points out that some species seem never to flower. Over a period of some years spent in British Guiana this observer was unable to find certain of these plants in flower or in fruit in spite of a continual look-out being kept and specimens being frequently seen. The following plants are stated to be known only from native habitations in British Guiana:—*Clibadium sylvestre* (Aubl.) Baill., *Tephrosia toxicaria* Pers., *Euphorbia cotinoides* Miq., *Phyllanthus* sp. A distribution of this sort courts the assumption that these plants have been under cultivation throughout a considerable period. If this is so, one would expect a wide degree of variation to exist within each species, variation extending also possibly to the degree of toxicity.

Two of the most commonly used fish-poisons of British Guiana are those known to the creoles as Black and White Haiari, forest lianas common on both lateritic and sandy soils. Both belong to the genus *Lonchocarpus*, but there is some doubt as to whether each is a distinct species or the one a varietal form of the other. Outwardly the one possesses a greyish and the other a dark-coloured bark, hence the local names of Black and White Haiari. Schomburgk, in his "Travels in British Guiana 1840-44," gives an account of the use of Haiari by the Guiana natives, and refers to the plant as *Lonchocarpus densiflorus* Benth. Schomburgk's original specimen marked "bastard haiari" does not, however, agree with specimens of Haiari collected in British Guiana subsequently, which do not appear to belong to the species *L. densiflorus* Benth. According to Altson the Arawak Indians know the White Haiari by the name of "Haiari" and the Black they call "Wacorocordak." The White is known to the Warrau Indians as "E-Yari" and to the Patamona as "A-Ya." White Haiari is often cultivated by the Arawak and Warrau tribes in the open on sandy and lateritic soils, under which conditions it develops into a straggling shrub. Speaking of Haiari Schomburgk states "When the Indians want to carry out a poisoning expedition, they smash and squash up the roots beforehand with huge wooden clubs and throw the mass into the water at those spots where they notice the fish to be plentiful; in about ten to fifteen minutes its effects are visible upon the scaled denizens. They rise to the surface, spring out of the water, gasp for breath, and then turn belly upwards, in which condition they are caught by hand or shot with the arrow. The small finger-long fry usually die while the larger fish generally recover after a time. . . . That the poison not only acts upon the respiratory organs as can be recognised from the difficulty in gasping for air and widely opened gill covers, but that it affects the nervous system to an equal degree is shown by

the generally dilated pupils of the dying fish." (Roth's translation).

There are abundant references to the use of Haiari or similar poisons in the Guianas. Coudreau (11) mentions in some detail the use of the plant in French Guiana which is referred to as "Nicou," or "Nesi" or "Bois enivrant" and considered to be *Lonchocarpus nicou* DC. Pool (12), in discussing the use of "Nekoe" by Indians in Surinam—referred to as *Lonchocarpus violaceus* Kunth. by Greshoff—concludes that the active principle is closely akin to that of *Derris*, as the following quotation indicates:—"Na onderzoek bleek mij, dat het werkzaam bestanddeel der nekoe in hoofdeigenschappen met derrid overeenkwaam."

The name "cube" is used in Peru and parts of Brazil for a virulent fish-poison plant, the botanical identity of which has only recently been definitely established. According to Killip and Smith (13) the plant is without doubt *Lonchocarpus nicou* (Aubl.) DC. These authors encountered the plant in both the wild and cultivated state when on a trip of botanical exploration made into the interior of Peru and across Amazonian Brazil. They state "We found that although several kinds of plants were used as fish poisons, such as *Cracca toxicaria* [*Tephrosia toxicaria*], *Cracca nitens* and one or more species of *Clibadium*, and in Brazil certain species of *Lonchocarpus*, one plant alone (cube) was most commonly cultivated and almost everywhere was said to be the most powerful. Curiously we never discovered this plant (*Lonchocarpus nicou*) in flower or fruit, a circumstance giving rise to interesting speculation." Some of the plantations encountered were said to contain several thousand plants, one centre of cultivation being Yurimaguas, situated on the Huallaga River a few miles from its mouth. In Brazil the plant was found both in the forest and in cultivation at Manáos and Gurupá, and in cultivation at Para. A second species of *Lonchocarpus*, the roots of which were reported as a fish-poison on the lower Amazon, was regarded as a new species and has been described by Killip and Smith as *Lonchocarpus urucu* K. & S. In referring to yet another species of *Lonchocarpus* (also a piscicide) these observers state "Along the south bank of the Rio Negro above Manáos we found a large plantation of a second species of *Lonchocarpus*, *L. floribundus* (Killip and Smith 30041). This was a low shrub, 1 to 1.5 metres high, in fine flower and fruit. The roots were of a softer, more porous texture than those of *Lonchocarpus nicou*, but were said to be quite as effective as a fish-poison."

The active principles of both Black and White Haiari from British Guiana have been studied in some detail by recent workers. Extracts from the stems and roots of both have been found to be highly toxic to insects, due to the presence in not inconsiderable quantity, of a compound identical with tubatoxin (the substance to which species of *Derris* owe their toxicity). The leaves, however, were not found to be toxic at any of the concentrations tested. Less

toxic resins were also isolated from the stems and roots. Tubatoxin and the resins proved to be several times more poisonous to certain insects than nicotine. When tried as a stomach poison extracts of Haiari showed both a toxic and a repellent action to the larvae of the insects tested (14).

Species of *Clibadium* have been recorded frequently under the name of "Barbasco" from several South American countries. In British Guiana the leaves of *Clibadium sylvestre* (Aubl.) Baill., an undershrub known to the Arawaks as "Conami," are mixed with bait and commonly used in fish-poisoning. According to some writers the seed also is used. This species has a wide range in Southern and Central America, and is known and used as a fish-poison more or less throughout.

Another of the better-known plants used in fishing and for insecticidal purposes by aborigines in the tropics of the New World is *Tephrosia toxicaria* Pers. This plant is known to the Caribs as "Onabouboue" and also in British Guiana as "Yarro conalli." Its cultivation, according to Chevalier (8), must have been widespread in the pre-Columbian period. This author shows how, at about the time of the voyage of P. Ch. Plumier (1689-97), the plant was common in the Antilles, but that subsequently it became more and more rare and almost disappeared at about the time of the extinction of the Caribs in the islands. According to Altson, in British Guiana the roots of the plant only are used, but it would appear that elsewhere in South America the aerial parts of the plant are used also. Macfadyen (15), in speaking of the occurrence of the plant in Jamaica and of its uses states "This plant is said to have been originally brought from Surinam, or what is more probable from Africa." An African origin for this species can hardly, however, be looked upon with favour at the present time. An enquiry (14) into the toxic properties of the plant made at the Rothamsted Experimental Station showed the roots to be very toxic, the stems less so, and the leaves to "possess insecticidal properties only in a very slight degree." The roots were considered to be quite as powerful in their action as the roots and stems of "Haiari" and leaves and seed of *Tephrosia Vogelii* Hk. As was the case with these species, both a crystalline and a resinous material was isolated from *Tephrosia toxicaria* Pers. Trials with an alcoholic extract of the roots as a stomach poison on insects gave results similar to those given by Black and White Haiari. The plant has now been introduced to certain Eastern countries, notably Malaya and Ceylon, where it is on trial as a cover-crop.

Other common Guiana fish-poisons are *Euphorbia cotinoides* Miq., a shrub possessing an irritating latex, the leaves and young shoots of which are used, and *Serjania paucidentata* DC. The latter is a small-stemmed liana, the stems of which are used in much the same way as Haiari. A small shrub, *Phyllanthus* sp.—known to the Arawak Indians as "Para-para"—is noted from British Guiana

as a piscicide by Altson, who records it only from aboriginal cultivations. The leaves of the plant are used; the name "Spanish Conami" is sometimes given to it by creoles. Other species of *Phyllanthus* quoted as piscicides in South America by Greshoff are *P. brasiliensis* Muell., Arg. var. *genuinus*, *P. piscatorum* Kunth, *P. epiphyllanthus* L., *P. cladotrichus* Muell. Arg., and *P. Conami* Sw.

The Sand Box Tree of South America, *Hura crepitans* L., has been reported as a fish-poison by many travellers in South American countries, the latex from the trunk, which is procured by tapping, being used. According to Ortega (16), a closely allied species, *Hura polyandra* Baill., is used in a similar manner in parts of Mexico. This author states that in some districts the latex is so much in demand for stupefying fish that there is scarcely a tree that is not annually bled for this product.

The *Sapindaceae* in South America are particularly rich in fish-poison plants, particularly among the genera *Paullinia*, *Serjania* and *Sapindus*. These plants owe their injurious effect on fish to a high saponin content. Macfadyen (15), in dealing with the uses of the fruits of *Sapindus Saponaria* L., states "The fleshy covering of the seeds of this tree, and in a less degree the root, make a lather in water, and serve all the purposes of soap, being very generally employed by the lower classes in washing their coarse linens. Bruised or pounded, and thrown into ponds of water, they intoxicate and kill any fish that may be there."

According to Chestnut (17) the weed *Eremocarpus setigerus* Benth. (*Croton setigerus* Hook.), popularly known as "turkey mullein," is or was used by Indians in California in fish-catching. The early Spaniards were well acquainted with the plant, calling it "yerba del pescado." Another popular name, indicative of the intoxicating action of the plant, is "fish locoweed."

ASIA.

One of the most widely spread and best known of Asiatic fish-poisons is undoubtedly *Anamirta Cocculus* Wight et Arn. (*A. paniculata* Colebr.), the fruits of which have long been known to possess peculiar and poisonous properties. Their use in medicine, under the name of "cocculus indicus" or "Indian berries," chiefly as a stimulant and parasiticide, has long been established. The berries are extensively used in parts of India, Malaysia and the Philippines in procuring fish. Their use for this purpose has even extended to European countries, and it is stated that, as a result of cases of poisoning among those who have consumed fish caught in this way, it has been found necessary in some countries to forbid the sale of the berries except in pharmacies. Cases are on record of poachers making use of the berries for capturing trout on some of the English rivers.

The berries owe their poisonous properties to the presence primarily of picrotoxin and to the alkaloid menisperm. A common

method of using the berries in Eastern countries is to grind them to a powder and then make into a thick paste with boiled rice. In this form a small quantity is sufficient to render fish, birds, and certain animals insensible. As an alternative the berry in a partly crushed state may be thrown into the water.

The *Derris* fish-poisons of Malaya and neighbouring countries are of particular interest on account of the extent to which they are now used in the commercial manufacture of insecticides. Known collectively as "tuba" root, the species most generally used as piscicides and of most promise in connection with insect control are *Derris elliptica* Benth., *D. uliginosa* Benth. and *D. malaccensis* Prain. In these species the toxic substances are located for the most part in the roots and root-bark.

The manner in which "tuba" is used by the Malays in sea-fishing is described by Wray (18) as follows:—"It [the root] is pounded or ground fine and mixed with stiff clay and crushed refuse, shrimps or small fish, and the mixture is then made into balls and dried. These balls are thrown into the sea, like ground-bait, and fish eating them become poisoned, rise to the surface, and are caught by the watching fishermen. This way of using it is probably not very harmful, though the same cannot be said of its use in fresh waters." In using "tuba" in rivers and fresh water generally the more usual practice is to pound the roots in water in some form of receptacle, sometimes a half-filled canoe, and then to empty this at the top of an enclosed portion of the river or stream. Sometimes lime is added after pounding in order to make the milky fluid sink and spread more rapidly when poured into the river. As the "tuba" infected water comes down the river the fish swim in a frenzied panic down stream to the second barrier, where they are speared or clubbed. In the construction of the barrier space is sometimes sufficient to allow the smaller fish to pass and escape. The exciting sport of tuba-fishing, which is now illegal in the Federated Malay States, has been described in detail by some writers, notably by Maxwell (19) and by Hose and McDougall (20).

The use of *Derris* as an insecticide was practised in the East long before its appearance in Europe and America. As far back as 1848 attention was directed to the use of "tuba" root as an insecticide by Oxley (21), who stated—in connection with the cultivation of Nutmeg seedlings—"Washing the leaves with a decoction of 'tuba' root is the best remedy I know of for a very small moth-like insect that is apt to infest the young plants, laying its eggs on the leaf." Chinese market-gardeners in Malaya frequently make use of an infusion of the pounded root in water, which is sprayed over the plants or brushed over with a bunch of feathers.

Studies of the toxic principles of the more important species of *Derris*, and of their insecticidal properties, have been made by several workers, notably Tattersfield and Roach (22), and McIndoo, Sievers and Abbott (23). The species investigated were found to

act as both contact insecticides and stomach poisons, and to affect different classes of insects differently according to the development of their nervous systems. According to McIndoo, the powdered root used as a dust was found to be effective under practical conditions against dog-fleas, chicken-lice, mealy bugs or red spiders. Used as a powder in water, with or without soap or other emulsifying agent, it was effective against most of the aphids tested, cabbage-worms (*Auto-grapha brassicae* Riley), potato-beetle larvae and certain caterpillars. Other investigators have found the larvae of *Lepidoptera* and sawflies to be very susceptible, and mosquito larvae and pupae, fresh-water crustaceans and molluscs to be sensitive also, while certain aphides such as the Bean-aphis (*A. rumicis*) and Woolly Aphis (*A. lanigera*) were resistant to wet application. Wray found that 0.03 per cent. of the green root in water was sufficient to kill fish and that 0.00029 per cent. of the resin was quickly fatal, while 0.00001 per cent. proved fatal in from fifteen to thirty minutes according to the species of fish.

The opinion from observations made in Malaya (24) with cultivated plants is that the fine lateral roots always have a higher toxic content than the large roots and that the toxicity is liable to vary with the age of the plant. In this connection it is stated—"Determinations of the ether extract of roots of *Derris elliptica* Benth. have shown that this variety should be harvested approximately twenty-three months after planting, the amount of toxic substance in the ether extract reaching a maximum about this period. Subsequently the toxic content declines until eventually the root becomes unsaleable." The cultivation of "tuba" root in the Federated and Unfederated Malay States has extended very much during the last few years, and at the present time runs into a few thousand acres.

The most important constituents of "tuba" root have been found to be a white crystalline derivative (tubatoxin), soluble in most organic solvents but insoluble in water, and a resin, both of which are toxic. It would appear that their toxicity to insects depends largely upon their degree of dispersion, though the actual physiological action is not at the present time thoroughly understood. It is regarded as strange that the poisonous constituents of *Derris*, being non-volatile insoluble solids, should be able to function so effectively as contact insecticides.

Tephrosia candida DC., which is now widely distributed in tropical countries as a plantation cover-crop, has been recorded by Gamble (25) as a fish-poison plant in Eastern Bengal and Burma, the bark and leaves being chiefly used. The roots and stems but not the leaves of this species were investigated and reported upon by Tattersfield (14). It would appear that both are toxic, though to a considerably less degree than the roots of *Tephrosia toxicaria* Pers. or leaves of *Tephrosia Vogelii* Hk. The plant is regarded as possessing only very moderate insecticidal properties.

Croton Tiglium L. has been recorded as a piscicide in several Eastern countries, and appears to have been much used by natives of the Philippine and neighbouring islands, where the fruit is sometimes known as "tuba." In the Celebes a common method of using the plant is to grind the fruits up with the strong-smelling root of an aroid (*Homalomena rubra* Hassk.) and scatter upon the surface of the water. The toxic effect is doubtless due to toxalbumin (croton). There seems to be a certain amount of disagreement among authors as to whether fish obtained by using *Croton Tiglium* can be eaten with impunity. Bacon (3, pt. iii, p. 89), speaking of this plant, states—"persons who eat fish poisoned with 'tuba' are not disturbed, although it is considered dangerous to drink water that contains any quantity of it." V. d. Velde, on the other hand, states that in using the fish great care must be taken to clean out thoroughly the entrails, to avoid being affected by the poison: and that the effect of the poison on the fish is sometimes so severe as partly to destroy the internal organs. A large number of other Euphorbiaceous plants, including other species of *Croton*, are in use as fish-poisons in Asia, the more important genera being *Euphorbia*, *Fluggea*, *Securinega*, *Macaranga*, *Excoecaria* and *Sapium*.

The fruits of several species of *Diospyros* from the tropics of both the Old and the New World, are known to be injurious to fish. Referring to a Philippine species Bacon (27) states—"A plant which is endemic, common and widely distributed in the Philippines; the part used being the fruit of the tree, which turns black after a few days' exposure to the air. The natives claim that the fruit is exceedingly poisonous, that it will quickly kill fish, and will even cause a crocodile to leave the water." The fruits of *Diospyros toposioides* King and Gamble are utilized in Malaya and those of *D. montana* Roxb. by the natives of Travancore.

The ripe apple-like fruits of *Randia dumetorum* Lam. are employed in parts of India, the fruits being bruised before being thrown into pools. The following remark of Roxburgh (28) in regard to this species is of interest—"If this is done during the hot season, it is said the fish generally die, but if during the wet or cold season they recover. . . . *Cocculus indicus* [*Anamirta Cocculus* Wight et Arn.] does not grow in these parts nor is it known or used there for this purpose." Other Indian plants whose pulpy fruits are used in a like manner, are *Gynocardia odorata* R. Br. and *Barringtonia acutangula* Gaertn. The genus *Barringtonia* is well represented throughout Polynesia, and a number of species are used as fish-poisons throughout the different islands.

Cleistanthus collinus Benth., a small tree occurring in various parts of India, is well known as a poisonous plant, the dried fruit being known to figure frequently in criminal poisoning cases, and the bark to be used in fish-poisoning. According to Hooper (29) the dried bark contains a high percentage of tannin (31.5 per cent.), and as no trace of an alkaloid or glucoside could be discovered the tannin is regarded as responsible for the injurious action on fish.

AUSTRALIA.

In Australia the custom of employing plant poisons in fishing is most noticeable among the aboriginal inhabitants of North-Eastern Australia, though it is recorded also in New South Wales, Victoria, North Australia and Western Australia. In South and Central Australia fish-poison plants are not generally used, as local conditions are unfavourable. The Tasmanians are stated never to make use of piscicides at all, which is strange for an insular people. In New Zealand also their use is regarded as unknown. In this connection the following statement by Hamlyn-Harris and Smith (30) is of interest—"Expert navigators and canoe-builders such as the Maoris never used them. Fish are very plentiful all around the coast, and they probably never experienced any difficulty in obtaining all they required. Mr. Cheeseman, the Curator of the Auckland Museum, has pointed out that it is rather curious, considering the extent to which fish-poisons are employed in Polynesia, but that on the other hand none of the plants used in Polynesia extend to New Zealand, and that they have few poisonous species of their own. This just suggests the idea that the plentiful growth of poisonous shrubs may be one of the reasons why the Malaysians employed fish-poisons universally, in spite of the fact that they too might be regarded as expert navigators, and might have got all the fish they required by more legitimate means." The same authors are inclined to the belief that the practice of fish-poisoning in Australia has arisen independently—by chance observation in the first place—and that the evolution of an empirical knowledge of efficient piscicides has occurred independently of any external influence from Polynesia where the use of piscicides is so common. Considering the universality of fish-poisoning such an assumption appears justifiable. An example of knowledge of toxic properties in plants acquired by chance is afforded by the present-day use of *Asclepias curassavica* L. by aborigines in Queensland. This plant, which is alien to Australia, cannot have been naturalized in that continent very long, and a knowledge of its use in procuring fish cannot therefore have been handed down from one generation to another, but must have been obtained more or less spontaneously.

Among the plants recorded in use as fish-poisons among the aboriginal inhabitants of Australia are a number with very marked astringent or tanniferous properties, such as species of *Acacia* and *Eucalyptus*. The injurious effects of such plants are due to tannins and saponins rather than to the presence of any alkaloid. Their relatively slow action compared with the better-known piscicides supports this view. Maiden (31) mentions several species of *Acacia* used in fish-catching, among which are *Acacia falcata* Willd., *Acacia penninervis* Sieb., and *Acacia salicina* Lindl. var. *varians* Benth.

There are not many references to the use by blacks of the all-pervading *Eucalyptus* vegetation in Australia for fish-catching. One of the earliest is probably that of Sir T. Mitchell (32), who

states—"There the river (River Lachlan) contained some deep pools and we expected to catch fish, but Piper (a black interpreter) told us that the holes had been recently poisoned, a process adopted by the natives in the dry seasons. . . . All these holes were full of recently-cut boughs of the eucalyptus, so that the water was tinged black." Speaking of the blacks in the interior of Queensland, Palmer states that small branches of *Eucalyptus microtheca* F. Muell. (the "Colibah" or "Flooded Box") are cut up and laid in the water for several days to sicken the fish. This may be the same species as that referred to by Sir T. Mitchell. The following remarks by Roth (33) refer also to the use of *Eucalyptus* though the actual species is not clearly indicated. "In the Cloncurry Woonamurra, and Leichhardt-Selwyn districts, especially with large water-holes, numerous leafy boughs and branches of 'gum-tree' ('mitakoodi,' 'joo-a-ro'), are utilized for capturing fish. The whole camp of blacks working at it, will start throwing these in first thing in the morning; during the day the water becomes darker and darker and strongly smelling until the following morning at sunrise, when it is almost black, the fish all lie panting at the surface and are easily caught."

The Fresh-Water Mangrove, *Barringtonia calypttrata* R. Br. (*Barringtonia racemosa* Gaud.) is reported to have been used by the natives of the Mitchell River, Northern Queensland, the bark being cut into small pieces and severely pounded between stones before being placed in the water. The bark of *Barringtonia speciosa* L. is also used and has been found when tested experimentally (Hamlyn-Harris & Smith) to be very toxic to fish, producing initial extreme excitement and exaggerated movement of the gills. The active principle, however, was not ascertained, the bark being found to be "alkaloid-, saponin- and practically tannin-free." The inhabitants of the Mary Anne Islands are said to use this plant extensively and Alvin Seale (34) states "In former times the natives caught and dried large quantities of fish by its means, a grand fishing fiesta being held at certain seasons of the year. The Spanish authorities, however, finding that this was depleting the waters by killing young as well as old, abolished the method in 1894. When the Americans took possession the law was considered obsolete. By chance, I was present at the first of these fiestas that had taken place for seven years. Fully several hundred people took part in the fishing. An immense pool several hundred feet deep, a short distance inside the reef, was surrounded by a line of seines. At low tide about one barrel of this precious juice was poured into the pool. The effect was almost instantaneous; hundreds of fishes came gasping and struggling to the top of the water, where they were captured and killed by the natives. No ill-effects seemed to follow the eating of these poisoned fish." In districts in and around Townsville in Queensland, where the plant is known as "Arroo" the fruits are eaten as food. This is strange, as the fruit of this species is used in fish-poisoning in New Britain according to Brown (35), and in the

Bismarck Archipelago, where the islanders cast into the water the ground-up seed which the fish consume and become stupefied (36).

Careya australis F. Muell. is a well-known and effective Australian fish-poison plant which grows plentifully in some areas. The bark is the part employed. It is stated that among the blacks on the Burdekin, a discrimination is made according to whether the water is salt or fresh—the bark of the stem being used in fresh water and that of the root in salt. The bark has been found to be saponaceous (30), infusions showing characteristic frothing at great dilutions and haemolysing at a concentration of 1 : 1000.

Another well-known piscicide in Queensland is *Jagera pseudorhus* Radlk. (*Cupania pseudorhus* A. Rich.), a small tree whose bark possesses a great reputation among the natives as a fish-poison. Interest is attached to this species in that during the War the bark was used as a substitute for "quillaja" bark for producing a head or foam on cordials. In an investigation of the occurrence of saponin in this species Francis (37) has shown saponin to be present in almost all parts of the tree with the exception of the leaves. An infusion of the bark has proved fatal to fish in one hour at a concentration of 1 : 1000, and haemolysis of blood corpuscles occurs at a dilution of 1 : 1400. An infusion of the leaves was found to exercise no notable physiological effect on fish, and the preference for the bark shown by the natives appears therefore to be well-founded. A method of using the bark, observed by Kenny on the Kull River, is as follows:—"The bark is carefully scraped from the tree-trunks and limbs and cooked in native ovens for about half an hour; then, when taken and put into a pond and well mixed in the water still held in dilly-bags, soon acts on the fish."

It has long been known that certain species of *Tephrosia* are used by Australian Aborigines in obtaining fish. Roth (33) states—"The practice of poisoning the water by special plants and capturing the fish as they rise to the surface is met with in the Cloncurry and Woonamurra districts. The Metakoudi use the "too-ta" (*Tephrosia astragaloides*), a blue-flowered shrub growing about three to four feet high. Its leaves are crushed and bruised, and whole bundles full thrown into the water-hole which may be waist-deep and twenty to thirty feet in diameter; in the course of a quarter or half-an-hour the fish come up to the surface, where they are knocked over by the hunters." *Tephrosia rosea* F. v. M. is considered to be one of the most effective fish-poisons used in the Cape York Peninsula and is known to Mapoon and Pennefather River natives as "Te-uma." Another frequently recorded species is *Tephrosia purpurea* Pers. (38), known as a fish-poison in other tropical countries also.

Hamlyn-Harris and Smith (30) experimented with both *Tephrosia rosea* F. Muell. and *T. purpurea* Pers. and found the action on test fish to be precisely similar to that of *T. Vogelii* as described by Hanriot, a concentration of approximately 1 : 1,000,000 of the

final product proving fatal in half-an-hour. They state—"Experimental work on *T. rosea* and *T. purpurea* demonstrates the presence of probably identical bodies in these species. Following substantially the method of Hanriot, extraction with alcohol and distillation of the extract in steam, a pungent yellow oil passed over which is thought to be identical with tephrosal (obtained from *T. Vogelii*) . . . The residue was found to be yellowish and hemi-crystalline, and the residue from evaporation of acetone solution is also markedly crystalline; the crystals being associated with a yellow body from which it was impracticable, with the material available, to completely separate them."

Species of *Diospyros*, as is the case in Asia and Africa, are numbered among the known fish-poisons in Australia, the fresh fruit being used. The best-known species is perhaps *Diospyros hebecarpa* A. Cunn. It is stated with regard to this species (39)—"Members of the Goongangee tribe pound it (the fruit) between two flat stones, the resulting pulp being then placed in a dilly-bag, which is swirled about in the selected creek (fresh or salt water). In fresh water "Tulican" (the Goongangee name) turns the water yellow, in salt water red. As the fish become stupefied they rise to the surface and are usually removed with a spear. In spite of the caustic nature of the fruit the poisoning does not in any way appear to spoil the fish as an article of food. The juice of the fruit brought into contact with the skin produces blistering, and the natives in handling it exercise great care in consequence." Dried fruits were found to be inefficacious as a fish-poison.

A species of *Lonchocarpus* (*L. Blackii* F. Muell.) and three species of *Derris*—*D. involuta* Sprague, *D. trifoliata* Lour. var. *macrocarpa* Domin (= *D. uliginosa* Benth.) and *D. koolgibberah* F. M. Bailey—occur in some of the warmer parts of Australia, chiefly Queensland (40). It is not known whether *L. Blackii* possesses piscicidal properties. There are, however, numerous records of the use of species of *Derris* for stupefying fish in Queensland and on neighbouring islands. Both *Derris trifoliata* var. *macrocarpa* and *D. koolgibberah* were found by Hamlyn-Harris and Smith (30) to be extremely toxic to fish. Speaking of the former these authors state "The experiments of the authors confirm the extreme utility and effectiveness of the plant as a stupefacient. The test fish, first evidencing considerable excitement, rapidly became stupefied and periodically rose to the surface. An infusion of one part of dried stem in one thousand parts of water proved fatal in under an hour. The rapidity of action, it may be surmised, has earned for the plant the name of 'Wild Dynamite' among the natives of Dunk Island." *Derris koolgibberah*, known as "Poison Rope," was found to possess a similar action owing to the established presence of derrid. In this species the presence of saponin was also indicated.

In addition to species already mentioned the following are numbered among recorded fish-poison plants in Australia:—

Garcinia Cherryi Baill., *Pongamia glabra* Vent., *Faradaya splendida* F. Muell., *Alocasia macrorrhiza* Schott., *Polygonum Hydropiper* L., *Sarcocephalus cordatus* Miq., *Terminalia sericocarpa* F. Muell., *Albizia procera* Benth., and *Stephania hernandiaefolia* Walp. Hamlyn-Harris and Smith (30) adopt a classification for the plants studied, based on their observed efficiency as piscicides, which is as follows:—

- “Group A.—Effective and rapid in action at great dilution.—*Derris*, *Tephrosia*, *Pongamia*, “Nero,” containing active principles associated with ether-soluble resins. The sapotoxin-containing *Careya*, *Cupania* (*Jagera*), *Faradaya*, *Garcinia*.
- Group B.—Poisons of intermediate effectivity.—*Barringtonia speciosa*, *Stephania hernandiaefolia*, alkaloid-containing.
- Group C.—Poisons of lesser activity.—Slow in action at higher concentrations or uncertain in action.—*Acacia*, *Albizia*, *Eucalyptus*, *Thespesia*, *Terminalia*, *Polygonum*.
- Group D.—Reputed poisons, found innocuous.—*Sarcocephalus*, *Pleiogynium*, *Alocasia*, *Asclepias* (?)”

EUROPE.

In Europe, particularly the Mediterranean countries, the practice of killing fish by means of toxic plants is a very ancient one and dates back to prehistoric times. Aristotle in his “*Historia animalum*” mentions the use of a plant (probably *Verbascum* sp.) in killing fish. Pliny refers to what is apparently a species of *Aristolochia* for poisoning fish in Italy, and also to a Spurge.

It is interesting to observe that in both Greek and Spanish special verbs exist to denote the practice of fish-poisoning. Ernst points out in this connection that it is significant that similar words should have arisen in Greek and Spanish to express the same use for the same plants without there being any corresponding word in Latin or any ethnological connection between them.

The generic name *Verbascum*—the genus being well known for the fish-poisoning properties of some of its species—is regarded as derived from the Latin “barba” on account of the hairy appearance of members of this genus. The Portuguese or Spanish word “embarbasca” (to fish by poisoning) and “barbasco” are considered to be of similar origin. It is interesting to note that the word “barbasco” in certain South American countries has now come to be used as a general term for any plant that may be known to possess fish-poisoning properties.

Among the more important fish-poisoning species of *Verbascum* are *V. phlomoides* L., *V. sinuatum* L. and *V. Thapsus* L. The parts of the plant used as a rule are the capsules and seeds, which are ground to a powder between stones and cast into the water. The first two of the above mentioned species are well known in Greece. Rosenthal (26) states that in Greece, in addition to the use of the

seeds of *Verbascum phlomoides* L. in stupefying the fish, the fresh plant placed in cellars or buildings has the effect of driving away rats and mice. According to Heldreich (42) *Verbascum sinuatum* L. is commonly known in Greece as “Phlomos,” a name given also to a species of *Euphorbia* with fish-poisoning properties. Rosenthal enquired into the poisonous properties of this species of *Verbascum* and found in the dried fruits 6.1 per cent. of a poisonous saponin. In the Northern European species of *Verbascum* saponin was found only in a very small quantity, even its presence in some cases being doubtful. Speaking of species of *Verbascum* Lindley (43) states—“The Muelleins approach *Digitalis* . . . the seeds of *Verbascum Thapsus* and *nigrum* are used by poachers to poison fish, and the flowers of *V. Lychnitis* are sometimes used to destroy mice; the foliage of these plants is acrid and bitterish.” *Verbascum Thapsus* L. is mentioned by a number of writers including Rochleder, Cornevin, and Wittstein. The last-mentioned states (44) “Das frische kraut riecht widerlich betäubend; zerquetscht soll es die Fische betäuben und in Italien und Griechenland noch zu diesem Zweck gebraucht werden, ebenso die frischen Blumen und die Samen.” *Verbascum crassifolium* Hoffm. is, according to Cardoso, well known as a fish-poisoning plant in Portugal.

In an interesting account by Greshoff (3) dealing with the significance of the genus *Verbascum* in the past, early references to the uses of the plants in medicine and as piscicides are given. They were apparently familiar to early Arabian physicians, and according to Ebn. Baethar, the well-known Arab writer of the thirteenth century, the plant (*Verbascum*) known as “Sikran elkut” was commonly used in fishing in Spain at the time of the Moorish occupation. So general did the practice in this country become that in 1453, and at intervals later, the method was declared illegal and a punishable offence. The Portuguese writer Ficalho (45) states that in Portugal, in the year 1565, a law was made, with severe penalties for infringement, preventing the “casting into rivers or lakes of *Verbascum*, *Daphne*, ‘Cocco’ (*Anamirta paniculata* Colebr.), chalk or any other material likely to kill the fish.” Dodoens, the Belgian botanist of the sixteenth century, refers in an interesting though sceptical manner to the use of what is in all probability *Verbascum* (“Wollecruydt”) in his famous herbal. He states that “some wash their hands with the sap of ‘Wollecruydt’ and then place them in the water believing that thereby the fish will come to their hands and allow themselves to be caught” (translation). In Linnaeus’ time the fame of *Verbascum* as a medicinal plant had considerably declined and its power of stupefying fish was discredited, though in a later edition of Linnaeus’ “*Praelectiones in Ordines Naturales*” the following occurs—“*Verbascum venenatum* esse inde apparet, quod globulis farinaceis mixtum pisces necet.”

In Sardinia the shaved and mashed roots of *Daphne Gnidium* L. are said to be used in fishing and to be regarded as superior to

Oenanthe, the plant being known in the island as "pateddu." Ernst quotes *Daphne Cneorum* L. as a fish-poison in Spain, the leaves and fruits being chiefly used. *Daphne oleoides* Schreb. is recorded as a fish-poison by Muwaffak and *D. Gnidium* L. by Martius, the last-mentioned species being regarded as only seldom used.

Several species of *Euphorbia* are known as fish-poisons in Greece and neighbouring countries. One of the best known of these is *Euphorbia dendroides* L., the method of use being described by Walpole (46) as follows:—"The inhabitants of Salamis practise a singular method of catching the rock-fish by poisoning or intoxicating them. For this purpose they make use of 'phlomos' or Tree Euphorbia, chopped and macerated and then pushed under the large stones or holes and caverns, where these fishes lie. After a few minutes they rise to the surface of the water and are either enclosed in small nets or are even taken by the hand. The *Euphorbia Characias* is employed for the same purpose and is now called 'thumalos' as well as 'phlomos.' The latter name is also given to *Verbascum sinuatum* which is used at Constantinople and Zante to catch different kinds of fish." In describing the use of *Euphorbia Characias* L. in Greece Landerer (47) states that the fish so procured quickly putrefy and that persons making use of the plant are liable to punishment and imprisonment. Other species of *Euphorbia* mentioned for Southern Europe are *E. amygdaloides* L., *E. Sibthorpii* Boiss., *E. platyphylla* L., *E. aleppica* L., and for central Europe, *E. Esula* L.

The root of *Oenanthe crocata* L. is used in fishing in Sardinia and also, according to some writers, in Portugal. Nobre (48) makes the following remarks concerning this species—"While I was busy collecting I met now and again groups of men and boys carrying baskets on their heads. As it was a Sunday this aroused my curiosity. I suspected that they were going fishing with *Oenanthe crocata* called 'Perrexil,' which is common in the district. As I particularly wished to see this method of fishing I followed and saw a group of men half undressed engaged surrounding a large rock with a net, while others, diving down, placed masses of the root of 'Perrexil,' finely shredded, in the cracks of the rock. Within a short time one saw the fish deserting their hiding-places and swimming hither and thither with great speed in a stupefied manner, some trying to bury their heads in the sand but eventually being caught up in the meshes of the net. The bulk of the fish were quite dead by the time they were packed into the baskets" (translation).

Certain species of *Cyclamen*, notably *C. europaeum* L., *C. neapolitanum* Ten. and *C. latifolium* Sibth., are reputed to possess a poisonous and irritating sap which has been used in stupefying fish. The use of certain species of *Aristolochia* for the same purpose has long been known: among these may be mentioned *A. Clematitis* L., *A. rotunda* L. and *A. pallida* Willd. References to the use of the leaves and branches of the Yew, *Taxus baccata* L., in various parts of Europe have been made by certain writers. Van der Harst (41) in

his treatise on the Yew gives various historical notes. It is stated that as early as 1212 the use of Yew in fishing was forbidden by Kaiser Frederick II, the penalty for anyone committing the offence being one year's hard labour. *Hyoscyamus niger* L. appears in Ernst's list of fish-poison plants, and according to Day is made use of in India, though information as to the manner of employment is not given.

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XVI.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXIV.

1231. **Ruyschia phylladenia** *Sandwith* [Marcgraviaceae]; a *R. clusiifolia* Jacq. atque *R. platyadenia* Gilg nectariis e medio vel paullo supra medium pedicellorum exsertis, a *R. sphaeradenia* Delp. nectariis majoribus spathulatis fere planis foliaceis differt.

Frutex (scandens?) 3–4 m. altus; rami florigeri 3–5 mm. diametro. *Folia* obovata vel obovato-oblonga, apice rotundata emarginata, basi in petiolum 2–3 mm. longum attenuata, 4–7.5 cm. longa, 1.5–3 cm. lata, coriacea, utrinque costa excepta omnino enervia aut nervis subtus nonnunquam fere visibilibus. *Racemi* elongati, 10–15 cm. longi, multiflori; rhachis valde corrugato-sulcata, 2–3 mm. diametro; pedicelli conspicue adscendentes nec horizontales, 5–7 mm. longi, ut cetera inflorescentia glabri. *Nectaria* e medio vel paullo supra medium pedicellorum exorientia; petiolus quam in ceteris speciebus ita laxius pedicello coalit ut lineae decurrentes facile cerni possint; lamina adscendens, coriacea, applanata, foliacea atque vix gibbosa, spathulata, apice nonnunquam acutata, 4–5 mm. longa, 1.8–2.5 mm. lata. *Prophylla* ovata, ad 2.5 mm. longa, 2 mm. lata. *Sepala* semiorbicularia, ad 2 mm. longa, 2.5–3 mm. lata. *Petala* atque stamina delapsa. *Fructus* subglobosus, circiter 2 mm. longus, ad 2.5 mm. diametro, in stylum haud 1 mm. longum abiens.

COSTA RICA. Border of wood, Las Concavas, Aug. (1919?), comm. 1920, C. H. Lankester K. 93. Described as an 'arbolito sarmentoso.'

This extends the range, already remarkably wide and interrupted, of a curiously small genus.

1232. **Impatiens Barnesii** C. E. C. Fischer [Geraniaceae]; *I. orchioidei* Bedd. affinis, foliis basi rotundatis haud cordatis, labello oblato, alis haud caudatis differt.

Herba acaulis, pendula, delicatissima; bulbus parvus globosus. *Folia* 1–2, membranacea, ovata vel elliptico-ovata, acuta vel subacuta, basi rotundata, plus minus inaequilateralis, marginibus remote denticulatis, 2–8 cm. longa, 1.3–3.6 cm. lata, nervis primariis utrinque 3, adscendentibus, supra sparse pilosa, subtus glabra; petioli graciles, glabri, 2–4 cm. longi. *Scapus* gracilis, glaber, 4–5 cm. longus, pauciflorus; bractae lanceolatae vel ovatae, subacutae; pedicelli graciles, c. 1.5 cm. longi. *Flores* 2–2.5 cm.

longi. *Sepala* ovato-falcata, 5 mm. longa. *Vexillum* ovato-oblongum vel suborbiculare, rotundatum, 1-1.2 cm. longum, basi brevissime accatum. *Petala* delicatissima. *Alae* 2-lobatae, 1.75-2.3 cm. longae; lobus inferior oblongus, obtusus, c. 7 mm. longus; lobus distalis oblongo-lanceolatus, obtusus vel parum emarginatus, c. 1.5 cm. longus. *Labellum* oblatum, 7-9 mm. longum, 1-1.25 cm. latum. *Capsula* ellipsoidea, acuta, 8 mm. longa.

INDIA. Nilgiri Hills, Kundahs, about 8000 ft., Sept., *E. Barnes* B 30 (type in Herb. Kew.), B 31. "On moss-covered tree trunks with its leaves and flowers hanging down . . . in deep shade in very wet sholas overlooking Malabar . . . I have also seen the leaves and capsules on trees near the top of Mukurti. . . . In the few specimens I saw the tip of the wing-petals were curled to form a tube. . . . The flowers are cream-coloured or almost white, very thin and fragile and soon drop." (*E. Barnes* in epistola.)

1233. ***Impatiens laticornis*** *C. E. C. Fischer* [Geraniaceae]; inter *I. clavicornu* Turcz. et *I. modestam* Wight, ab illa foliis apice angustatis supra pilosis, ab hac calcari incurvato valde lato, ab utraque lobis alarum inferioribus minoribus differt.

Herba erecta, acaulis, stolonifera; bulbus parvus, globosus. *Folia* 1-2, subcarnosa, suborbicularia vel ovata, obtusa, basi cordata, 1.5-4 cm. longa, 1.2-2.5 cm. lata, marginibus apiculato-crenatis, basi plus minus 5-costata, nervis primariis utrinque 1-2, adscendentibus, subtus manifestioribus, supra pilosa, pilis subulatis multicellulatis, subtus glabra vel fere glabra, pagina inferiore petiolisque saepe purpurascens; petioli glabri, laminam subaequant. *Scapi* solitarii vel bini, glabri, saepius rubri, 6-17 cm. longi, 2-10-flori; bractae oblongae vel ovato-oblongae, obtusae, concavae, semiamplexicaules, 3-6 mm. longae; pedicelli 1-1.7 cm. longi. *Flores* albi, rubro- vel aurantiaco-pilosi, c. 2 cm. longi. *Sepala* ovato-falcata late ovata vel subcordata, obtusa, viridia, 5 mm. longa. *Vexillum* suborbiculare, obtusum, concavum, 6-8 mm. longum, in calcar curvatum bulboso-clavatum fauce 2 mm. diam. apice 4 mm. diam. productum. *Alae* 3-lobatae, basin versus pilosae; lobus inferior ovato-oblongus, rotundatus, 4-5 mm. longus, intra labello incurvatus; lobus medius suborbicularis, 8-9 mm. diam.; lobus distalis oblongus, obtusus, 9-13 mm. longus. *Capsula* ellipsoidea (matura non visa).

INDIA. Nilgiri Hills, Kundahs at about 8000 ft., Sept., *E. Barnes* B 41 (type in Kew. Herb.), B 40, B 42. "Common in the region of Hill 8510 on wet rocks and on tree trunks and in other shady places exposed to the rain and mists from Malabar. . . . A magenta-coloured form (B42A) also occurs." (*E. Barnes* in epistola.)

1234. ***Banara regia*** *Sandwith* [Samydaceae-Banareae]; nulli speciei evidenter affinis, inflorescentia maxima, foliis maximis basi inaequilateralibus profunde cordatis primo visu distinguenda.

Arbor "60-pedalis, speciosa, recta, ramulis longissimis pendulis distiche foliosis" (*Spruce*); ramuli summi siccitate obscure purpurei, glabri, angulati atque profunde sulcati, ad 7 mm. diametro. *Folia* (unum tantum e ramulo florifero lectum superest) maxima, elliptico-oblonga, apice obtusa sed costa centrali in mucronem brevem 1 mm. longum excurrente, basi inaequilateralia profunde obliquiter auriculato-cordata, lobis rotundatis majore (superiore?) 3 cm. longo 5.5 cm. lato minore 0.7 cm. longo 1.5 cm. lato, 38 cm. longa, 12 cm. lata, tenuiter coriacea, utrinque subnitida, nervis venulisque utrinque praecipue subtus satis prominentibus, nervis arcuatis latere majore 22 minore 16, supra glabra, subtus costa nervisque necnon facie minute pilosula, conspicue crenato-dentata, dentibus glanduligeris a se 0.5-1.5 cm. distantibus; petiolus indumento costae praeditus, 1.3 cm. longus, ut videtur eglandulosus. *Paniculae* "terminales, saepe maximae, 4-pedales" (*Spruce*) identidem compositae, apice pyramidales ad 24 cm. latae; rami ramulique glabri, siccitate obscure purpurei, angulati atque sulcati, versus apices crescentim abbreviati; ramuli ultimi inferiores cymis trifloris ceteri pedicellis solitariis praediti; pedicelli glabri, ad 7 mm. longi, supra basim articulati, eundem colorem praebentes. *Flores* "flavi, odorati" (*Spruce*), trimeri vel tetrameri, expansi circiter 1 cm. diametro. *Sepala* ovata, acuta, 3-5 mm. longa, ad 3.5 mm. lata, extra siccitate obscure purpurea marginibus fulvis exceptis, praesertim prope apicem marginesque plus minusve conspicue pubescentia, intus dimidio superiore dense griseo-tomentella. *Petala* late ovato-oblonga, obtusa, ad 6 mm. longa, ad 5 mm. lata, igitur sepalis longiora, flore expanso cum sepalis reflexa, extra marginibus exceptis dense griseo-tomentella, intus glabrescentia sed hic illic conspicue pilosula vel tomentella. *Stamina* petala fere aequantia vel haud multum excedentia, filamentis glabris liberis disco glabro insidentibus. *Ovarium* ovoideo-ellipsoideum, glabrum, 4-5 mm. longum, 2.5-3.5 mm. diametro, in stylum glabrum 2 mm. longum attenuatum; placentae 6.

ECUADOR. At the foot of Mt. Chimborazo, 900-1200 m., Aug. 1860, *Spruce* 6160. "The leaves on the flowering branches are mostly mutilated, and some fine ones, 2 ft. long, I took from a sterile branch seem unfortunately to have been lost."

Readers of *Spruce's* "Notes of a Botanist on the Amazon and Andes," ed. Wallace, vol. ii. chap. xxi, will remember that in August, 1860, he was occupied at El Limon, on the western side of Chimborazo, in the important task of obtaining seeds and young plants of *Cinchona succirubra* for the Indian Government. A sketch of the vegetation of the Red Bark forests of Chimborazo is given in the same chapter, and the species here described appears on p. 281, being listed under Tiliaceae. It is noted as a very handsome tree, abundant and ornamental about the middle region of the Red Bark. On p. 276 we are told that *Spruce* was too busy with his official work to be able to collect many specimens of plants which were not of

economic value; in fact, he "collected very few (often unique) specimens of each plant." Judging from the material of this fine species in Herb. Hook. in the Kew Herbarium, it may be assumed that little or none was available for further distribution. It must be borne in mind that these later numbers of Spruce were never properly named and listed by Bentham; consequently, other undescribed novelties from this area may be expected among them.

1235. **Strychnos silvicola** A. W. Hill [Loganiaceae]; *S. barbatae* A. W. Hill affinis, sed foliis ovato-lanceolatis acutis superne vernicosis corollae lobis glabris praecipue differt.

Frutex scandens, ramis glabris, spinis binis teretibus circinatis 2-6 cm. longis. *Folia* lanceolato-ovata vel elliptico-lanceolata, acuta, triplinervia, basi rotundata vel paullo angustata, 8-14 cm. longa, 4.5-7 cm. lata, glabra, superne vernicosa; petioli 6-7 mm. longi, glabri. *Inflorescentiae* axillares, paniculatae, 4-8 cm. longae; pedunculi et pedicelli minute tomentosi. *Calycis* segmenta late ovata, subacuta, circiter 1 mm. longa et lata, marginibus ciliatis. *Corolla* 5 mm. longa, alba, lobis 2-2.25 mm. longis ovato-lanceolatis reflexis acutis, intus fauce et tubo superne cingulo pilorum instructa. *Antherae* 1 mm. longae, ovoideae, basi paullo barbatae. *Ovarium* ovoideum, cum stylo 3.5-4 mm. longum, pilosulum. *Fructus* globosus, lignosus, 1.5-1.8 cm. diametro. *Semina* 3-4, discoidea, 1.5 cm. diametro, compressa, circiter 2.5 mm. crassa.

SIAM. Kaw Tao, Surat, 10 m., in evergreen forest, *Kerr* 11238 (type); Kaw Pa-ngan, Surat, *Put* 1254; Kaw Samui, Surat, *Put* 1306; Tung Wa, Surat, 10 m., edge of evergreen forest, *Kerr* 13903; Kaw Tao, Surat, below 5 m., in evergreen forest, *Kerr* 12990; Kaw Chang Ranawng, climbing in evergreen forest bordering beach, *Kerr* 16554; Tanjong Po, Satul, climbing over trees by beach, *Kerr* 14232; Kao Talu Ranawng, 50 m. (local name Tao Plawng), in evergreen forest, *Kerr* 11838.

1236. **Jacquemontia ciliata** Sandwith [Convolvulaceae-Convolvuleae]; *J. pentanthae* (Jacq.) G. Don affinis, sepalis subaequalibus obtusis ciliatis distinguitur.—*J. menispermoides* Standley in Contr. U.S. Nat. Herb. xxvii. 313 (1928)?

Herba volubilis; caules pilosuli, pilis debilibus plus minusve adpressis, partibus novellis flavicantibus conspicuis, ad 2 mm. diametro; internodia vulgo 3-6 cm. longa. *Folia* late triangulari-ovata ad ovato-lanceolata, apice sensim conspicue acuminata, basi rotundata cordata vel fere truncata, adulta 3.5-7 cm. longa, 2-5 cm. lata, marginibus saepe subsinuatis, utrinque pilosa sed senectute glabrescentia pilis adpressis plus minusve raris conspersa, subtus quam supra pallidiora nervis venulisque satis reticulatis; petiolus pilosulus, 1-2.5 cm. longus. *Inflorescentia* axillaris, longipedunculata, multiflora, umbelliformis, cymis contractis densis, adulta 1.5-3.5 cm. diametro; pedunculus communis indumento caulium

saepius densiore atque magis adpresso, folium subtendens saepius longe excedens, 4-11 cm. longus; bractae setaceae, ad 2 mm. longae; pedicelli 3-5 mm. longi, sub fructu glabrescentes. *Sepala* scariosa, subaequalia, duo exteriora interioribus paullo longiora, oblonga, obtusa, rotundata, secus totos margines conspicue ciliata, ceterum glabra, 4-5.5 mm. longa, circiter 2 mm. lata, circum fructum latiora. *Corolla* 1.2-1.8 cm. longa, pallide caerulea, lobis acutis mucronatis. *Stamina* circiter 2 mm. supra basim corollae inserta; filamenta longiora 5.5 mm., breviora 4.5 mm. longa. *Ovarium* ovoideo-subglobosum, glabrum, ad 1.5 mm. longum, ad 1.2 mm. diametro; stylus circiter 1 cm. longus, stigmatibus 1.5 mm. longis. *Fructus* globosus, 4-valvis, ad 5 mm. longus atque diametro, sepalis auctis apice recurvatis cinctus; semina ad 2.5 mm. longa.

TRINIDAD. In open places on the outskirts of Irois Forest, Jan. 1928, *Broadway* 6718 (type); *ibid.*, Williams in *Trin. Herb.* 11923.

COSTA RICA. Las Vueltas, Tucurrique, 635 m., Nov. 1898, *Tonduz* 12821. Presumably it occurs on the coast of Northern South America.

This agrees with no other species described (e.g. in *Flora Brasiliensis*) as having obtuse and ciliate sepals, since the outer sepals are the longer, while the general facies and indumentum are those of *J. pentantha*. It seems extremely probable that the plant recorded from Panama by Standley as *J. menispermoides* Choisy is this species, the true *menispermoides* being peculiar to the neighbourhood of Rio de Janeiro.

1237. **Vitex calothyrsa** Sandwith [Verbenaceae-Viticeae]; sect. *Agnus-Castus*, § *Terminales* pertinens, *V. Sprucei* Briq. affinis, foliis 3-foliolatis, foliolis basi semper rotundatis, dentibus calycinis brevioribus differt.—*V. pacimonensis* Spruce, ms. in sched., ined.

Arbor ad 18 m. alta, ramis florigeris glabris vel minute puberulis, lenticellatis, ad 7 mm. diametro. *Folia* 3-foliolata; petiolus minute puberulus, nigrescens, supra applanatus, subtus convexus, 2.5-7 cm. longus, ad 2 mm. latus; petioluli similes sed supra saepius profunde canaliculati, laterales 5-10 mm. longi, terminales nonnunquam longiores ad 12 mm. longi; foliola ovato-lanceolata vel oblongo-lanceolata ad lanceolata, apice conspicue attenuata acuminata, nisi in foliis male evolutis late elliptica atque rotundata emarginata, basi semper rotundata, 6-16 cm. longa, 3-7 cm. lata, nitida, coriacea, oculo nudo utrinque glabra sed sub lente subtus minute sparse pubescentia, nervis supra impressis, subtus prominentibus rete venularum non valde conspicuo, nervis primariis in utroque latere costae 9-12 arcuatis prope marginem anastomosantibus. *Inflorescentia* speciosa, thyrsideo-paniculata, pyramidata, illam specierum quarundam *Verbasci* revocans, terminalis, nonnunquam etiam ex axillis summis exoriens, ad 30 cm. longa atque 15 cm. lata; rami plus minusve dense pubescentes, arcuato-adscendentes, inferiores

PLATE VI

longissimi, tum gradatim decrescentes; cymae ipsae in ramis plerumque per paria inferne 2-4.5 cm. distantia oppositae, trichotomae, compositae, congestim multiflorae, dense pubescentes, cum pedunculo brevi 1-2.5 cm. longae, ad 1.5 cm. diametro; bracteae bracteolaeque ovatae, dense pubescentes, illae ad 3 mm., hae ad 1 mm. longae; pedicelli dense pubescentes, 1-5 mm. longi. *Calyx* campanulatus, extra plus minusve dense pubescens atque sub pubescentia nigrescens, intus nigrescens fere glaber, 1.5-2.5 mm. longus, 2-4 mm. latus; dentes breves, saepe inconspicui, late triangulares, 0.5-1 mm. longi, ad 1.5 mm. lati. *Corolla* caerulea, ante expansionem lorum 7-9 mm. longa, tubo sensim ad 3 mm. latitudinem ampliato, extra passim densissime pubescens triente tubi inferiore glabrescente nigrescente excepto, intus tubo fere glabra vel sparse pilosa, fauce hic illic pilosa, lobis intus minute velutino-tomentella; lobi minores circiter 4 mm. longi, 3.5 mm. lati, lobus anterior intimus major ad 7 mm. longus, 5 mm. latus. *Stamina* vix 2 mm. supra basim tubi affixa, longiora 7 mm. longa, breviora 6 mm. longa; filamenta prope insertionem dense pubescentia, ceterum parce hispida vel glabrescentia. *Ovarium* subglobosum, ad 1.5 mm. longum atque diametro, dimidio superiore densissime pubescens, inferiore nigrescens fere glabrum; stylus hispidus ad 8 mm. longus, lobis subulatis glabris ad 0.5 mm. longis. *Fructus* drupaceus, obovoideo-globosus, ad 1.3 cm. longus, ad 1.2 cm. diametro, calyce aucto obscure lobato 5-6 mm. diametro insidens.

VENEZUELA. Banks of the Rio Pacimoni, Feb. 1854, *Spruce* 3356 (type). "Arbor patula, 30-pedalis; flores caerulei, odorati."

BRAZIL. Rio Negro; Rio Padawiri (Padauiry), March 1839, *Robert Schomburgk* 1009 (1st collection). "A tree, 50 to 60 ft. high. Leaves dark lucid green; bark brown, rough. *Calyx* greyish. Petals bright blue; filaments white; anthers blue." Most of the leaflets of this collection are broader than those of *Spruce's* plant, but it is obviously conspecific, and the description is compiled from both.

The source of the Pacimoni is about 100 miles to the west of the upper part of the Padauiry, but from *Robert Schomburgk's* account of his travels, it is evident that he collected his specimens near the confluence of the Padauiry with the Rio Negro on the left bank of the latter river. These, like many other sheets of *Robert Schomburgk's* first collection from the Rio Negro and Rio Branco, and a few from Venezuela, are wrongly labelled "British Guiana. R. H. Schomburgk (1st coll.)." *Bentham* omitted to copy out *Robert Schomburgk's* manuscript notes, which are fortunately preserved in the library of the Kew Herbarium, a fact which should be noted by botanists working on the Guiana flora, who may be in doubt as to the correct locality—whether British Guiana, Venezuela or Brazil—of any particular number of this collection.

1238. ***Pandanus (Vinsonia) Basedowii*** C. H. Wright [Pandaceae]; affinis *P. Hornei* Balf. f., a qua foliis angustioribus drupisque paucioribus differt.



Photo: Dr. H. Basedow.

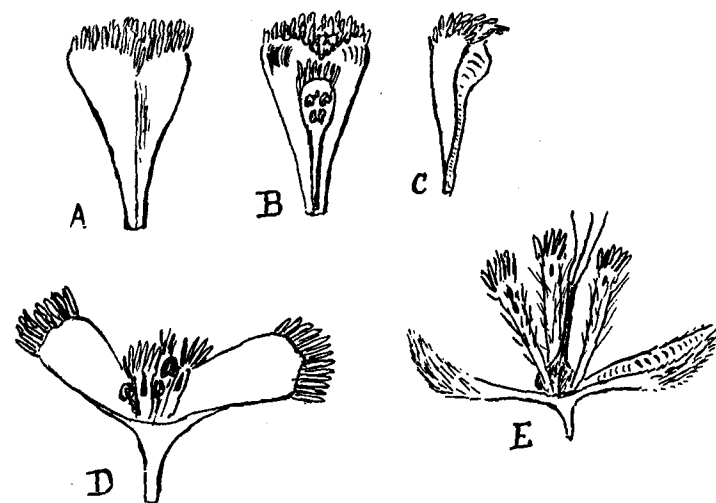
Pandanus (Vinsonia) Basedowii.

Caulis. 4.5 m. altus; rami fere horizontales, 2-3 m. longus, 2.5 cm. diam. *Folia* lineari-acuminata, circiter 3 dm. longa, 1-1.5 cm. lata, basi breviter lateque amplexicaulia, spinis brunneis 1 mm. longis 6-10 mm. distantibus ad margines carinamque instructa. *Syncarpia* solitaria; drupae 8-10, 7 cm. longae, 4.5 cm. diam., 2-loculares, obtuse 4-5-angulatae, pallide brunneae; mesocarpium 12-18 mm. crassum, fibrosum; endocarpium tenue. *Semina* oblonga, concavo-convexa, 2 cm. longa, 1 cm. lata, 0.5 cm. crassa.

AUSTRALIA. High tablelands of Arnhem Land, c. 310 m. alt., Dr. Herbert Basedow.

While most species of *Pandani* inhabit seashores, this one is remarkable for growing on dry, rocky, barren surfaces in the interior of Arnhem Land at an altitude of about 1000 ft. Its habitat is shown in some photographs received from Dr. Basedow (see Plate VI.). *P. monticola* F. v. Muell. grows in similar situations in Queensland, but belongs to the *Acrostigma* section. A ripe drupe with its fibrous mesocarp and thin sclerenchymatous endocarp weighs less than $\frac{1}{2}$ oz. and could easily be dispersed by the wind.

1239. ***Eriocaulon ensiforme*** C. E. C. Fischer [Eriocaulaceae]; *E. sexangulare* Linn. affinis, pedunculo solitario, capitulis majoribus, sepalis exalatis differt.



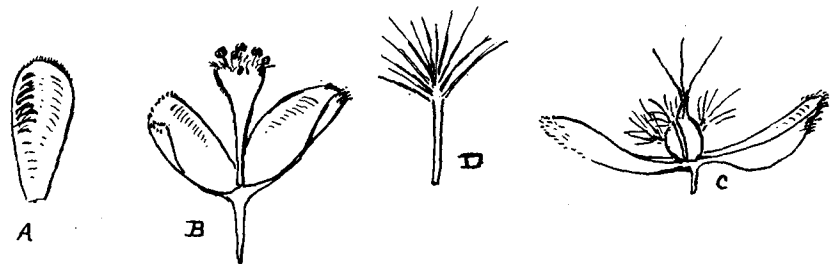
Eriocaulon ensiforme C. E. C. Fischer. A. Floral bract, dorsal aspect $\times 5$. B. Floral bract, ventral aspect with σ flower $\times 5$. C. Floral bract, lateral aspect $\times 5$. D. σ flower $\times 7$. E. φ flower $\times 7$.

Caulis brevis, sericeo-lanuginosus. *Folia* erecta, equitantia, ensiformia, acuta, 14-26 cm. longa, 1-1.5 cm. lata, infra parce pilosa et minute papillosa, c. 20-nervia. *Pedunculus* solitarius, haud tortus, c. 40 cm. longus, glaber, valde c. 10-costata; vagina pedunculum arte amplexans, folia circiter adaequans, oblique longe fissa, acuta, externe parce pilosa. *Capitulum* depresso-globosum,

1.3 cm. diametro; receptaculum pilosum; bracteae involucrales obovatae, obtusae, 3 mm. longae, glabrae, exteriores pallido-brunneae, interiores fusco-brunneae; bracteae flores stipantes patentes regulariter imbricatae, rhomboideo- vel obovato-cuneatae, acutae, basin versus angustatae, fuscae, parte superiore inflexa et dorso albo-pilosa, parte inferiore parum carinata, 5 mm. longae. *Flos* ♂ stipitatus, 3 mm. longus; sepala 2, fere libera obovata, alterum latius, truncata, abrupte apiculata, fusca, apicem versus dense albo-pilosa; corolla brevis, cylindrica, lobis 3 ligulatis, uno longiore, apice albo-pilosis et glandulis ensiformibus nigris instructis; stamina 6, antheris nigris. *Flos* ♀ breviter stipitatus, 4 mm. longus; sepala 2, libera, navicularia, acuta, parte superiore externe dense albo-sericea, inferiore angustata, glabra; petala 3, linearia, longe sericeo-hirsuta, apice albo-pilosa, glandulo nigro instructa; ovarium sessile, stigmatibus 3, petala superantibus.

INDIA. Tinneveli District; near Naterikal, March. Only one plant seen (type in Herb. Kew), *Madras Govt. Botanist* 14497.

1240. **Eriocaulon Gamblei** C. E. C. Fischer [Eriocaulaceae]; *E. Thwaitesii* Koern. affine, sed multo minus, pedunculis apice tumefactis, capitulis minoribus, bracteis involucralibus fusco-viridibus differt.



Eriocaulon Gamblei C. E. C. Fischer. A. Floral bract $\times 9$. B. ♂ flower $\times 14$. C. ♀ flower $\times 11$. D. ♀, petal $\times 20$.

Herba minima. *Caulis* perbrevis. *Folia* linearia, acuta, usque 1.3 cm. longa, 0.5 mm. lata, 1-venosa. *Pedunculi* solitarii vel pauci, 1.5-4 cm. longi, glabri, 2-4-costati, haud vel parum torti, sub involucri hemisphaerico-tumefacti; vagina superne laxa, folia circiter adaequans, oblique fissa, acuta, glabra. *Capitulum* breviter conicum, pilosum; bracteae involucrales obovato-oblongae, obtusae vel apiculatae, fusco-virides, glabrae, 2 mm. longae; bracteae flores stipantes anguste obovatae, concavae, obtusae vel subacutae, fusco-virides, 2 mm. longae, apice breviter puberulae. *Flos* ♂ 2 mm. longus, pedicello longo, gracili; sepala 2, anguste obovato-oblonga, fusca, apice breviter albo-pilosa; corolla cylindrica, ore expansa, lobis perbrevibus, apice glandulo nigro instructis et breviter albo-pilosis; stamina 6, antheris nigris. *Flos* ♀ breviter stipitatus, 2 mm. longus; sepala 2, libera, navicularia, interdum

carinata, obtusa, fusca, apice dorso breviter albo-pilosa; petala 3, capillaria, sepalis duplo breviora, eglandulosa, pilis longis apice dense cristata; ovarium breviter stipitatum, stylo brevi, stigmatibus 3, longis. *Semina* subgloboso-ovata, rubro-brunnea, leviter transverse reticulata, nonnunquam papillis albis longitudinaliter lineata.

S. INDIA. Naduvattam, Nilgiri Hills, 6000 ft., Oct., J. S. Gamble 14881 (type in Herb. Kew.).

XVII.—CONTRIBUTIONS TO THE FLORA OF SIAM.* Additamentum XXVII.

Pygeum Kingianum Craib [Rosaceae-Pruneae]; a *P. lanceolatum* Hook. f. foliis basi latioribus, sepalis angustioribus magis numerosis, ovario haud glabro recedit, a *P. persimile* Kurz ovario pilis haud oblecto distinguendum.

Frutex circa 4 m. altus (ex Kerr); ramuli graciles, primo fulvo-pilosi, mox puberuli, brunneo-corticati, demum fusco-corticati, glabri, lenticellis parvis. *Folia* lanceolata, oblongo-elliptica, vel subovata, apice obtuse acuminata, basi haud rarius inaequilateralia, cuneata rotundatave, 5.5-11 cm. longa, 3-5.5 cm. lata, chartacea, sicco plus minusve brunnescentia, supra glabra, subtus ad costam nervosque laterales parce pubescentia, basem versus glandulis duabus instructa, paucis aliis secundariis parvis additis, costa supra impressa subtus prominente, nervis lateralibus utrinque 6 bene intra marginem anastomosantibus supra vix conspicuis subtus prominulis, integra, petiolo 7-8 mm. longo primo parce piloso cito glabro supra canaliculato suffulta; stipulae fugaces, lineares, circa 5 mm. longae. *Racemi* axillares, saepissime e ramulis defoliatis orti, pedunculo communi brevi incluso paulo ultra 1 cm. longi, partibus omnibus breviter fulvo-pilosi; bracteae subovatae, obtuse subacuminatae, circa 2 mm. longae; pedicelli 1 mm. longi. *Receptaculum* 2 mm. longum, apice circa 3 mm. diametro, intra glabrum. *Sepala* 10, obtuse subdeltoidea, 1 mm. longa. *Petala* haud visa. *Filamenta* glabra, 1.5 mm. longa, antheris parvis. *Ovarium* pilis sat longis sericeis inferne instructum; stylus 2.5 mm. longus, glaber, sat robustus; ovula 2, pendula.

Pang-nga, Kao Bangto, 100 m., evergreen forest, Kerr 17167.

Pyrus fragrans Geddes [Rosaceae-Pomeae]; a *P. cuspidata* Bertol. foliis breviter acuminatis, nervis minus numerosis adscendentibus, inflorescentia laxa glabra et pauciflora differt.

Arbor circa 10 m. alta (ex Kerr); ramuli brunnei, striati, glabri. *Folia* ovato-oblonga, apice breve et obtuse acuminata, basi late cuneata vel rotundata, 4-10 cm. longa, 2.8-7 cm. lata, chartacea, mox subcoriacea, supra brunnea, subnitentia, glabra, subtus pallidiora, glabra, nervis lateralibus utrinque 8-11 pagina superiore conspicuis inferiore prominentibus, margine crenulata, petiolo

*Continued from *K.B.*, 1929, p. 119.

1.5–3.5 cm. longo glabro suffulta. *Cymae* terminales, usque ad 5 cm. longae; pedicelli 2–4 mm. longi, filiformi-bracteolati, glabri. *Calycis* lobi 5, ovato-elliptici, apice obtusi, 3 mm. longi, 1.8 mm. lati, glabri. *Petala* 5, alba (ex *Dr. Smith*), rotundata, basi cuneata, 4–5 mm. diametro, venata, extra glabra, intra puberula. *Stamina* permulta, biseriata. *Ovarium* 2-loculare, per loculum biovulatum, glabrum; styli duo, 5 mm. longi, basi ad 2.5 mm. inter se connati, glabri. *Fructus* vix maturus, pyriformis, 1 cm. longus, subconspicue lenticellatus.

Nakawn Sritamarat, Kao Luang, 1500–1750 m., evergreen forest, *Kerr* 15513 (*fruit*), *Dr. Eryl Smith* 730 (*flower*).

Terminalia densiflora *Craib* [Combretaceae]; a *T. alata* Roth, cui maxime affinis videtur, indumento multo densiore, spicis rigidis densifloris recedit.

Arbor circa 10 m. alta (ex *Kerr*); ramuli iuventute tomento denso cinnamomeo, pallide cinnamomeo, vel interdum subferrugineo obtecti, tomento diutius persistente, subteretes, ad 4 mm. diametro. *Folia* opposita vel subopposita, oblonga vel elliptica, apice rotundata vel saepius truncata et late retusa, basi rotundata, ad 8.5 cm. longa et 5.5 cm. lata, sat rigida, subtus pallidiora, supra sparse sericea, ad costam dense adpresse pubescentia, subtus tomentosa, pagina inferiore paulo supra basem ad costam glandulis duabus subglobosis circa 1.5 mm. diametro plus minusve tomentosis sessilibus instructa, nervis lateralibus utrinque 10–11 sat patulis intra marginem curvatis supra conspicuis subtus prominentibus, nervis transversis subtus fere subconspicuis, margine integra, tomentoso-ciliata, petiolo 4–5 mm. longo indumento ei ramulorum simili oblecto eglanduloso suffulta. *Spicae* et axillares et in paniculam efoliatam terminalem circa 8 cm. longam dispositae, pedunculo communi 5–10 mm. longo incluso 3.5–7 cm. longae, densiflorae, et pedunculo et rhachi indumento ei ramulorum simili oblectis; bracteae circa 1.5 mm. longae, sub anthesin deciduae; flores sessiles. *Receptaculum* densius tomentosum, subteres, vix 1 mm. longum, 1.25 mm. diametro. *Calyx* dorso tomentosus, intra ad lobos sparse longius pilosus, basi pilis erectis longis dense pilosus; tubus 1 mm. longus; lobi 5, deltoidei, subacuti, paululo ultra 1 mm. longi et lati. *Stamina* 10, filamentis pallidis glabris superne angustatis 3.5–3.75 mm. longis, antheris versatilibus breviter obtuse apiculatis, loculis basi inter se liberis. *Stylus* calycem fere 2 mm. superans; ovula 2, pendula.

Nakawn Tai, 200 m., deciduous forest, *Kerr* 5845.

Combretum alatum *Craib* [Combretaceae]; ab affini *C. quadrato* *Craib* ramulis alatis, petiolis conspicue brevioribus recedit.

Frutex volubilis (ex *Kerr*); ramuli circa 3 mm. diametro, primo dense squamosi, quadrangulares, angulis anguste sed conspicue alati, pallide brunneo-corticati. *Folia* opposita vel subopposita, oblonga vel elliptica, apice obtuse acuminata, basi rotundata vel late cuneata,

6.5–10 cm. longa, 3–5 cm. lata, rigide chartacea, pagina utraque dense parvi-squamosa, nervis lateralibus utrinque circa 8 supra plus minusve conspicuis interdum impressis subtus subprominentibus, nervulis supra obscuris subtus paucis subconspicuis, integra, petiolo usque ad 5 mm. longo dense squamoso supra late canaliculato suffulta. *Spicae* in paniculas axillares et terminales foliatis dispositae, pedunculo communi rhachi florifera paulo longiore incluso 2.5–3.5 cm. longae, dense squamosae praeterea parce puberulae; bracteae ad pedunculorum bases foliaceae, inferiores ad 3 cm. longae, supremae circa 1 cm. longae; floris bractea parva, cito decidua; flores virides (ex *Kerr*). *Receptaculum* in tubum 3.5 mm. longum apice 2.5 mm. diametro extra squamosum intra apice annulo denso pilorum rigidorum et erectorum et deflexorum instructum supra ovarium productum. *Calycis* tubus brevis, lobi 4, deltoidei, obtusi, circa 1 mm. longi et lati. *Petala* 4, plus minusve rotundata, circa 0.75 mm. diametro, breviter sed distincte unguiculata. *Stamina* 8, filamentis glabris ad 2.5 mm. longis, antheris parvis oblongis brevissime apiculatis, loculis basi inter se liberis. *Stylus* 6 mm. longus, glaber; ovarium 2.5 mm. longum, obtuse quadrangulum, dense squamosum, intra basi pilis longis erectis ornatum, ovulis 4 pendulis.

Chiangmai, Mê Rim, 800 m., evergreen forest, *Kerr* 6440.

Combretum foliatum *Craib* [Combretaceae]; a *C. squamoso* Roxb. bracteis foliaceis, fructu faciebus processibus lineari-lanceolatis vel deltoideis instructo recedit.

Frutex volubilis (ex *Kerr*); ramuli primo angulati, dense brunneo-squamosi, mox teretes, squamis paucis persistentibus. *Folia* opposita vel subopposita, subelliptica, elliptico-ovata, vel elliptico-ovata, apice acuminata vel cuspidato-acuminata, basi rotundata vel late cuneata, 8–13 cm. longa, 5–8 cm. lata, subcoriaceo-chartacea, pagina utraque squamis parvis sat copiose instructa, nervis lateralibus utrinque 6–8 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervis transversis paucis supra subconspicuis subtus vix conspicuis, integra, petiolo 10–13 mm. longo dense squamoso supra conspicue canaliculato suffulta. *Spicae* in paniculam terminalem foliatam, foliis (vel bracteis foliaceis) superne gradatim minoribus inferioribus ad 6 cm. longis et 3 cm. latis petiolo 8 mm. longo suffultis supremis oblanceolatis 2 cm. longis 0.7 cm. latis petiolo 4 mm. longo suffultis, ad 30 cm. longam dispositae, pedunculo communi circa 1 cm. longo incluso ad 4.5 cm. longae, dense squamosae; bracteae saepissime deciduae, sublineares, acutae, 2 mm. longae. *Receptaculum* paululo post anthesin quadrangulum, dense squamosum. *Fructus* 4-alatus, alis inclusis suboblatus, 3 cm. longus, 3.5 cm. latus, faciebus processibus lineari-lanceolatis vel deltoideis squamis tectis instructus, alis stramineis horizontaliter striatis squamis tectis.

Pang-nga, Nop Pring, 20 m., climbing in scrub, *Kerr* 17239.

Combretum Winitii Craib [Combretaceae]; ab affini *C. flagrocarpo* C. B. Clarke foliis multo maioribus, fructus alis pubescentibus recedit.

Frutex vagans; ramuli primo sulcati, dense fulvo-pubescentes, mox teretes, tomentelli, 4-5 mm. diametro. *Folia* opposita vel ternata, oblonga, anguste elliptica, interdum subobovata, apice acute acuminata, basi cuneata vel rarius subrotundata, 15-23 cm. longa 7-12 cm. lata, rigide chartacea, sicco viridia, subtus parum pallidiora, pagina superiore ad costam nervosque laterales densius hirsuta, aliter sparse hirsuta, inferiore ad costam fulvo-tomentosa praeterea cum nervis lateralibus nervulisque pilis divaricatis sat rigidis instructa, nervis lateralibus utrinque 10-14 supra conspicuis subtus cum costa prominentibus intra marginem ipsam anastomosantibus, margine integra, ciliata, petiolo 12-17 mm. longo indumento ei ramulorum simili oblecto suffulta. *Racemi* simplices, apicem versus ramulorum positi, pedunculo communi circa 1 cm. longo incluso ad 8 cm. longi, indumento ei ramulorum simili oblecti, rhachi mox ad 2.5 mm. diametro; pedicelli paulo post anthesin 3 mm. longi. *Receptaculum* paulo post anthesin quadrangulum, albo-hirsutum et faciebus processibus parce pubescentibus ad 1.5 mm. longis instructum. *Fructus* pedicello quadrangulo 4 mm. longo pubescente suffultus, 4-alatus, alis inclusis ambitu ellipticus, 2.6 cm. longus, 2.1 cm. latus, alis stramineis pubescentibus striatis, faciebus processibus persistentibus instructus.

Lampun, Mè Kaw, 270 m., near stream in deciduous forest, *Winit* 376. Rahêng, 270 m., deciduous forest not far from stream, *Winit* 181.

Quisqualis caudata Craib [Combretaceae]; a *Q. densiflora* Wall. ex Miq. receptaculi tubo brevior, calycis lobis basi latioribus, petalis paulo latioribus apice rotundatis, antheris longioribus recedit.

Frutex volubilis (ex *Kerr*); ramuli primo dense breviter adpresse pubescentes, mox puberuli, cortice rubro-brunneo vel fusco-brunneo oblecti, substriati, teretes, lenticellis haud conspicuis. *Folia* saepissime oblonga vel oblongo-elliptica, apice subacute caudato-acuminata, basi rotundata, rarissime cuneato-rotundata, 6-11 cm. longa, 3-4.5 cm. lata, rigide chartacea, sicco subviridia vel plus minusve brunnescentia, supra ad costam puberula, aliter sparse pustulata, subtus ad nervorum axillas brunneo-pilosa, nervis lateralibus utrinque 6-7 marginem versus longius prorsus directis intra marginem anastomosantibus inter se sat distantibus supra conspicuis subtus subprominentibus, nervis transversis saepissime e costa et nervis lateralibus rectangulatim oreuntibus cum nervulis rete gracile subtus subprominulum supra interdum subconspicuum efficientibus, margine integra, petiolo 4-7 mm. longo puberulo fusco supra parum canaliculato suffulta. *Spicae* vel terminales tantum vel etiam saepe ex axillis supremis ortae, pedunculo communi brevi incluso circa 4 cm. longae, pedunculo cum rhachi dense breviter

adpresse pubescente; bracteae foliaceae, infimae ovato-oblongae, acute acuminatae, 18 mm. longae, 9 mm. latae, nervosae, puberulae, petiolo ovario dimidio brevior suffultae, aliis spicae apicem versus gradatim minoribus, supremis lanceolatis 12 mm. longis 3 mm. latis. *Receptaculum* supra ovarium ad 1.7 cm. tubuloso-productum, inferne oblique gibbosum, extra breviter adpresse pubescens et superne pilis paucis longiusculis instructum, intra glabrum. *Calycis* tubus brevis, segmenta 5, late deltoidea, longius acute acuminata, 2.75 mm. longa, basi 2 mm. lata, extra pilosa, intra adpresse pubescentia. *Petala* 5, punicea (ex *Kerr*), oblonga, apice rotundata, basi late cuneata, subunguiculata, 5 mm. longa, 2.5 mm. lata, utrinque sed extra densius adpresse puberula. *Stamina* 10, biseriata; filamenta glabra, circa 3 mm. longa; antherae versatiles, circa 1.25 mm. longae. *Stigma* antheras altiores attingens; ovarium angulatum, 3.5 mm. longum, sericeum; ovula pendula, 3 vel rarissime 2. *Fructus* ambitu anguste oblongus, 5-alatus, 2 cm. longus, alis inclusis 1.1 cm. diametro, glaber, alis circa 4 mm. latis brunneo-stramineis horizontaliter substriatis.

Ranawng, Kao Pawta Chongdong, 900 m., evergreen scrub, *Kerr* 16797.

Eugenia cacuminis Craib [Myrtaceae-Myrteae]; inter species monticolas suffruticosas gregis *Jambosarum* foliis mediocribus saepissime oblongo-oblancoelatis acuminatis, cymis terminalibus, pedicellis (i.e. infra articulationem) haud evolutis, receptaculo brevi lato inferne in pseudopedicellum contracto cognoscenda.

Frutex circa 2 m. altus (ex *Kerr*), partibus omnibus glaber; ramuli primo subfusci, mox cortice brunneo-cinereo vel subcinereo oblecti, lenticellis haud conspicuis. *Folia* opposita, oblongo-oblancoelata vel elliptico-oblonga, apice obtuse acuminata, basi cuneata, 4-6 cm. longa, 1.5-2.8 cm. lata, coriacea, sicco supra fusco-viridia, subtus viridia, nervis lateralibus utrinque circa 12 rectis inter se parallelis paucis aliis tantum paulo minus conspicuis interiectis supra prominulis subtus conspicue prominulis, costa supra impressa subtus prominente, nervulis rete pagina utraque prominulum efficientibus, nervis intramarginalibus duobus, altero intra marginem ipsam altero robustiore circa 2 mm. intra marginem posito, margine cartilaginea, parum recurva, petiolo 3-4 mm. longo supra canaliculato suffulta. *Inflorescentia* terminalis, 1.5-2.5 cm. longa, simplex vel saepissime fere e basi furcata, bracteis deciduis, pedicellis (i.e. infra articulationem) haud evolutis. *Receptaculum* paulo post anthesin apice 7 mm. diametro, parte expansa late campanulatum, 5 mm. longum, basi in pseudopedicellum ad 3.5 mm. longum contractum. *Calyx* omnino deciduus.

Nakawn Sritamarat, Kao Luang, 1700 m., scrub, *Kerr* 15525.

Eugenia furfuracea Craib [Myrtaceae-Myrteae]; ab *E. pallidula* Ridl., cui maxime affinis videtur, foliis apice rotundatis haud acuminatis recedit.

Ramuli iuventute compressi, glanduloso-furfuracei, cinnamomei, mox teretes, glabri, cortice cinereo vel cinnamomeo-cinereo obtecti, lenticellis haud conspicuis. *Folia* opposita vel subopposita, saepissime oblongo-obovata vel obovato-elliptica, apice rotundata, basi cuneata, interdum subacuminata, 7-12 cm. longa, 4-7.3 cm. lata, coriaceo-chartacea, sicco plus minusve brunnescentia vel saepius supra pallide plumbea, subtus pallide viridia, pagina utraque inconspicue parvi-punctata, nervis lateralibus utrinque circa 12 rectis supra conspicuis vel subconspicuis subtus subprominentibus, nervulis rete laxum subtus prominulum efficientibus, nervis intramarginalibus duobus, uno fere ad marginem subprominulo uno 2-3 mm. intra marginem subprominente, margine anguste cartilaginea, saepissime leviter recurva, petiolo 5-10 mm. longo suffulta. *Paniculae* et terminales et ex axillis foliorum superiorum ortae, laxae, pedunculo communi 2-7 cm. longo cum pedunculis partialibus 2-2.5 cm. longis et pedunculis ultimis ubi evolutis circa 1 cm. longis compresso cinnamomeo glanduloso-furfuraceo; alabastra turbinata; bractae deciduae; pedicelli (i.e. infra articulationem) haud evoluti. *Receptaculum* in pseudopedicellum 2 mm. longum contractum, supra ovarium ad 2 mm. turbinato-productum, apice 5 mm. diametro, glanduloso-furfuraceum. *Flores* aperti haud visi. *Ovarium* 2-loculare.

Chumpawn, Bang Son, *Put* 1494.

***Eugenia fuscescens* Craib** [Myrtaceae-Myrteae]; ab affini *E. alyxifolia* Ridl. foliis maioribus fere epunctatis, ab *E. subhorizontali* King, cui facie subsimilis, nervis lateralibus subtus minus prominulis, floribus conspicue minoribus recedit.

Arbor circa 10 m. alta (ex *Kerr*); ramuli fusci vel subfusci, iuventute plus minusve pustulati, compressi, saepissime angulati, circa 3 mm. diametro. *Folia* opposita vel subopposita, lanceolata vel oblongo-lanceolata, apice acute acuminata, basi cuneata sed saepe inaequilateralia, latere altero acuminata, altero cuneata, 8-14 cm. longa, 2-4.5 cm. lata, chartaceo-coriacea, sicco pagina superiore fusco-viridia, inferiore viridia, pagina utraque ad costam punctata et praesertim marginem versus inconspicue parvi-punctata, nervis lateralibus utrinque circa 20 rectis subpatulis supra saepissime subconspicuis subtus conspicuis parum impressis, nervulis subtus subconspicuis, nervo intramarginali saepissime circa 2 mm. a margine posito subtus parum impresso, margine anguste cartilaginea, parum recurva, petiolo 6-12 mm. longo supra argute canaliculato suffulta. *Panicula* terminalis, e basi ramosa, ad 5 cm. longa et basi 6 cm. diametro, ramulis oppositis, pedunculis partialibus infimis circa 8-10 mm. longis cum pedunculis ultimis usque ad 1.5 cm. longis brunneis vel fusco-brunneis; pedicelli infra articulationem haud evoluti vel brevissimi, apice bracteolis duabus parvis deciduis instructi. *Receptaculum* turbinatum, 4 mm. longum, apice 4 mm. diametro, inferne angustatum, pedicellum distinctum vix simulans, fuscum, parum glandulosum. *Calycis* segmenta decidua, circa

0.5 mm. longa. *Petala* ut videtur calyptratim decidua, glanduloso-punctata. *Stamina* circa 1 cm. longa; antherae parvae, breviter apiculatae. *Stylus* stamina circa 4 mm. superans; ovarium 2-loculare.

Ranawng, Kao Talu, 100 m., evergreen forest, *Kerr* 11786.

***Eugenia globiflora* Craib** [Myrtaceae-Myrteae]; species quoad flores *E. Kurzii* Duthie similis sed foliorum nervis lateralibus magis approximatis et minus prominentibus distincta.

Arbor circa 15 m. alta (ex *Kerr*); ramuli teretes, glabri, cortice primo pallide brunneo mox cinereo obtecti, lenticellis haud conspicuis. *Folia* opposita, oblongo-lanceolata vel oblongo-oblancoolata, apice acuminata, basi cuneata, parum inaequilateralia, 7-15 cm. longa, 2.5-5.5 cm. lata, rigide chartacea, glabra, nervis lateralibus utrinque circa 10 aliis tantum paulo minus conspicuis additis supra conspicuis vel sicco subprominulis subtus prominulis bene intra marginem nervum intramarginalem formantibus, nervulis pagina utraque subprominulis, margine integra, recurva, anguste cartilaginea, petiolo 4-7 mm. longo supra canaliculato suffulta. *Inflorescentia* terminalis, laxa, ad 7 cm. longa, saepissime e basi ramosa, ramorum pedunculo communi usque ad 2 cm. longo, cymis ultimis e floribus tribus pedicellis 8-12 mm. longis suffultis vel cymarum terminalium subsessilibus constitutis, bracteis omnibus deciduis. *Receptaculum* 3 mm. longum, glabrum. *Calycis* segmenta 4, imbricata, 2 exteriora 4 mm. longa, 6 mm. lata, 2 interiora 5.5 mm. longa, 8 mm. lata, coriacea, glabra. *Petala* 4, imbricata, medio crassa, margine tenuia, ad 9 mm. longa et 8 mm. diametro. *Stamina* pluriseriata, filamentis ante anthesin inflexis. *Ovarium* 2-loculare, stylo circa 9 mm. longo.

Doi Pa Kao, 1500 m., evergreen by stream, *Kerr* 5388.

***Eugenia irregularis* Craib** [Myrtaceae-Myrteae]; *E. microcalyci* Duthie habitu similis sed foliis maioribus vel saltem pro longitudine latioribus saepissime sicco viridibus recedit.

Arbor circa 15 m. alta (ex *Kerr*); ramuli iuventute subvirides, compressi, parum pustulati, mox rubro-brunnei, demum irregulariter cinerei, teretes, vix 4 mm. diametro, lenticellis haud conspicuis. *Folia* opposita vel subopposita, saepissime elliptica, apice breviter obtuse acuminata, basi cuneata vel subacuminata, 7-16 cm. longa, 4-8.5 cm. lata, rigide chartacea, sicco saepissime viridia, hic et illic plus minusve brunnescentia, pagina utraque sat copiose parvi-punctata, nervis lateralibus utrinque circa 15 supra plus minusve conspicuis subtus prominulis, aliis tantum paulo minus conspicuis interiectis, intra marginem anastomosantibus et circa 3-5 mm. intra marginem nervum intramarginalem saepissime undulatum formantibus, apud marginem nervo intramarginali alio multo tenuiore evoluta, margine irregulariter conspicue revoluta, petiolo 0.5-1 cm. longo supra canaliculato suffulta. *Panicula* terminalis, a basi ramosa, usque ad 16 cm. longa et 15 cm. diametro, ramis oppositis vel suboppositis pedunculo ad 5.5 cm. longo incluso ad

10 cm. longis iterum ramosis cum ramulis sicco subviridibus compressis vel angulatis sparse pustulatis; flores ad quinque pedunculo saepissime circa 2 mm. longo suffulti, approximati, sessiles; alabastra ambitu suboblunga, 3 mm. longa, pustulata. *Calycis* lobi subdeltoidei, vix 0.5 mm. longi. *Corolla* ut videtur calyptratim decidua. *Ovarium* 2-loculare.

Takuapa, Kapong, 100 m. evergreen forest, *Kerr* 17128.

***Eugenia jugorum* Craib** [Myrtaceae-Myrteae]; ab *E. sublaeta* Craib foliis tenuioribus, receptaculo fere dimidio brevior recedit.

Arbuscula circa 5 m. alta (ex *Kerr*), omnino glabra; ramuli primo parum compressi, rubro-brunneo-corticati, mox teretes, cortice cinereo vel subcinereo obtekti, lenticellis haud conspicuis. *Folia* saepissime lanceolata vel oblanceolata, rarius subelliptica, apice caudato-acuminata, rarius subcaudato-acuminata, basi cuneata, interdum inaequilateralia, 4-6 cm. longa, 1.5-2.5 cm. lata, rigide chartacea, sicco viridia, subtus pallidiora, pagina utraque subsparse punctata, nervis lateralibus utrinque numerosis inter se parallelis et 2.5-4 mm. distantibus subtus subprominulis supra conspicuis vel subconspicuis, nervo intramarginali conspicuo, nervulis rete subtus prominulum efficientibus, margine anguste cartilaginea, recurva, petiolo ad 1 cm. longo supra canaliculato suffulta. *Inflorescentia* e racemo terminali 7-floro efoliato constituta vel floribus inferioribus axillaribus; pedicelli infra articulationem 1-2.5 cm. longi, apice bracteolis duabus 3 mm. longis cito deciduis instructi. *Receptaculi* sub anthesin pars cylindrica vix 1 cm. longa, apice circa 3 mm. diametro, pars expansa circa 7 mm. longa, apice circa 12 mm. diametro. *Ovarium* 2-loculare.

Nakawn Sritamarat, Kao Luang, 1600-1700 m., evergreen forest, *Dr. Eryl Smith* 747 (*type*), *Kerr* 15533.

***Eugenia rhamphiphylla* Craib** [Myrtaceae-Myrteae]; ab affini *E. penangiana* Duthie foliis tenuioribus, receptaculi tubo supra ovarium expanso recedit.

Arbor circa 30 m. alta (ex *Kerr*), glabra; ramuli graciles, primo parum angulati, cito teretes, fuscescentes, cortice longitudinaliter fisso. *Folia* opposita vel subopposita, saepissime oblango-oblanceolata, rarius oblango-elliptica, elliptica, vel late lanceolata, apice longius obtuse acuminata, basi cuneata vel subacuminata, saepissime circa 7 cm. longa et 2.5 cm. lata, rigide chartacea, pagina utraque conspicue distanter punctata, sicco pallescentia, nervis lateralibus numerosis inter se parallelis supra fere obscuris subtus prominulis, nervo intramarginali intra marginem ipsam conspicuo, nervulis nervis lateralibus plus minusve parallelis subtus subprominulis, margine cartilaginea, petiolo gracili 5 mm. longo supra canaliculato suffulta. *Cymae* terminales, saepe etiam ex axillis superioribus ortae, pauciflorae, floribus basi articulatis paululo post anthesin 1.3 cm. longis; bractae deciduae. *Receptaculum* elongatum, ad ovarium paululo ultra 1 mm. diametro, supra ovarium ad 3 mm.

diametro subitius expansum. *Calycis* segmenta saepissime cito decidua, circa 1.5 mm. longa et lata. *Stylus* inferne incrassatus; ovarium 2-loculare.

Satul, Klawng Ton, 300 m., evergreen forest, *Kerr* 14444.

***Eugenia spissa* Craib** [Myrtaceae-Myrteae]; inter species foliorum nervis lateralibus numerosis approximatis et inflorescentia brevi axillari *E. refertae* Craib maxime affinis a qua nervis lateralibus quam reticulatione multo magis conspicuis recedit.

Arbor circa 7 m. alta (ex *Kerr*), glabra; ramuli graciles, cortice brunneo vel mox cinereo-brunneo obtekti. *Folia* opposita vel subopposita, oblango, apice obtuse caudato-acuminata, basi cuneata vel late cuneata, saepe parum inaequilateralia, 5-11 cm. longa, 2-4.8 cm. lata, rigide chartacea, sicco subtus luteo-viridia, pagina inferiore, punctata, nervis lateralibus utrinque numerosis rectis supra subobscuris subtus subprominulis, costa supra impressa subtus prominente, nervis transversis paucis subtus vix conspicuis, nervo intramarginali circa 1 mm. intra marginem supra obscuro subtus subprominulo, margine anguste cartilaginea vel saepe vix distincte cartilaginea, interdum recurva, petiolo 3-5 mm. longo supra canaliculato suffulta. *Cymae* axillares, saepissime petiolo fere duplo longiores, rarius ad 2 cm. longae, pauciflorae, pedunculo communi 2-6 mm. longo suffultae; bractae ad cymularum bases circa 1.5 mm. longae; pedicelli ad 1.75 mm. longi, basi bractea solitaria 0.75 mm. longa et apice bracteolis duabus circa 0.5 mm. longis instructi; alabastra turbinata, 4 mm. longa, apice 4 mm. diametro. *Corolla* ut videtur calyptratim decidua.

Chumpawn, Tasan, 75 m., by stream in evergreen forest, *Kerr* 11666.

***Eugenia sublaeta* Craib** [Myrtaceae-Myrteae]; ab *E. laeta* Ham., cui habitu similis, foliis minoribus, floribus saltem inferioribus axillaribus recedit.

Frutex circa 3 m. altus (ex *Kerr*), partibus omnibus glaber; ramuli primo parum compressi, brunneo-corticati, mox subteretes, cortice cinereo-brunneo obtekti, lenticellis haud conspicuis. *Folia* opposita vel subopposita, saepissime elliptica vel oblango-elliptica, obtuse acuminata, basi cuneata, 4.5-5.5 cm. longa, 2-3 cm. lata, chartacea vel rigide chartacea, sicco viridia vel plus minusve brunnescentia, pagina utraque sat copiose punctata, nervis lateralibus utrinque numerosis inter se 3-4 mm. distantibus rectis pagina utraque prominulis intra marginem anastomosantibus nervum intramarginalem continuum formantibus, nervulis pagina utraque rete subprominulum vel saltem conspicuum formantibus, margine cartilaginea, anguste recurva, petiolo ad 5 mm. longo supra anguste canaliculato suffulta. *Inflorescentia* e floribus in axillis supremis positis et cymula triflora terminali constituta; pedicelli inferiores infra articulationem ad 2.5 cm. longi, apice bracteolis duabus deciduis instructi, flore terminali saepissime subsessili. *Receptaculum*

cylindricum, 1.5 cm. longum, superne gradatim paululo incrassatum, medio circa 2-2.5 mm. diametro, summo apice ad 7 mm. diametro expansum, sicco fuscum. *Sepala* 4, plus minusve transverse oblata, 1-2 mm. longa, 4.5-6 mm. lata, saltem interiora marginem versus membranacea. *Petala* 4, inter se libera, in alabastro circa 7.5 mm. longa et lata, sat copiose glandulosa, medio crassiora. *Ovarium* 2-loculare.

Ranawng, Kao Pawta Luang Keo, 1300 m., open evergreen on ridge, *Kerr* 16951.

Barringtonia abbreviata Craib [Lecythidaceae]; a *B. conoidea* Griff. eiusque affinioribus foliis longius petiolatis et inflorescentia brevi rigida erecta distinguenda.

Arbor circa 8 m. alta (ex *Kerr*), glabra; ramuli primo stramineo-brunnei, mox pallide brunnei vel brunneo-cinerei, plus minusve striatuli vel reticulato-striatuli, lenticellis haud conspicuis. *Folia* ad ramulorum apices aggregata, oblonga vel oblongo-oblancoolata, apice subacute acuminata, basi cuneata vel subacuminata, interdum decurrentia, saepe parum inaequilateralia, 9-24.5 cm. longa, 3-9 cm. lata, chartacea, sicco viridia, nervis lateralibus utrinque 9-10 bene intra marginem anastomosantibus supra conspicuis subtus prominulis, nervis transversis pagina utraque conspicuis vel subprominulis, nervulis reticulatis, margine distanter denticulata, parum recurva, petiolo 1-5 cm. longo basi conspicue incrassato suffulta. *Spicae* infra folia ortae, solitariae vel geminae, pedunculo communi circa 1 cm. longo incluso ad 7 cm. longae, rigidae, erectae, nodis prominentibus sat proximis, rhachi sub anthesin brunnea vel fusco-brunnea circa 4 mm. crassa; bracteae deltoideae, circa 1.5 mm. longae, deciduae. *Receptaculum* sub anthesin circa 1.3 cm. longum, parte basali pseudopedicellum 5-7 mm. longum formante, superne incrassatum, subangulatum. *Calyx* 7-9 mm. longus, in lobos 2-4 irregulariter rumpens. *Petala* 4, punicea (ex *Kerr*), suboblonga, plus minusve cucullata, circa 3 cm. longa et 1.5 cm. lata. *Filamenta* basi inter se connata, exteriora 3.5 cm. longa, antheris circa 0.75 mm. longis, interiora multo breviora, antheris 1.25 mm. longis breviter apiculatis, connectivo lato. *Stylus* 3 cm. longus; ovarium 4-loculare, ovulis in loculo quoque circa 12 biseriatis.

Pang-nga, Kao Pang-nga, 100 m., evergreen forest, *Kerr* 17226A.

Barringtonia kratensis Craib [Lecythidaceae]; a *B. longipede* Gagnep. foliis latioribus conspicue serrulatis vel denticulato-serrulatis, racemis laxifloris, calycis lobis brevioribus distinguenda.

Arbor circa 4 m. alta (ex *Kerr*); ramuli annotini glabri vel subglabri, angulati, stramineo-corticati, lenticellis vix conspicuis. *Folia* ad ramulorum apices aggregata, late lanceolata, oblongo-lanceolata, rarius suboblonga, apice longius acuminata, apiculata, basi acuminata vel acuminato-cuneata, parum decurrentia, 8-25 cm. longa, 3.3-8.3 cm. lata, rigide chartacea, sicco viridia, matura pagina utraque glabra, costa supra sicco anguste subacute prominente

subtus prominente, nervis lateralibus utrinque 12-19 intra marginem anastomosantibus supra impressis vel prominulis subtus prominentibus, nervulis rete gracile pagina utraque prominulum efficientibus, margine serrulata vel denticulato-serrulata, petiolo 2-10 cm. longo basi conspicue incrassato suberoso apice lamina decurrente anguste alato glabro suffulta. *Inflorescentia* spicata vel racemiformis, solitaria, ramulos terminans vel rarius e ramulis vetustioribus lateraliter orta, pedunculo communi circa 2 cm. longo incluso circa 35 cm. longa, rhachi cum pedunculo communi conspicue angulata vel hic et illic subalato-angulata glabra sicco viridi mox straminea partibus iuvenilibus plus minusve fusciscente, pedunculo basi bracteae dense aggregatis deciduis instructo; bracteae deciduae. *Receptaculum* glabrum, circa 3 mm. longum et apice 4 mm. latum, basi in pseudopedicellum vix conspicuum vel usque ad 1 cm. longum angustatum. *Calycis* segmenta 4, oblonga vel oblongo-rotundata, ad 6 mm. longa et 5 mm. lata, sparse crassius ciliata, aliter glabra. *Petala* 4, oblongo-elliptica, apice rotundata, circa 1.5-1.8 cm. longa et 1 cm. lata, medio incrassata, margine superne reflexa, basi saepe inflexa, glabra. *Stamina* circa 2 cm. longa. *Stylus* 2.5 cm. longus; ovarium 4-loculare.

Krat, Baw Rai, 100 m., evergreen forest, *Kerr* 9456.

Osbeckia pulchra Geddes [Melastomaceae-Osbeckieae]; ab *O. crinita* Benth. receptaculo supra ovarium multo longius tubuloso-producto, fructu ambitu oblongo haud rotundato, ab *O. Garrettii* Craib receptaculo superne appendicibus penicellato-setosis instructo recedit.

Frutex erectus; ramuli quadrangulares, sulcati, pilis pallidis rigidis patentibus basi bulbatis instructi. *Folia* oblongo-lanceolata vel oblongo-elliptica, apice acuta, basi lata vel obtusa, 6-11 cm. longa, 2.5-4 cm. lata, chartacea, sicco viridia, subtus pallidiora, supra pilis longis subsparsae tecta, subtus ad nervos nervulosque pilis albis rigidis copiose instructa, margine ciliata, e basi 7-nervia, nervis marginalibus tenuibus, omnibus supra impressis subtus prominentibus; petioli 5-9 mm. longi, dense hirsuti. *Inflorescentia* terminalis, umbellato-cymosa, laxa, pedunculo pubescente suffulta; pedicelli 2-3 mm. longi. *Receptaculum* setis inferne simplicibus superne stellatis et appendicibus penicellato-setosis sat crebris instructum, supra ovarium longius tubuloso-productum, circa 1 cm. longum. *Calycis* segmenta 4, linearia, 4-5 mm. longa, setis paucis margine instructa, apice stellato-setosa, appendicibus similibus sed dimidio brevioribus alternantia. *Petala* 4, rotundato-oblonga, 1.5 cm. longa, 1.1 cm. lata, ciliata. *Stamina* 8, inter se aequalia; antherae apice attenuatae; filamenta 1.2 cm. longa. *Ovarium* circa 9 mm. diametro, apice setosum, quadriloculare; stylus 2.2 cm. longus.

Doi Sutep, 1600 m., *Kerr*.

Osbeckia watanae Craib [Melastomaceae-Osbeckieae]; *O. nepalensis* Hook. habitu similis sed antheris acuminatis haud gradatim attenuatis facile distinguenda.

Ramuli quadranguli, setis erectis adpressis pallidis basi incrassatis scabridi, straminei, ad angulos virides. *Folia* lanceolata angustave oblongo-lanceolata, apice obtusa, basi rotundata vel cordatula, 3-8 cm. longa, 1-1.5 cm. lata, chartacea, pagina superiore viridia vel fusco-viridia, inferiore pallidius viridia, supra setosa, subtus ad nervos setosa, aliter pilis sat longis plus minusve adpressis subrigidis instructa, e basi 5-7-nervia, nervis duobus exterioribus tenuibus, aliis supra parum impressis subtus prominentibus, nervis transversis fere omnino obscuris, margine longius ciliata, subintegra, sessilia vel petiolo ad 2 mm. longo adpresse setoso suffulta. *Flores* terminales, congesti; bracteae subovatae, acutae, 5 mm. longae, 3 mm. latae, dorso medium versus adpresse setosae, margine longius setoso-ciliatae; pedicelli subnulli. *Receptaculum* circa 9 mm. longum, ima basi setosum, medium versus processibus paucis carnosus quadrato-oblongis circa 1 mm. longis apice longe setosis et apice cum calycis segmentis alternantibus processibus similibus 1.5 mm. longis ornatum, aliter glabrum. *Calycis* segmenta 4, oblongo-lanceolata, acuta, 1 cm. longa, fere 5 mm. lata, margine setoso-ciliata. *Petala* 4, flabelliformia, paulo ultra 2 cm. longa, 2.5 cm. lata, pauperius ciliolata. *Stamina* 8, inter se aequalia, filamentis 1 cm. longis, antheris 9 mm. longis in acumen loculis paulo brevius productis, connectivo basi paululo producto.

Watana, Put 1909.

Otanthera confusa Craib [Melastomaceae-Osbeckieae]; ab *O. moluccana* Blume receptaculi setis multo longioribus recedit.

Suffrutex circa 0.75 m. altus (ex Kerr); ramuli setis erectis adpressis primo rubris cito fusco-rubris iuventute tecti, mox cinereo-corticati, angulati, 2-3 mm. diametro, sparsius similiter setosi. *Folia* opposita, paribus inter se aequalibus parumve inaequalibus, lanceolata, vel oblongo-lanceolata, apice acuta, basi cuneata, 2.5-7.5 cm. longa, 0.8-2.1 cm. lata, rigide chartacea, sicco viridia, pagina inferiore pallidiora, supra setis adpressis saepe primo apice rubro-tinctis scabrida, subtus setis longioribus tenuioribus adpressis instructa, 5-nervia, e basi trinervia, nervis duobus exterioribus paululo supra basem furcatis, nervis supra argute impressis subtus prominentibus, nervulis supra obscuris subtus paucis magis minusve conspicuis, margine subintegra, petiolo ad 7 mm. longo longius adpresse setoso suffulta. *Inflorescentia* 3-5-flora, et terminalis et ex axillis supremis orta, subsessilis vel pedunculo communi sub fructu ad 1 cm. longo suffulta; pedicelli infructescentes circa 4 mm. longi; bracteae deciduae. *Receptaculum* 4 mm. longum, supra ovarium tubuloso-productum, dorso setis elongatis rubro-tinctis ima basi paucis solitariis superne saepissime per 5 processibus carnosus brevibus subquadratis gestis tectum praeterea sparse inconspicue puberulum, intra glabrum. *Calycis* tubus circa 0.3 mm. longus, apice intra puberulus, segmenta subulata, 4 mm. longa, longe rubro-setosa, processibus circa 1 mm. longis apice similiter setosis alternantia. *Petala* 5, purpurea (ex Kerr), cuneata, apice

truncata, medio breviter acuminata, ad 8 mm. longa et 7 mm. lata, ciliata et ad acumen setis paucis elongatis instructa. *Stamina* 10, inter se subaequalia, filamentis 3.5 mm. longis, antheris 3-3.5 mm. longis, brevioribus sub antheram ipsam longioribus 0.5 mm. infra antheram bi-appendiculatis. *Ovarium* apice longe et dense setosum; stylus 7 mm. longus. *Fructus* fere maturus subglobosus, 7 mm. diametro, setis persistentibus instructus, receptaculo subcarnoso, parte apicali libera capsulari longitudinaliter fissa; semina curvata, circa 0.5 mm. longa, punctata.

Ranawng, Kao Pawta Chongdong, 800 m., evergreen forest, Kerr 16763.

Chirita capitis Craib [Gesneriaceae-Cyrtandreae]; a *C. involucreta* Craib et *C. involucrellata* Craib antheris glabris recedit.

Herba annua, ad 45 cm. alta; caulis simplex vel e basi ramosus, basi ad 8 mm. diametro, pilis pallidis transverse septatis divergentibus sparse instructus, viridis vel praesertim supra nodos rubro-tinctus. *Folia* opposita, paribus saepe inter se parum inaequalibus, saepissime oblonga vel suboblonga, apice acuta vel acute subacuminata, basi saepissime inaequilaterialia, latere altero rotundata, altero rotundata vel cuneato-rotundata, ad 8 cm. longa et 5 cm. lata, pagina superiore viridia, inferiore pallide viridia, utraque sed inferiore sparsius pilis erectis pallidis transverse septatis instructa, nervis lateralibus utrinque 6-7 supra parum impressis subtus prominentibus, costa supra impressa subtus prominente, margine integra, ciliata, petiolo 1-6.5 cm. longo supra parum canaliculato saepe rubro-tincto parcius piloso suffulta. *Cymae* axillares, saepissime 3-florae, pedunculo communi subnullo vel saepissime 5-10 mm. longo indumento ei caulis simili tecto apice bracteis duabus inter se haud connatis foliaceis sessilibus circa 10 mm. longis et 6 mm. latis instructo suffultae; pedicelli 10-12 mm. longi, pilis pallidis divaricatis glanduloso-capitatis instructi. *Calycis* viridis segmenta linearilanceolata, subacuta, apice breviter recurva, 6 mm. longa, 1.25 mm. lata, dorso pilis elongatis transverse septatis glanduloso-capitatis subsparse tecta. *Corollae* tubus extra superne pilis brevioribus glanduloso-capitatis instructus, 14 mm. longus, medio parum curvatus, parte basali aequali 2.5 mm. diametro, apice ad 7 mm. diametro ampliatus; limbus pallide violaceus, oculo purpurascens; labium inferius 3-lobatum, lobo mediano lateralibus paulo maiore ad 6 mm. longo et 7 mm. lato; labium superius e lobis duobus 4 mm. longis et 5.5 mm. latis constitutum. *Stamina* 2, antheris omnino glabris dorso basi et apice fusco-purpureis, filamentis 3 mm. longis 7 mm. supra corollae tubi basem insertis; staminodia lateralia 2, filiformia, apice haud pilosa. *Ovarium* sessile, viride, glabrum, basi disco circa 0.5 mm. alto cinctum, circa 8 mm. longum, stylo pallido circa 5 mm. longo pilis paucis tenuibus glanduloso-capitatis instructo, stigmatibus bilamellato, lamellis recurvis supra papillosis.

Described from plants raised in Aberdeen from seed collected in Bangkok by Dr. A. F. G. Kerr. Flowered November 1928.

XVIII.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies :—DR. W. YOUNGMAN, Economic Botanist, Central Provinces, India, to be Director of Agriculture, Ceylon ; MR. F. BURNETT, Divisional Agricultural Officer, Ceylon, to be Deputy Director of Agriculture, British Guiana ; DR. F. J. MARTIN, Agricultural Chemist, Sierra Leone, to be Assistant Director of Agriculture, Sierra Leone.

DR. ERYL SMITH. We deeply regret to record the death on January 25th, as the result of a motor accident, of Dr. Eryl Smith, who for more than two years had worked intermittently in the Herbarium on the Ferns of Malaya. Educated at University College, Bangor, the London School of Medicine for Women, and the Royal Free Hospital, Dr. Eryl Smith took the degrees of M.B. and B.S. of the University of London in 1918, and, after holding medical appointments at home and abroad, married Dr. Malcolm Smith, who at that time was in practice at Bangkok. Proceeding to Siam she was attracted to the study of the flora and early commenced to specialize on the Pteridophyta. She visited the Nakawn Sritamarat Mountains in the Siam Peninsula, the Kam Chay mountains in Cambodia, and the Five Finger Mountains in Hainan, and later spent six months in the Malay Archipelago chiefly in Celebes and Timor. In all these countries Dr. Eryl Smith made collections of ferns, many of which she presented to Kew. She published a paper on the ferns of Kaw Tao, Surat, and had in view a complete work on the ferns of Siam.

The Otari Open Air Museum, Wellington, New Zealand.—

In the *Kew Bulletin* for 1926 (p. 428) and 1929 (p. 63), brief accounts were given of the establishment of this Museum as a reserve for the native vegetation of New Zealand.

We now record with pleasure the fact that DR. L. COCKAYNE, C.M.G., F.R.S., has been appointed Honorary Botanist to the Wellington City Council. This appointment, which will ensure that Dr. Cockayne's knowledge and advice are fully utilised in the management of the Museum and other reserves, is, we believe, the first of its kind to be made by any City. It is welcome evidence of the care with which the project is being carried out, and should ensure that its development will proceed along sound lines.

Strychnos chloropetala A. W. Hill.—A new species of *Strychnos*, *S. viridiflora* A. W. Hill, was published in *K.B.* 1925, p. 424, but it was unfortunately overlooked that Dr. De Wildeman had previously used this name for a species collected in the Belgian Congo (De Wild. in Plant. Bequaert. ii. p. 101, 1923). It is therefore necessary to give the Siamese species another specific name and *Strychnos chloropetala* A. W. Hill is now substituted for *S. viridifolia* A. W. Hill.

Chirita oculata Craib [Gesneriaceae-Cyrtandreae] ; a *C. barbata* Sprague, *C. tubulosa* Craib, earumque affinium corollae oculo brunneo vel fusco-brunneo reccedit.

Herba annua, caule erecto 30–70 cm. alto ramoso viridi basi ad 1.3 cm. diametro pilis longiusculis transverse septatis albis divergentibus sat rigidis primo instructo mox plus minusve glabrescente. *Folia* elliptico-ovata vel elliptico-oblonga, inferiora apice acuta vel acute subacuminata, basi rotundata vel superiora cordatula, inferiora ad 20 cm. longa et 13.5 cm. lata, superiora circa 9 cm. longa et 5.5 cm. lata, supra viridia, subtus pallida, supra pilis longioribus transverse septatis et brevioribus sat rigidis instructa, subtus ad costam nervosque laterales aliter sparsius similiter instructa, nervis lateralibus utrinque 11–14 supra parum impressis subtus prominentibus, petiolo usque ad 4 cm. longo suffulta, superiora fere sessilia, ramis axillaribus oblique erectis cauli similibus cum petiolo basi concretis. *Racemi* axillares, pedunculo communi cum petiolo omnino concreto, pedicellis ad petioli summum apicem oreutibus circa 1 cm. longis viridibus pilis longiusculis transverse septatis pallidis instructis sub anthesin erectis. *Calyx* pallide viridis, dorso et intra apice pilosus, segmentis lineari-lanceolatis subacutis ad 13 mm. longis et 2 mm. latis. *Corollae* tubus inferne pallidus, superne lutescens, dorso inferne glaber, superne pilosus, intra inferne glaber, superne pilis brevibus glanduloso-capitatis instructus, circa 1.2 cm. longus, inferne ad 8–9 mm. tubulosus, circa 1.75 mm. diametro, apice ad 5.5 mm. diametro expansus, intra apice brunneus vel fusco-brunneus ; limbus 5-lobatus, lobis imbricatis oblatis, infimo 6 mm. longo 8 mm. lato, lateralibus 4 mm. longis 7 mm. latis, supremis 2.5 mm. longis 5 mm. latis. *Stamina* 2, filamentis circa 1.5 mm. longis pilis paucis instructis circa 8 mm. supra corollae tubi basem insertis, antheris coalitis pallidis apice pilis purpureis instructis. *Ovarium* sericeum, basi disco conspicuo unilaterali instructum, stipite quam disco longiore glabro suffultum ; stylus pubescens, apice bilamellatus, lamellis papillosis.

Described from a plant which flowered at Aberdeen in July 1928. It was raised from seed of *Kerr* 9750 which was collected on Kao Sakan.

The corolla limb is lemon-yellow and the throat brown or dark brown.

Polypodium (Goniophlebium) Garrettii C. H. Wright [Filices-Polypodiaceae] ; *P. niponico* var. *Wattii* Bedd. proximum, frondibus angustioribus longioribus velutinis pinnisque pluribus acutis distinguendum.

Rhizoma late repens, 3 mm. diametro, ramentis anguste lanceolatis brunneis deciduis vestitum. *Stipes* 2.5 cm. longus, stramineus, tenuis, glaber. *Frondes* oblongae, usque ad 32 cm. longae, alte pinnatisectae, utrinque velutinosae ; pinnae basi confluentes, oblongae, acutae, 2.5 cm. longae, 5 mm. latae, utroque latere rhachidis circiter 50 ; sori uniseriati.

Doi Angka, Doi Pa Mawn, 1720 m., *Garrett* 382.

BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1930 ROYAL BOTANIC GARDENS, KEW

XIX.—REVISION OF THE OLD WORLD SPECIES OF BUDDLEJA. C. V. B. MARQUAND.

Distribution.

The genus *Buddleja* has a wide distribution extending throughout most of the warmer parts of Asia, Eastern and Southern Africa, and both North and South America. The present work excludes the New World species. There are no representatives of the genus wild in Europe, Northern Asia or Australasia, while all Mascarene species which have been placed in *Buddleja* are considered to belong to the allied genus *Nicodemia*, which differs in having a berry instead of a capsule. In every species from the Mascarene Islands in which the fruit is known this has been found to be the case. As in so many genera, the largest number of species is to be found in the Chinese province of Yunnan.

The interesting "Alternifoliae," which alone in the Loganiaceae have alternate leaves, are confined to Tibet and the borders of Western China* where all the species are normally deciduous. One species (*B. polystachya*) is common to Arabia and East Africa, and only three other species are African.

The altitudinal range of the genus extends from the Plains of India (1000 ft.), to the windswept Tibetan Plateau (12,000 ft.), but most of the species occur in the temperate zone.

Taxonomy.

Among the species included in this work, *B. gynandra* stands out as very distinct in the position of the androecium. Apart from this, the genus is a very natural one and not readily subdivided according to natural relationship.

The Sections and Series adopted by Bentham (in DC. Prodr.) and accepted by Engler (in Nat. Pflanzenfam.) are scarcely satisfactory when applied to the greatly increased number of Asiatic species now known. The following Series are proposed as convenient for the Old World species:—

§ *Gynandrae*—Corolla tube straight. Stamens free from the corolla tube. Leaves opposite (Sp. 1).

§ *Alternifoliae* (Kränzl. in Bull. Jard. Bot. Pétersb. xiii. 89 (1913), as a *Section*)—Corolla tube straight. Stamens inserted on the corolla tube. Leaves alternate. (Spp. 2-6).

*Except *B. amentacea* Kränzl., the origin of which is doubtful (see p. 184).

In addition to *Kerr* 6005, from Mè Wong, Nakansi Sawan, the type specimen of *S. chloropetala*, the following additional specimens, which have been arranged in their circles according to the order adopted in Prof. Craib's *Florae Siamensis Enumeratio*, may now be placed in this species.

SIAM.

Maharat.

Prè, Hui Mè Kammi, 300 m., woody climber, edge of stream on limestone, *Kerr* 4843. Lampang, Mè Long, 170 m., the berry is said to be about 1 cm. in diameter and the seed is used for clearing muddy water, *Winit* 802. Lampang, Mè Puyang, 190 m., flowers greenish-white, *Winit* 1284. Lampang Mè Yom, 100 m. (Vernacular name Tung Kua Kam. tua mè), straight spines, greenish-white flowers, *Winit* 1629.

Rachasima.

Korat, Chantûk, Tachang, 400 m., climber, rocky limestone hill, *Kerr* 10,049.

Rachaburi.

Kanburi, Wangka, 200 m., scrambling shrub growing among limestone rocks, *Kerr* 10,474.

Surat.

Chumpawn, Kaw Wieng, 50 m., *Kerr* 11,372.

Kaw Tao, 10 m., woody climber, flowers green, *Kerr* 12,726.

Kaw Tao, 20 m., *Kerr* 11,136.

Kaw Tao, 300 m., (?) *Kerr* 16,080.

Kaw Prap, 10 m., *Kerr* 12,522.

Puket.

Pang-nga, Kao Taknan, on rock of limestone hill, *Kerr* 17,285.

Nakawn Sritamarat.

Patalung, Kao Oktalu, 100 m., woody climber on limestone hill, *Kerr* 15,359 (flowers slightly larger than in the type).

Flora of Trinidad and Tobago.*—The second part of the first volume of this flora has now been published (*K. B.* 1929, p. 92). This continues to follow the order of the cohorts of the Genera Plantarum, and reaches the end of the *Geraniales*. The order of the families is not always that of the Genera Plantarum, and some genera are placed in different families, e.g. *Sauvagesia* in Ochnaceae. A few new species and several new combinations are published here for the first time. As before, the typescript was carefully checked at Kew.

* *Flora of Trinidad and Tobago*, Vol. 1, Part 2, pp. 23-164; Parietales, Polygalinae, Caryophyllinae, Guttiferales and Geraniales by R. O. Williams, Malvales by R. O. Williams and E. E. Cheesman. Trinidad: printed by the Government Printer, Government Printing Office, Port of Spain. Price 6s.

§ **Curviflorae**—Corolla tube curved. Stamens inserted on the corolla tube. Leaves opposite (Spp. 7–11).

§ **Rectiflorae**—Corolla tube straight. Stamens inserted on the corolla tube. Leaves opposite (Spp. 12–52).

For many years after its discovery *B. alternifolia* Maxim. was the only species with alternate leaves known in the family Loganiaceae. In 1913 Kränzlin described, in Bull. Jard. Bot. Pétersb. xiii. 89, a species of uncertain origin based on a single incomplete specimen, and proposed the name '*Alternifoliae*' for a Section of the genus to include the alternate-leaved species. The discovery of *B. Wardii*, however, in which some of the branches bear alternate leaves and others opposite, has shown that too much importance should not be attached to this character in the primary division of the genus.

Since the whole genus is not under review, no attempt is made here to discuss its systematic position. Originally placed in the Scrophulariaceae by Bentham, Lindley and other authors, it was transferred to the Loganiaceae in Benth. et Hook. f. Gen. Plant., and placed in the tribe Euloganieae which is now its accepted position.

The generic name has been spelt in a variety of ways by different authors. That adopted in the present work is the original (see Sprague in *Kew Bull.* 1928, p. 349).

Of the species coming within the scope of this Revision, all are shrubs except *B. Colvilei*, which is unique in its very large flowers and becomes a considerable sized tree in the Sikkim Himalaya; and *B. salviifolia*, which is not uncommon throughout a wide area in Africa, and though normally a shrub, has been reported to attain the girth of a tree in one locality.

Unfortunately in a number of cases it has not been possible to obtain fruiting specimens for examination, so a classification of the genus on the seed characters is impossible at the present time, but a sufficient number of species are known in fruit to indicate that there is no correlation between the position of the anthers and the character of the seed. This is seen at once in the following table:—

Seeds not tailed.		Seeds shortly tailed.		Seeds with long tails.	
Lindleyana	B	alternifolia	M	albiflora	T
paniculata	T	japonica	B	nivea	T
asiatica	M	Colvilei	T	macrostachya	T
salviifolia	M	Forrestii	T	Hookeri	T
heliophila	M	Griffithii	T	Davidii	M
tibetica		limitanea	M	officinalis	M
var. Farreri	M	Fallowiana	M	myriantha	M
				stenostachya	M

(Reference to insertion of stamens: B = near base, M = near the middle, T = near the throat of the corolla tube.)

The leaves in some species of this genus exhibit a particularly wide range of fluctuation in size, due to external conditions, especially soil moisture, so that cultivated plants are frequently very

different in appearance from the wild specimens. In some species a great range of leaf-form may be found on a single plant, some of the leaves having winged petioles and others not winged. Similarly the indumentum has been found to be variable to a certain extent. This variation in response to environment is one of the greatest difficulties in determining the limits of the species, especially when the material is scanty.

From the dissection of a very large number of flowers, the position of insertion of the stamens on the corolla tube has been found to be a most important character in this genus, being constant for each species. The shape of the corolla-tube is used to divide the genus into Series and also to separate the species. On the other hand, the corolla-lobes vary much within the same species. The indumentum of the ovary and corolla are also specific characters, though subject to slightly more variation. The flower-colour is almost invariably lost in drying, the corollas becoming blackish in many species.

The flowers of most species are strongly fragrant and are much visited by insects, particularly Lepidoptera. Several hybrids are known in gardens. Some of these were intentionally produced between Asiatic and American species of no close affinity such as *B. Fallowiana* × *B. globosa*, but no scientific genetical study of the genus has been made, nor has the cytology of any of the species been investigated to the author's knowledge.

In the present paper, 52 species and 22 varieties are recognised. Five species are described here for the first time.

Material and Acknowledgments.

The basis of the present work has been the material in the Herbarium of the Royal Botanic Gardens, Kew, but "types" of nearly all the species unrepresented at Kew have been received on loan for study through the kindness of those in charge of the following Institutions: Arnold Arboretum, U.S.A.; Botanical Museum, Berlin; Herbarium, Botanical Garden, Breslau; Royal Botanic Garden, Edinburgh; Rijks Herbarium, Leiden; Herbarium, Principal Botanical Garden, Leningrad; Muséum d'Histoire Naturelle, Paris; National Herbarium, Pretoria, South Africa.

The author wishes to acknowledge his indebtedness to all who have assisted in this way and particularly desires to express his thanks to Professor W. Wright Smith for most generously handing over to him some notes he had made on the species in cultivation at the Royal Botanic Garden, Edinburgh.

Buddleja [*Houst.* ex Linn. Gen. ed. 1, 26 (1737)] *Linn.* Sp. Pl. ed. 1, 112 (1753); Gen. Pl. ed. 5, 51 (1754); Benth. & Hook. f. Gen. Pl. ii. 793 (1876).

KEY TO THE OLD WORLD SPECIES OF BUDDLEJA.

Stamens inserted on the ovary, free from the corolla tube.....

1. *gynandra*.

Stamens inserted on the corolla tube :

Leaves alternate (on some branches more or less opposite in *B. Wardii*) :

Flowers 3 mm. in length ; leaves linear-lanceolate attenuate to a very narrow apex (the upper alone known), 10 cm. long...

2. *amentacea*.

Flowers exceeding 6 mm. in length ; leaves small, not linear-lanceolate :

Lamina entire, thin, upper surface glabrous ; midrib inconspicuous on lower surface.....3. *alternifolia*.

Lamina sinuate-dentate, thick, upper surface densely stellate-tomentose ; midrib conspicuous on lower surface :

Ovary glabrous :

Corolla pale pink, about 5 mm. long ; tube less than 1 mm. in diameter.....4. *Legendrei*.

Corolla cream coloured, about 10 mm. long ; tube 1.5-2 mm. in diameter.....5. *tsetangensis*.

Ovary tomentose.....6. *Wardii*.

Leaves always opposite :

Corolla tube curved :

Stamens inserted near the base of the corolla tube ; stem tetragonus, winged :

Leaves small (under 8 cm. in length) ; flowers deep red or violet purple ; exterior of corolla glandular, not tomentose ; fruit small.....7. *Lindleyana*.

Leaves large (10-20 cm. in length) ; flowers pale lilac ; exterior of corolla tomentose ; fruit large...8. *japonica*.

Stamens inserted near the middle of the corolla tube ; stem terete without wings :

Inflorescence elongate, up to 25 cm. long ; ovary glabrous, leaves large :

Leaves membranous, persistent ; exterior of the corolla stellate tomentose.....9. *curviflora*.

Leaves more or less coriaceous, deciduous ; exterior of the corolla glandular.....10. *venenifera*.

Inflorescence subcapitate ; ovary pilose above, leaves minute.....11. *Purdomii*.

Corolla tube straight :

Stamens inserted in the lowest third of the corolla tube.....

12. *yunnanensis*.

Stamens inserted in the upper two-thirds of the corolla tube :

*Corolla densely glandular, not tomentose on the exterior :

Limb of the corolla about 6 mm. in diameter ; tube about 7 mm. long, anthers inserted in the middle ; leaves subtruncate at the base :

Inflorescence on the previous year's wood appearing before the leaves.....52. *tibetica* var. *glandulifera*.

Inflorescence terminal on the leafy branches :

Leaves 2-3 cm. long, cuneate at the base ; inflorescence small.....13. *acosma*.

Leaves 6-8 cm. long, cordate at the base, inflorescence large.....38. *agathosma* var. *glandulifera*.

Limb of the corolla about 2 mm. in diameter ; tube about 3 mm. long ; anthers inserted near the mouth ; leaves attenuate at the base.....14. *adenantha*.

*Corolla eglandular glabrescent or tomentose on the exterior, occasionally with a few glands among the tomentum :

STAMENS INSERTED AT OR IMMEDIATELY BELOW THE MOUTH OF THE COROLLA :

Flowers very large ; corolla tube 6-8 mm. in diameter at the mouth.....15. *Colvillei*.

Flowers much smaller ; corolla tube not exceeding 3.5 mm. in diameter at the mouth :

Length of corolla tube twice the diameter at the mouth (i.e. about 6 mm. long, 3-3.5 mm. diam.) :

Branchlets tetragonus ; ovary either glabrescent or tomentose throughout.....16. *Forrestii*.

Branchlets terete ; upper half of ovary tomentose, lower half glabrous17. *taliensis*.

Length of corolla tube more than three times the diameter at the mouth (i.e. not exceeding 2.5 mm. in diam.) :

Ovary glabrous :

Branchlets subterete ; flowers not exceeding 5 mm. in length.....18. *albiflora*.

Branchlets tetragonus :

Corolla not exceeding 5 mm. long, 1 mm. wide.....19. *Duclouxii*.

Corolla 8-10 mm. long, 2 mm. wide.....20. *longifolia*.

Ovary tomentose :

Inflorescence a widespreading panicle :

Leaves lanceolate ; anthers distinctly showing in the mouth of the corolla tube (Asiatic).....21. *paniculata*.

Leaves ovate or hastate-lobed ; anthers scarcely showing in the mouth of the corolla tube (African).....

22. *pulchella*.

Inflorescence an elongated spikelike panicle :

†Rhachis, peduncles, etc., clothed with a dense white floccose tomentum :

Leaves petiolate, submembranous, up to 10 cm. wide ; stem more or less terete.....23. *nivea*.

Leaves sessile, coriaceous, not exceeding 5 cm. wide ; stem tetragonus.....24. *cylindrostachya*.

†Rhachis, peduncles, etc. clothed with a short sparse tomentum, never floccose and frequently becoming glabrescent :

Flowers 8-10 mm. long :

Exterior of corolla tube densely tomentose :

Inflorescence very dense ; branchlets tetragonous, winged ; calyx longer than diameter.....

25. *macrostachya*.

Inflorescence very lax ; branchlets subterete, calyx shorter than diameter.....26. *Hookeri*.

Exterior of corolla tube glabrous..... 27. *Henryi*.

Flowers 4-6 mm. long :

Corolla scarcely twice as long as calyx ; branchlets winged..... 28. *alata*.

Corolla three to five times as long as calyx ; branchlets not winged :

Stipules auriculate, almost always present ; stem terete ; flower reddish-yellow, exterior of corolla with glands interspersed with sparse tomentum ; calyx very densely tomentose.....29. *polystachya*.

Stipules absent (reduced to stipular ring) ; stem tetragonous ; flower lead-blue, throat orange, exterior of corolla eglandular, densely tomentose ; calyx rather sparsely tomentose.....30. *Griffithii*.

STAMENS INSERTED IN THE MIDDLE PORTION OF THE COROLLA TUBE :

Ovary glabrous :

Corolla tube 3.0-3.5 mm. in diameter, leaf margin serrate :

Style 3-4 mm. long.....31. *limitanea*.

Style 1 mm. long.....32. *Cooperi*.

Corolla tube 1-1.5 mm. in diameter :

Flowers subsessile ; corolla tube not exceeding 5 mm. in length, exterior villous or tomentose :

Corolla tube 2-2.5 mm. long, less than 1 mm. wide ; lobes erect..... 33. *asiatica*.

Corolla tube 4.5-5 mm. long, 1.5 mm. wide, lobes widespreading34. *Neemda*.

Flowers distinctly pedunculate ; corolla tube 7-10 mm. in length, exterior usually glabrous :

Lamina more than twice as long as broad ; margin serrate ; inflorescence elongate ; ripe fruit c. 10 mm. long.....

35. *Davidii*.

Lamina less than twice as long as broad ; inflorescence short ; ripe fruit c. 5 cm. long..... 36. *Delavayi*.

Ovary tomentose :

Calyx $\frac{2}{3}$ - $\frac{3}{4}$ length of corolla tube ; flowers large, very densely clustered in large subglobose whorls.....37. *hastata*.

Calyx usually less than $\frac{1}{2}$ length of corolla tube ; flowers not very densely clustered :

**Inflorescence terminal on the leafy branches :

Inflorescence interrupted pseudo-verticillate ; leaves dentate, densely tomentose on both surfaces, cordate-ovate, attenuate to a fine acumen and long-petiolate.....

38. *agathosma*.

Inflorescence not interrupted nor apparently verticillate :

Panicle widespreading or few-flowered :

Upper surface of lamina densely bullate and stellate-tomentose ; leaf usually distinctly auriculate with a short petiole (African).....39. *salviifolia*.

Upper surface of lamina not bullate ; leaf not auriculate at the base (Asiatic except *auriculata*) :

Leaves long-petiolate, more or less truncate or cordate at the base, usually crenate-serrate, up to 18 cm. long :

Inflorescence compound, spreading, ebracteate or with a few short bracts.....40. *crispa*.

Inflorescence small with numerous bracts longer than the flowers.....41. *caryopteridifolia*.

Leaves attenuate at the base into a short petiole, or subsessile, lanceolate, entire :

Shrubs of dwarf habit with leaves less than 4 cm. long, 1 cm. wide and few-flowered inflorescence:

Calyx densely tomentose, length scarcely equalling its diameter ; lobes very short and broad, subobtus.....42. *brachystachya*.

Calyx tomentellous, length about $1\frac{1}{2}$ times its diameter ; lobes triangular acute...43. *nana*.

Shrubs of tall habit with large leaves (6-20 cm. long) and many-flowered inflorescence :

Upper surface of the leaf glabrous (African).....

44. *auriculata*.

Upper surface of the leaf covered with stellate hairs (Asiatic) :

††Panicle subcylindrical c. 5 cm. in diameter on short leafy branches ; leaves broadly elliptical or elliptic-ovate ; peduncles 1-2 cm. long..... 45. *heliophila*.

††Panicle more or less pyramidal, usually widespreading on long leafy shoots :

Corolla tube c. 4 times as long as wide ; leaves rarely exceeding 11 cm. in length....

46. *officinalis*.

Corolla tube c. 8 times as long as wide ; leaves up to 20 cm. long.....47. *acutifolia*.

Panicle strict, elongate, spike-like, bearing many flowers :

Branches tetragonous, plant sparsely tomentose, with auriculate stipules.....48. *myriantha*.

Branches terete; plant very densely tomentose:

Flowers very densely crowded in erect spikelike panicles, auriculate stipules sometimes present....

49. *Fallowiana*.

Flowers rather lax in very long arcuate spikes; stipules absent:

Leaves subcoriaceous with the upper surface markedly rugose, narrowly lanceolate abruptly petiolate; petioles 1-1.5 cm. long...50. *candida*

Leaves membranous with the upper surface smooth, broadly lanceolate, attenuate into the very short petiole.....51. *stenostachya*.

**Inflorescence borne on short shoots on the previous year's wood, appearing before the leaves.....52. *tibetica*.

§ GYNANDRAE.

1. *Buddleja gynandra* Marquand, sp. nov.; distinctissima staminibus ovario nec corollae affixis.

Shrub. Branches subterete, rather slender, covered with a short tomentum when young. *Leaves* opposite, lanceolate or ovate-lanceolate, acuminate, up to 13 cm. long, 3.5 cm. wide, attenuate into a petiole 5-8 mm. in length; both upper and lower surface of the lamina densely stellate-tomentose at first, afterwards becoming glabrous or sparsely tomentellous above; margin entire, occasionally slightly sinuate. *Stipules* reduced to a stipular ring. *Inflorescence* a rather lax widespreading panicle. *Bracts* linear, 6-8 mm. long above, lower ones larger and resembling the leaves. *Flowers* yellowish-white, scented, forming cymules of 5-7 flowers on short tomentose peduncles. *Calyx* tomentose, 2-2.5 mm. long, divided to $\frac{1}{2}$ into 4 subobtusely deltoid lobes. *Corolla* sparsely stellate-tomentose outside; tube 4-5 mm. long, about 1 mm. in diameter, sparsely pubescent inside; lobes 4, obovate-spathulate, about 2 mm. long, 1.5 mm. wide, entire. *Stamens* 4, inserted on the side of the ovary, about 1.5 mm. long; anthers subdeltoid; lower portion of filaments adnate, upper free portion slender, slightly shorter than the anthers. *Ovary* tomentose; style twice as long as the stamens; stigma clavate. *Fruit* not seen.

TONKIN. Langson, in rocky places, 27 Jan. 1886, *B. Balansa* 930 (type in Herb. Kew.).

§ ALTERNIFOLIAE.

2. *B. amentacea* Kränzlin in Bull. Jard. Bot. Pétersb. xiii. 89, 92 (1913).

JAVA. Precise locality and collector unknown, "*Herb. Fischer*."

The only known specimen of this species is the "type," which is preserved in the Herbarium of the Principal Botanic Garden, Leningrad. Unfortunately the lower leaves are not present, and the collector's label is indecipherable. This was stated to be the case

by the author of the species in the original place of publication and by the editor in a footnote in the Russian text. A recent study of the type sheet has failed to reveal any clue. The label also bears the *nomen nudum* "*Buddleja microcarpa* Kl." in another handwriting.

3. *B. alternifolia* Maxim. in Bull. Acad. Pétersb. xxvi. 494 (1880).

"CHINA BOREALIS Vallis fl. Peishui inter pagos Tangtshang et Lidshapu, prov. Tschili, Schansi, Kansu occidentali et orientali et Szetschuan septentrionali" (apparently Tangshan and Likiapu in Southern Kansu), 19 Juni 1885, *G. N. Potanin*.

KANSU. Near Pinglo, Oct. 7, 1914, *F. N. Meyer* 1787; Tsing shui hsien, 1500 m., July 7, 1922, *J. Hers* 2402; moist foothills, Ho lan shan mountains, 1375-2400 m., shrub up to 5 m., flowers violet, very fragrant, May 10-25, 1923, *R. C. Ching* 185.

Cultivated specimens of *Purdom* 388 and *Farrer* 100, also belong to this species.

4. *B. Legendrei* Gagnepain in Lecomte, Not. Syst. ii. 280 (1912).

KANSU. Pongsu shi in the Li-kiu Valley, on mica schist soil, 3400 m., *Legendre* 1036.

5. *B. tsetangensis* Marquand in Journ. Linn. Soc., Bot. xlviii. 202 (1929).

TIBET. Tsetang, Tsampo Valley, on cliffs and gravel beds abundant in most villages, 3600 m., April 21, 1924, *F. Kingdon Ward* 5616.

6. *B. Wardii* Marquand in Journ. Linn. Soc., Bot. xlviii. 203 (1929).

TIBET. On rocks and cliffs by the river and around villages in the Tsang-po Valley below Tsetang, 3000-3400 m., April 29, 1924, *F. Kingdon Ward* 5636.

§ CURVIFLORAE.

7. *B. Lindleyana* Fortune in Lindl. Bot. Reg., Misc. 25 (1844).—*B. intermedia* Carr. in Rev. Hort. xlv. 151 (1873). *B. insignis* Hort. ex Dippel, Handb. Laubholzk. i. 154 (1889). *B. salicifolia* Hort. ex Dippel loc. cit. 153.

SZECHUAN. Yangtze banks, without precise locality, shrub of 60 cm. with purple flowers, June 1903, *E. H. Wilson* (Veitch Exped.) 4116; near Wa-shan, valley of Tung River, 1000-1300 m., July and Nov. 1908, *E. H. Wilson* (Arn. Arb. Exped.) 1375a.

HUPEH. Ichang and immediate neighbourhood, *A. Henry* 4190; in glens, Ichang, flowers red, Aug. 1901, *E. H. Wilson* (Veitch Exped.) 1615.

CHEKIANG. Chusan, *Fortune* 37; near Ningpo, Sept. 7, 1877, *W. Hancock* 26; without precise locality, *W. Hancock* 87; near Hangchow, July 3, 1915, *F. N. Meyer* 1497; open roadside, Ling-Ying-Sze near Hangchow, June 20, 1922, *A. N. Steward* in *Nanking Univ. Herb.* 2354.

FUKIEN. "Almost all from about 2000 feet above the plain," Foochow, 1897, *W. R. Carles* 575; open ground, Pei-ling hills, Foochow, *W. R. Price* 1172; Foochow city, Wooshihshan, on rocks by the side of spring, shrub with purple flowers, Aug. 25, 1923, *H. H. Chung* 2359.

KIANGSI. Kiukiang, 1873, *Shearer*; Lu shan (Kuling Range), 200-1100 m., July, Aug., Sept. 1908, *A. K. Schindler* 363.

KWANGTUNG. Hillsides by the North River, July 1864 and June 1865, *T. Sampson* in *Herb. Hance* 321; Nin District, Sept. 20, 1918, *Canton Christian College Herb.* 3445.

HONGKONG. South of Wanchai Gab, one bush only, Oct. 15, 1900, *W. T. Tutchet* 656.

JAPAN. Nikko and Fujiyama, *Maries*.

var. **sinuato-dentata** *Hemsl.* in *Journ. Linn. Soc., Bot.* xxvi. 120 (1889).

HUPEH. Ichang and immediate neighbourhood, flowers purple, *A. Henry* 624 and 3974; without precise locality, June 1901, *E. H. Wilson* (Veitch Exped.) 1995.

SZECHUAN. Mount Omei, 750 m., *E. Faber* 77; Mount Omei, bush of 1.3 m., July 1904, *E. H. Wilson* (Veitch Exped.) 5037; Yachou-Fu, thickets, 600-1300 m., bush of 1-1.5 m., flowers very dark red, July and Nov. 1908, *E. H. Wilson* (Arn. Arb. Exped.) 1375.

Differing from the type in the leaves being sinuate-dentate.

8. **B. japonica** *Hemsl.* in *Journ. Linn. Soc., Bot.* xxvi. 119 (1889), in obs.

JAPAN. Hondo: Hakone, Yokohama, 1862, *Maximowicz*; central part of the island, 1866, *Tschonoski*; without precise locality, *F. V. Dickens* 1305; Oyama, Oct. 1876, *J. Bisset*; central mountains, 600-2100 m., *Maries*; without precise locality, Aug. 1904, *H. Takeda*; without precise locality, Sept. 28, 1914, *E. H. Wilson* 7585. Japan, without precise locality, 1866-74, *L. Savatier* 896; Fudintsugi, Aug. 13, 1889, *Sci. Coll. Imp. Univ. Jap.*; Hyachine, Aug. 23, 1894, *Faurie* 13519.

9. **B. curviflora** *Hook. et Arn.* *Bot. Beech. Voy.* 267 (1836-1840). —*B. carnea* *Carr.* in *Rev. Hort.* li. 90 (1879).

LUCHU ARCHIPELAGO. Without precise locality, June 1827, *Beechey*.

10. **B. venenifera** *Makino* in *Bot. Mag. Tokyo*, xxiv. 56 (1910).

JAPAN. Osumi Province: Miyanaoura, Yaku-shima Island, Sept. 1909, *T. Makino*; Nako-no-shima Island, *S. Tashiro*.

A specimen in Herb. Kew. received through the Paris Herbarium from the Japanese Exhibition of 1886 without any particulars appears to belong to this. The corolla is densely glandular and sparsely stellate-tomentose outside.

Professor Hayata has very kindly presented to Kew some leaves and portions of stems of this plant collected by Dr. Makino, judging from which it appears to be a distinct species. As, however, I have not been able to see the flowers, its exact position is doubtful and it is placed in the Key to the species from the original description.

11. **B. Purdomii** *W. W. Smith* in *Notes Roy. Bot. Gard. Edin.* ix. 87 (1916).

KANSU. Common on very steep and torrid cliffs and banks of the most torrid loess region about Kiai-how; descending along the burning walls of the Hei-Shui-Jang, but not extending to Siku, April 29, 1914, *R. Farrer* 14.

§ RECTIFLORAE.

12. **B. yunnanensis** *Gagnepain* in *Lecomte, Not. Syst.* ii. 187, 192 (1912).

YUNNAN. Between Szemao and Chienhung, *Bons d'Anty* 437; Szemao in hedgerows, 1300 m., a shrub of 60 cm. with lilac flowers, *A. Henry* 12214.

13. **Buddleja acosma** *Marquand*, nom. nov.*—*B. incompta* *W. W. Smith* in *Notes Roy. Bot. Gard. Edin.* viii. 180 (1914), non *Linn. fil.*

YUNNAN. On dry rocks and exposed hillsides in the A-tun-tsi Valley, 3400 m., an untidy bush of 1-2 m., leaves silver in spring, golden in autumn, June 1913, *F. Kingdon Ward* 345; on calcareous and schistose soil, frequent west of Likiang, 1900-1950 m., May 30, 1916, *H. Handel-Mazzetti* 8786; open dry situations in side valleys of the Mekong-Salween divide, lat. 28° N., 2300-2700 m., flowers soft grey rose, fragrant, June 1918, *G. Forrest* 16557; dry situations amongst boulders and scrub on the Doker-La, Mekong-Salween divide, lat. 28° 25' N., 2700 m., a stunted shrub of 60 cm. with rose-lavender flowers, June 1919, *G. Forrest* 18720; on cliffs and dry rocky slopes on the Mekong-Salween divide, lat. 27° 36' N., long. 98° 50' E., 2700 m., shrub of 60 cm., in fruit, July 1921, *G. Forrest* 19665; open, dry, rocky hillsides in the A-tun-tsi Valley, lat. 28° 30' N., long. 98° 54' E., 3000 m., shrub of 60-90 cm., in fruit, Sept., 1921, *G. Forrest* 20767.

14. **B. adenantha** *Diels* in *Notes Roy. Bot. Gard. Edin.* v. 248 (1912).

YUNNAN. Amongst scrub on the margins of pine forests on the eastern flank of the Tali Range, lat. 25° 40' N., 2900-3400 m., a shrub of 1.5-2.5 m. with fragrant greyish-purple flowers, June-Aug. 1906, *G. Forrest* 4736.

15. **B. Colvillei** *Hook. f. et Thoms.* in *Hook. Illustr. Himal. Pl.* t. 18 (1855).

NEPAL. Nangki (near the border of Sikkim), shrub of 3 m., *Hooker*.

* I have been obliged to change the name of this species, for the trivial name was already occupied by the South African *B. incompta* *Linn. fil. Suppl.* 123 (1781). C.V.B.M.

SIKKIM. Lachen, 2800–3600 m., July and Aug. 2, 1849, *Hooker*; Chola, 3000–4200 m., Nov. 5 and 6, 1849, *Hooker*; Tonglo, 3000 m., Aug. 5, 1874, *Treutler* 493; Tonglo, 3100 m., Nov. 3, 1874, *J. S. Gamble* 3256a; Tonglo, 3000 m., Sept. 1880, July 1881, and July 1882, *J. S. Gamble* 8466, 9495, and 10436; Islumbo, 3400 m., Oct. 24, 1875, *J. S. Gamble* 25599; Tumbok, 3000 m., tree of 6 m., Oct. 10, 1870, *C. B. Clarke* 12896a.

TIBET. Chumbi: Pun-ka-bee-see-mo, July 24, 1884, *Dr. King's collector* 32.

The fruits in this species vary considerably in length.

16. **B. Forrestii** *Diels* in *Notes Roy. Bot. Gard. Edin.* v. 249 (1912).

YUNNAN. On ledges of cliffs and very stony ground on the western slopes of the Tsan-shan Range near the head of the Yangtze Valley, lat. 25° 40' N., 2800–3000 m., flowers reddish-maroon, fragrant, Sept. 1905, *G. Forrest* 979; open situations in scrub on the hills east of Tengyueh, lat. 25° N., 2300–2600 m., shrub of 2–4 m., flowers pale mauve, almost white, fragrant, Dec. 1912, *G. Forrest* 9471; on the mountains between the Salween and Irrawaddi, 1800 m., Oct. 1914, *C. Schneider* 2591; 1917–1919 collection, without precise data, *G. Forrest* 16017; in thickets in side valleys, Jang-tzow Shan, Shweli-Salween divide, lat. 25° 10' N., 2600 m., shrub of 3–4 m. with fragrant soft lavender-rose flowers, Aug. 1919, *G. Forrest* 18361.

There is a wide range of variation in the indumentum of the ovary in this species. Even in the same inflorescence of the type specimen, of two flowers examined, one had a practically glabrous ovary while the other was tomentose.

17. **B. taliensis** *W. W. Smith* in *Notes Roy. Bot. Gard. Edin.* ix. 87 (1916).

YUNNAN. Open scrub on the western flank of the Tali Range, lat. 25° 40' N., 2900 m., Aug. 1913, *G. Forrest* 11561.

18. **B. albiflora** *Hemsl.* in *Journ. Linn. Soc., Bot.* xxvi. 118 (1889).—*B. Hemsleyana* *Koehne* in *Gartenfl.* 169 (1903).

HUPEH. Patung district, *A. Henry* 156a, 1871, 2515 and 4689; Kuei, spreading shrub of 1 m. with purplish flowers, *A. Henry* 6193; west of the province, without precise locality, flowers lilac, July 1901, *E. H. Wilson* (Veitch. Exped.) 2247 and 2247a, also July 1907 (Arn. Arb. Exped.) 3360 and 3361.

SHENSI. Central part of the province, Aug. 20, 1916, *E. Licent* 2673.

var. **Giraldii** *Rehd. & Wils.* in *Sargent Pl. Wilson.* i. 569 (1913).—*B. Giraldii* *Diels* in *Engl. Jahrb.* xxix. 535 (1900).

SHENSI. Ta-see-tsuen, Sept. 19, 1897, *Giraldi*; Kay-y-san, June 18, 1899, *Giraldi* 5497 and 5498; Tai-pe-shan, 1910, *W. Purdom*.

SZECHUAN. Without precise locality, shrub of 2 m. with lilac flowers, 1300 m., Aug. 1903, *E. H. Wilson* (Veitch Exped.) 4117.

Differing from the type in the tomentose calyx.

19. **Buddleja Duclouxii** *Marquand*, sp. nov.; affinis *B. albiflorae* *Hemsl.*, sed ramulis gracillimis tetragonis inflorescentia angustissima inter alia insigniter differt.

Shrub. Branches slender, tetragonous, sparsely tomentose. *Leaves* thin, opposite, (lower not seen) upper lanceolate, up to 5 cm. long, 1–3 cm. wide, cuneate at the base, margin finely serrate-dentate, upper surface at first sparsely stellate-tomentose, shortly becoming glabrescent, dark green in the dried specimen, lower surface densely tomentose with the nerves inconspicuous. *Stipules* small, auriculate. *Inflorescence* terminal, composed of 1–3 strict panicles up to 25 cm. long, 1–1.5 cm. wide, cymules subsessile, 2–3-flowered. *Bracts* few, linear-lanceolate, up to 8 mm. in length. *Flowers* small (colour not known); pedicels 1–1.5 mm. long, tomentose. *Calyx* tomentose, 2–2.5 mm. long, lobes 4, narrow, acute, shorter than the tube. *Corolla* sparsely tomentose outside; tube 4–5 mm. long, 1 mm. in diameter, interior pubescent; lobes 4, obovate-spathulate, 1–1.5 mm. long, margin slightly erose. *Anthers* subsessile, 1 mm. long, inserted just below the mouth of the corolla-tube. *Ovary* glabrous, subglobose; style short, glabrous; stigma clavate, 1–1.5 mm. in length. *Fruit* not seen.

YUNNAN. Neighbourhood of Ngy-leang, Sept. 14, 1905, (collected by Petrus Py), *Ducloux* 3790.

20. **B. longifolia** *Gagnepain* in *Lecomte, Not. Syst.* ii. 190, 191 (1912).

N.E. UPPER BURMA. Shrub of 1.5–2 m., flowers rose, tube yellow, on margins of thickets and by streams on Hpimaw-pass, N'Maikha-Salween Divide, lat. 26° N., long. 98° 42' E., 3000 m., Sept. 1924, *G. Forrest* 25079.

YUNNAN. Woods, Kichan, near Ta-pin-tze, flowers violet, 2800 m., Aug. 21, 1889, *Delavay* 3991; shrub of 2–4 m., flowers fragrant, deep lavender-purple, interior darkest, in thickets by streams in side valleys on the Chien-chuan—Mekong divide, lat. 26° 30' N., long. 99° 40' E., 2700 m., Aug. 1922, *G. Forrest* 23215.

21. **B. paniculata** *Wall.* in *Roxb. Fl. Ind. ed. Carey*, i. 412 (1820); *Wall. Cat. No.* 6403.

NEPAL. *Wallich* 6403.

ASSAM. Manipur: "collected during the Government Demarcation Survey of 1881–82" (without precise locality), *G. Watt* 6061. Lushai Hills: Stalong, 1500 m., "a *Buddleja* with bunches of small flowers, magenta pink within the tube," Feb. 1929, (Mrs.) *N. E. Parry* 125.

The two species, *B. paniculata* and *B. crispa* (No. 40), are united in *Fl. Brit. Ind.* by *C. B. Clarke* (1883), and by all subsequent authors.

In addition to the shape of the leaves and habit of the inflorescence they may be distinguished by the position of the anthers in the corolla tube.

B. nepalensis Colla which has been cited as a synonym of *B. paniculata* (sensu lato) is a doubtful species. The description agrees neither with *B. paniculata* (sensu stricto) nor with *B. crispa*.

22. **B. pulchella** N. E. Br. in Kew Bull. 1894, 389.—*B. usambarensis* Gilg in Engl. Pfl. Ost-Afr. C. 313 (1895). *B. Woodii* Gilg in Engl. Jahrb. xxiii. 201 (1896).

TANGANYIKA. Usambara: Kwa Mshaza, in high forest, 1570 m., *Holst* 8967.

NATAL. Near Kettle Fountain, 1862, *T. Cooper* 1159; Inanda, comm., Oct. 20, 1879, *J. M. Wood* 574; Alexandra District, Dumisa, 550 m., June 19, 1910, *H. Rudatis* 1035, and 650 m., July 3, 1910, *H. Rudatis* 1054. Specimens cultivated at Kew and in the Botanic Gardens, Durban, origin York, 600–1000 m., comm. *J. M. Wood*. Kentani District, 400 m. July 1913, *Alice Pegler* 764.

23. **B. nivea** Duthie in Gard. Chron. Ser. 3, xxxviii. 275 (1905).

W. SZECHUAN. Mountains, Washan, 1800–2400 m., flowers purple, shrub of 1.5–2 m., July 1903, *E. H. Wilson* (Veitch Exped.) 4121; south-east of Tachienlu, Tung Valley, 1300–2000 m., Aug. 1908, bush, 1–1.5 m. high with lilac flowers, *E. H. Wilson* (Arn. Arb. Exped.) 3356; Washan, thickets 1300–2000 m., bush, 1.5–2.5 m. high with purple flowers, Aug. 1908, *E. H. Wilson* (Arn. Arb. Exped.) 3358.

Locality unknown, *Hort. Veitch*, flowers Aug. 4, 1905, fruit Oct. 14, 1905, *E. H. Wilson* (Veitch Exped.), Seed No. 1428 (type specimens).

var. **yunnanensis** Rehder & Wils. in Sargent Pl. Wilson. i. 570 (1913).—*B. macrostachya* Benth. var. *yunnanensis* Dop in Bull. Soc. Bot. France lvii. Mém. xix. 7 (1910).

W. SZECHUAN. Without precise locality, mountains, 2500 m., flowers purple, bush 1–2 m. high, July 1903, *E. H. Wilson* (Veitch Exped.) 4119; West of and near Wen-chu'an Hsien, in the Min Valley, in roadside thickets, 1300–1600 m., May 25, 1908, *E. H. Wilson* (Arn. Arb. Exped.) 3353, Aug. 1908, 3359; vicinity of Tachienlu in thickets, 1300–3800 m., July and Aug. 1908, *E. H. Wilson* (Arn. Arb. Exped.) 3351, 3357; Mupin, in thickets, 1600–2000 m., July and Oct. 1908, *E. H. Wilson* (Arn. Arb. Exped.) 1351, 1351a, 3354.

Differs from the type in the spikes being usually solitary and the upper surface of the leaf pubescent.

24. **B. cylindrostachya** Kränzlin in Engl. Jahrb. l. Beibl. III, 35 (1913).

YUNNAN. Mengtze, in deep valleys, very rare shrub with dark purple flowers smelling of rhubarb root, Jan. 25, 1895,

W. Hancock 264; Mengtze, on grassy mountains near Ho-chie-ch'ai, 1600–1800 m., corolla reddish with orange throat, Nov. 15, 1896, *A. Henry* 10251; 2nd sheet of same No., bushy shrub 1 m. high with lilac flowers; Fêng chên Liu, 1500 m., shrub of 1–2 m., with pink to purplish flowers, Feb. 3, 1897, *A. Henry* 10251a; Szemao, grassy places on summit of East high range (Men chu thian), local shrub 15–30 cm. high with lilac flowers, 1800 m., Nov. 27, 1896, *A. Henry* 10251b; on way to Hsin-Kei, Fêng chên Liu, Mengtze, shrub of 3 m. with small leaves, 1500 m., *A. Henry* 10251d.

25. **B. macrostachya** Benth. Scroph. Ind. 42 (1835).—*B. Martii* J. A. Schmidt in Journ. Bot. vi. 228, 245 (1868).

ASSAM. Sillet, 1837, *Wallich* 6407: Khasia; *Fielding* sine numero; *Griffith* 196 and 197, also *East Ind. Co. Herb.* 3742; Surureen, lax bush of 4 m., June 26, 1850, *Hooker*; Kullung, July 8, 1850, *Hooker*; Pourang, large bush, "flowers sweet, flesh-coloured with darker eye," Sept. 15, 1850, *Hooker*; Myrong, 1200–1800 m., flowers pale primrose with croceous eye, odour strong, Oct. 1850, *Hooker*; Naga Hills; Kohima, Oct. 1886, *D. Prain*; lower spur of Japro Kohima, large straggling shrub on the exposed crest of knife edge ridge, flowers in long pendent spikes, cream with deep orange eye, strongly fragrant, 2100 m., lat. 25° 40' N., long. 94° 10' E., Nov. 27, 1929, *F. Kingdon Ward* 7702: Lushai Hills; Chuarlung 1500 m., flowers mauve with red centres, Jan. 1928, (*Mrs.*) *N. E. Parry* 124, 466 and 553; Manipur, "comm. 1886," *Watt* 5011 and 5125.

BURMA. Bhamo district; Lahpyekha, 1800 m., small tree, almost shrub, flowers mauve, stem brownish, upper bark peels off in strips, March 18, 1927, *Saw Mang Mya* 5321; 1800 m., shrub, flowers dull mauve, stem greyish red, slightly crooked, Bum Rawng Bum, March 20, 1927, *Saw Mang Mya* 5332. Mogok District, Kyinitaung Valley, 1200 m., Nov. 23, 1928, *E. A. Seaton* 7421.

YUNNAN. West Mountains, Szemao, 1500 m., tree of 6 m., *A. Henry* 10251 c; in side valleys on the hills east of Tengyueh, lat. 25° N., 1800 m., shrub of 2.5–3.5 m., in fruit, May 1912, *G. Forrest* 7604; shrub of 6 m., open situations, hills around Man-Hsien, lat. 24° 30' N., 900–1200 m., flowers dull rose fragrant, Feb. 1913, *G. Forrest* 9661; in thickets by streams on the Chien-chuan—Mekong divide, lat. 26° 36' N., long. 99° 40' E., 2400–2700 m., shrub of 3–6 m., flowers deep purple lavender, tube darkest, fragrant, July 1922, *G. Forrest* 23055.

SIAM. Calcareous rocks on "summit III," 2180 m., shrub of 2.5 m., Doi Chieng Dao, Feb. 17, 1905, *C. C. Hosseus* 400.

26. **Buddleja Hookeri** Marquand, sp. nov.; affinis *B. macrostachyae* Benth. sed ramulis subteretibus inflorescentia laxa calyce brevior inter alia differt.

Shrub 4–6 m. high. Branches subterete, drooping, at first whitish tomentose, shortly becoming glabrescent. Leaves opposite, lanceolate or obovate-lanceolate, subsessile, attenuate at the base, 15–20 cm.

long, 5-7 cm. wide, margin finely serrate, apex acuminate, upper surface soon becoming glabrous, lower surface tomentose. *Stipules* reduced to a rather conspicuous ring. *Inflorescence* terminal, of few lax tomentose spike-like panicles, usually bearing a pair of leaves at the basal node, and axillary. *Bracts* few, linear, up to 8 mm. long. *Peduncles* usually very short. *Pedicels* 2 mm. long, tomentose. *Calyx* tomentose; tube campanulate 1.5 mm. long, 2.5 mm. in diameter; lobes 4 acute, scarcely 1 mm. long, sinus broad, rounded. *Corolla* throat deep orange, limb white, powerfully fragrant, exterior tomentose throughout; tube 8-10 mm. long, 2-2.5 mm. in diameter, interior pubescent except near the base; lobes 4 obovate or sub-orbicular c. 3 mm. long and wide, margin subentire. *Stamens* 4 inserted just below the mouth of the corolla, anthers scarcely 1.5 mm. long, subsessile. *Ovary* densely tomentose; style tomentose at the base, together with the clavate stigma up to 5 mm. in length. *Fruit* ovoid, up to 8 mm. long. *Seeds* tailed, about 2.5 mm. long.

FRONTIER OF BURMA AND TIBET. In open Alder glades in the bottom of the valley of the Seinghku, lat. 28° 5' N., long. 97° 30' E., 2400 m., Sept. 25, 1926, *F. Kingdon Ward* 7456 (type).

SIKKIM. Lachen, 1800 m., Aug. 5, 1849, *J. D. Hooker*; Lachong River, 1800 m., Oct. 2, 1849, *J. D. Hooker*; Choongtau hill, Oct. 28, 1849, *J. D. Hooker*; Chongthang, Sept. 1903, *Prain*.

27. *B. Henryi* Rehder & Wilson in Sargent Pl. Wilson. i. 571 (May 1913); Kränzlin in Engl. Jahrb. l. Beibl. III. 44 (August 1913), *pro parte*.*

YUNNAN. Mengtze, S.E. in woods, 1500 m., shrub 2.5 to tree of 6 m., flowers flesh-coloured, *A. Henry* 9025; ravine, Mengtze, 1500 m., orange flowers, deliciously fragrant, *A. Henry* 9025b; open situations amongst scrub on the western flank of the Shweli-Salween divide, lat. 25° 20' N., 2400-2700 m., shrub 4-6 m., in fruit, Aug. 1912, *G. Forrest* 9044; in thickets and in conifer forests, Salween-Kiu-chang divide, lat. 27° N., long. 98° 35' E., 3000 m., shrub 2.5-3 m., flowers fragrant deep muddy wine colour, Aug. 1924, *G. Forrest* 25761.

var. *glabrescens* Marquand, var. nov.; a typo differt ovario glabrescente.—*B. Henryi* Kränzlin in Engl. Jahrb. l. Beibl. III. 44 (1913) *pro parte*.

YUNNAN. Flowers reddish, south of Red River from Manner, 1800 m., *A. Henry* 9025a.

Differs from the type in the glabrescent ovary.

var. *Hancockii* Marquand.—*B. Hancockii* Kränzlin in Engl. Jahrb. l. Beibl. III. 46: 1913.

* The *B. Henryi* Kränzlin was founded upon a mixed type; the "ovarium glabrum" agreeing with *Henry* 9025a only, of the three sheets cited and marked "typus" by the author. The other two had already been cited by Rehder & Wilson under their description published a few months previously.

YUNNAN. Mountain woods near Mengtze 1800-2100 m., a small tree or shrub, flowers dull purple with rather oppressive odour, Aug. 18, 1895, *W. Hancock* 384.

Differs from the type of the species and the preceding variety in the exterior of the corolla being tomentose.

28. *B. alata* Rehder & Wilson in Sargent Pl. Wilson. i. 570 (1913).

W. SZECHUAN. Ravine 1200 m. (without precise locality), Aug. 1903, shrub of 2 m., flowers lilac, *E. H. Wilson* (Veitch Exped.) 4118.

This species is closely allied to *B. myriantha* Diels, from which it differs in the absence of auriculate stipules, more distinctly winged stem, coarser tomentum on the flowers, and larger leaves, as well as the more or less infundibular corolla showing the anthers in the mouth.

29. *B. polystachya* Fresen. in Flora xxi. 605 (1838).—*B. acuminata* R. Brown nomen in Salt. It. Abyss. App. 62 (1814), non Poir. *B. Saltiana* Steud. Nom. ed. 2, i. 235 (1840). *B. foliata* R. Br. ex Benth. in DC. Prodr. x. 466. *B. Powellii* Kränzlin in Engl. Jahrb. l. Beibl. III. 34 (1913).

ARABIA. Yemen; on Kahil mountain near Menâkhah, 2500 m., Feb. 18, 1889, *G. Schweinfurth* 1467.

ERITREA. Neighbourhood of Acrur, 1900 m., March 6, 1892, *G. Schweinfurth & D. Riva* 779.

ABYSSINIA. Tigre; near Adowa, *Schimper* 1905; *Steudner* 851; Ankober, shrub of 2.5-3 m., common on the fences, called "Amfar," Nov. 12, 1841, *Roth* 464; Memsach, in narrow valleys near Gennia, June 26, 1837, *Schimper* 266; Gondar and vicinity, *R. E. Massey* 72; Mount Chillalo, 2400-2800 m., Nov. 1926, *H. Scott*.

UGANDA. Mount Nkoko Njern, 1500 m., shrub of 2-3 m. with reddish brown flowers, in short grassland, Nov. 12, 1916, *J. D. Snowden* 495; Mount Elgon, 1500-2000 m., shrub or small tree 3-5 m. high with reddish brown flowers, fairly common in bush and forest land, Feb. 17, 1924, *J. D. Snowden* 824; and without precise locality, *H. Powell* 73; Mount Elgon, 2400 m., shrub of 3 m. with yellow cinnabar flowers, occasional on the edge of the Bamboo zone, Jan. 1918, *R. A. Dümmer* 3610.

KENYA. Nyanza Prov.: Usain Gishu Plateau and Trans Nzoia, Nov.-Dec. 1928, *W. J. Dawson* 652. Naivasha Prov.: Nakuru, among the rocks of a dry valley, 1800 m., bushy shrub of 2 m., Dec. 1893, *G. F. Scott Elliott* 6850; Aberdare Mountains, 1905, *Evan James*; Kijube, shrub at 2200 m., Feb. 23, 1914, *W. J. Dawson* 24; Kamasia, 2400 m., "small tree up to 5 m.," *E. Battiscombe* 1189; near Forest Station, Dec. 20, 1921, *R. E. & C. E. Fries* 538. Kenya Prov.: Escarpment, 1900-2200 m., *E. Battiscombe* 41, and at 2200 m., *A. Linton* 174, also *C. F. Elliott* 158 and 250.

var. *parvifolia* Marquand, var. nov.; a typo differt foliis minoribus vix 2 cm. longis 1 cm. latis integris.

ERITREA. Ainsaba, May 1870, *Beccari* 69.

The leaves of this plant are very distinct in their exceedingly small size, but it is possible that this may be largely due to the very dry conditions under which it was growing, the range of fluctuation in this respect being known to be large in some species of this genus. In floral characters this variety scarcely differs from the type of the species except that the inflorescence is slightly reduced.

30. *Buddleja Griffithii* Marquand, sp. nov.; ex affinitate *B. macrostachyae* Benth. sed floribus minoribus vix ad 6 mm. longis inter alia differt.—*B. macrostachya* Benth. var. *Griffithii* C. B. Clarke in Hook. fil. Fl. Brit. Ind. iv. 81 (1883).

Shrub. Branches subtetragonous, scarcely winged, sparsely tomentose or glabrescent. *Leaves* opposite, lanceolate, usually 15–20 cm. long, 2.5–3.5 cm. wide, margin minutely serrate, apex attenuate, upper surface glabrescent, lower surface clothed with a thin tomentum. *Stipules* absent. *Inflorescence* composed of terminal and axillary spike-like panicles 20–30 cm. long, 1–1.5 cm. wide. *Bracts* linear, 3–12 mm. long. *Flowers* rather densely crowded on short pedicels. *Calyx* tomentose; tube 1 mm. long, 1.5 mm. in diameter; lobes narrowly triangular acute, scarcely as long as the tube. *Corolla* lead blue with an orange throat, exterior tomentose; tube 4–5 mm. long, less than 1 mm. in diameter, interior pubescent; lobes 4 suborbicular 1–1.5 mm. in diameter, margin slightly erose. *Stamens* inserted just below the mouth of the corolla tube, anthers subsessile, scarcely 1 mm. in length. *Ovary* tomentose; style short. *Fruit* 4–5 mm. long. *Seeds* shortly tailed, scarcely 1 mm. long.

EAST BENGAL. Mishmee, *Griffith* (Kew Distrib.) 3747.

BHUTAN: fruiting without precise locality *Griffith* 2447 and (Kew Distrib.) 3743.

This plant is noted in ms. by C. B. Clarke from the Naga Hills, but there is no specimen from this locality in Herb. Kew.

31. *B. limitanea* W. W. Smith in Notes Roy. Bot. Gard. Edin. ix. 85 (1916).

YUNNAN. Open scrub on the western flank of the Shweli-Salween divide, lat. 25° 20' N., 2100–2400 m., shrub of 1–1.5 m., in fruit, Aug. 1912, *G. Forrest* 8962; shrub up to 1.5 m. high, thickets at the foot of the mountain near Talifu, 2400 m., Aug. 1914, *C. Schneider* 2487; “duplicate of 1912–13” (without precise locality), *G. Forrest* 15851; open scrub in the Shweli Valley, lat. 25° 20' N., shrub of 1.5–2 m., flowers deep rose, 1800–2100 m., July 1917, *G. Forrest* 15936; in open thickets, Shweli-Salween divide, 2400 m., shrub of 1–1.5 m., flowers rose purple, June 1918, *G. Forrest* 17546.

32. *B. Cooperi* W. W. Smith in Notes Roy. Bot. Gard. Edin. x. 14 (1917).

BHUTAN. Between Rudong La and Pumthang, bush of 60–90 cm. on gravel and debris. Flowers white, tinged purple, 3400 m. July 23, 1915, *Cooper* 4154.

33. *B. asiatica* Lour. Fl. Cochinch. 72 (1790).—*B. acuminatissima* Blume Bijdr. 743 (1825). *B. discolor* Roth Nov. Pl. Sp. 83 (1821). *B. lanceolata* Heyne ex Wall. Cat. sub no. 640. *B. salicina* Lam. Tab. Encyclo. et Méth. i. 291 (1791). *B. serrulata* Roth Nov. Pl. Sp. 82 (1821). *B. subserrata* Buch.-Ham. ex D. Don Prod. Fl. Nep. 92 (1825). *B. virgata* Blanco Fl. Filip. ed. I. 57 (1837).

MADRAS. Pulney Mountain, Sept. 1836, *Wight* 1811; Nilgiris, 1900 m., Aug. 1883, *Gamble* 12257; Sigur Ghat, 900 m., Aug. 1886, *Gamble* 17892; Kodaikanal Ghat, Dec. 7, 1898, *Bourne* 1607.

FORMOSA. Bankinsing, *A. Henry* 200; Tamsuy, *Oldham* 318.

INDO-CHINA. Hue and vicinity (the type-locality), Jan.-May 1927, *R. W. Squires* 296.

SZECHUAN. Min River and Omei 1100 m., *Faber* 608.

The above are only representative. The specimens of this species in Herb. Kew. are too numerous to enumerate here. The range of the species includes Sikkim, Bhutan, Assam, Bombay, Madras, Burma, Siam, Tonkin, Yunnan, Szechuan, Kwangtung, Formosa, Java, Sumatra, Borneo and the Philippine Islands.

This is an exceedingly polymorphic species. A number of varieties have been described, some of which were originally accorded specific rank. Although some are distinct enough in their extreme forms they are completely connected by intermediates. The best marked of these varieties are the following from Java:—var. *sundaica* *Koorders* in Meded. 's Lands Pl. lxi. 93 (1903), distinguished by the inflorescence up to 25 cm. long, calyx lobes shorter than the tube, and cymules 1–3-flowered; var. *densiflora* *Koorders* l.c., with a short uninterrupted inflorescence, and cymules 3–7-flowered, and calyx lobes shorter than the tube; var. *salicina* *Koorders* l.c. with the inflorescence thin and interrupted, and calyx lobes as long as the tube.

34. *B. Neemda* Buch.-Ham. ex Roxb. Fl. Ind. ed. Carey et Wall. i. 411 (1820); Benth. Scroph. Ind. 43 (1835); Benth. in DC. Prodr. x. 446 (1846); Bot. Mag. t. 6323.

N.W. HIMALAYA. Punjab: Dehra Dun, April 1834, *Jamieson* 507; on river banks in the Punjab plain, 300–1200 m., Oct. 1846, *Thomson*; River Dak, Husa, March 20, 1871, *Aitchison* 491; Hurroo, March 24, 1872, *Aitchison* 1094; Gurdaspur, 2000 m., March 8, 1885, *Drummond* 1713; Thakor, March 1885, *Nanak* in *Herb. Drummond* 1714; dry hillside near Abbottabad, “only seen in one place as yet,” Feb. 1902, *Barritt* 66 in *Herb. Drummond* 21972, without precise locality, *Drummond* 25488; small shrub, white, scented, Gurdaspur, Feb. 6, 1917, *R. R. Stewart* 1056.

This species is very different from the type of the preceding species in the much larger flowers with wide corolla tube and lobes

spreading to a diameter of 5-8 mm. instead of small and erect. They have been united by most authors. *B. asiatica* has a more southern and eastern distribution, but in parts of India and China some forms approach this species and it is possible that natural hybrids occur. On the other hand the present species resembles some forms of *B. polystachya*, which may be distinguished by its tomentose ovary.

35. **B. Davidii** Franch. in Nouv. Arch. Mus. Paris, Sér. 2, x. 65 (1887-88).—*B. variabilis* Hemsl. in Journ. Linn. Soc., Bot. xxvi. 120 (1889).

TIBET. Kam: without precise locality, Aug. 1, 1893, *Potanin*.

SZECHUAN. Mt. Omei, *Faber* 604 and 606; Tatsien-lu, July 13, 1893, *Potanin*; without precise locality, Aug. 7, 1893, *Potanin*; Mao chou, Aug. 27, 1893, *Potanin*; Tatsien-lu, 1893, *Soulié* 778 and 919; mountains, S. Wushan, bush of 1.5 m., flowers purple, July 1900, *E. H. Wilson* (Veitch Exped.) 1347; Min Valley, 1950 m., bush of 60-120 cm., flowers purple, Aug. 1903, *E. H. Wilson* (Veitch Exped.) 4120, Mt. Omei, July 1904, *E. H. Wilson* (Veitch Exped.) 5039, and Aug. 1904, 5038; bush 1-2 m., flowers purple, side of streams, Mupin, 2300 m., Aug. 1908, *E. H. Wilson* (Arn. Arb. Exped.) 3349; Hsien, 1300-2000 m., bush 2 m. high, flowers rose purple, side of streams West of and near Wen-ch'uan, *E. H. Wilson* (Arn. Arb. Exped.) 3350.

HUPEH. Ichang without precise locality, *A. Henry* 156, 1069, 2351, 3110a, 3110b, 4166a; Nanto and mountains to northward *A. Henry* 2060, 2668; Patung, shrub of 3 m. spreading with lilac flowers, *A. Henry* 7008; W. Hupeh, without precise locality, July 1900, *E. H. Wilson* (Veitch Exped.) 1347, 1347a; Patung mountains, bush 1.5 m. high, flowers purple, Aug. 1900, *E. H. Wilson* (Veitch Exped.) 1569; hills, Ichang, bush 1 m. high, flowers purple, Oct. 1900, *E. H. Wilson* 1738; by the side of streams north and south of Ichang, 1300-2000 m., bush 1-2.5 m. high, flowers purple, Aug. and Sept. 1907, *E. H. Wilson* (Arn. Arb. Exped.) 613a; thickets, Hsing-shan Hsien, 1300-2300 m., bush 1.5-2 m. high, flowers purple; Aug. and Oct. 1907, *E. H. Wilson* (Arn. Arb. Exped.) 3347.

var. **alba** Rehd. & Wils. in Sargent Pl. Wilson. i. 568 (1913).

W. SZECHUAN. Lugan Fa, Tu-ti-liang-shan, 1800 m., Oct. 1910, *E. H. Wilson* (Arn. Arb. Exped.) 4638.

Distinguished by the white flowers.

var. **magnifica** Rehd. & Wils. in Sargent Pl. Wilson. i. 567 (1913).

W. SZECHUAN. Lugan Fu, Tu-ti-liang-shan, 1800 m., bush 2-2.5 m. high, flowers violet purple, Aug. 1910, *E. H. Wilson* (Arn. Arb. Exped.) 4639.

W. HUPEH. Without precise locality, June, 1900, *E. H. Wilson* (Veitch Exped.) 1249; Hsing-shan Hsien, in thickets 1600-2300 m., flowering specimen only, bush 2 m. high, flowers vinous purple fragrant, July 1907, *E. H. Wilson* (Arn. Arb. Exped.) 613 *pro parte*; side of streams, Patung Hsien, bush 1.5-2.5 m. high, flowers

rosy-purple, fragrant, Aug. 1907, *E. H. Wilson* (Arn. Arb. Exped.) 3346.

Distinguished by the very large dense-flowered inflorescence and the margin of the corolla lobes reflexed.

var. **superba** Rehd. & Wils. in Sargent Pl. Wilson. i. 568 (1913).

W. HUPEH. Side of streams, Hsing-shan Hsien, 1600-2300 m., fruiting specimens only, Oct. 1907, *E. H. Wilson* (Arn. Arb. Exped.) 613 *pro parte*.

Distinguished by the extremely dense flowers with flat corolla lobes which are fimbriate but with margins not reflexed. This exceedingly polymorphic species has been cultivated extensively, and several other varieties founded on habit, time of flowering, etc. are known to the author from garden material only.

36. **B. Delavayi** Gagnepain in Lecomte, Not. Syst. ii. 190, 193 (1912).—*B. glabrescens* W. W. Sm. in Notes Roy. Bot. Gard. Edin. ix. 85 (1916).

YUNNAN. Oha-pin-keou, in a wood, Aug. 7, 1889, *Delavay* 3939; open situations amongst scrub at the North end of the Chien-Chuan Valley, lat. 27° N., 2400-2700 m., shrub of 1.5-3 m., flowers very deep blue-lavender, throat and tube tinged rose, fragrant, May 1914, *G. Forrest* 12433; on the Chungtien plateau, lat. 27° 30' N., 3000 m., July 1914, *G. Forrest* 12753; in open scrub on the Shweli-Salween divide, lat. 25° 30' N., 3000-3400 m., shrub of 2 m., flowers lilac-rose, fragrant, May 1917, *G. Forrest* 15664; amongst scrub by streams, N'Maikha-Salween divide lat. 26° 30' N., 2400 m., shrub of 2-3 m., flowers rose-lavender? faded when collected, July 1919, *G. Forrest* 18199.

37. **Buddleja hastata** Prain ms., sp. nov.; ex affinitate *B. agathosmae* Diels et *B. tibeticae* W. W. Sm. sed limbo corollae ad 1 cm. diametro calyce 9 mm. longo distinctissima.

Shrub. Branches terete, densely tomentose. *Leaves* hastate, 15-20 cm. long including the winged petiole, 4-6 cm. wide, apex acute, margin crenate-dentate, upper and lower surfaces clothed with a thin tomentum. *Stipules* auriculate. *Inflorescence* terminal and axillary, with the flowers in very dense subglobose whorls 3-4 cm. in diameter. *Bracts* numerous, densely tomentose, linear-lanceolate, up to 2.5 cm. in length. *Flowers* very large. *Calyx* densely tomentose, tube 5 mm. long, lobes 4 linear subobtusate 4 mm. long. *Corolla* glabrous; tube 8-10 mm. long, 1.5 mm. wide; lobes 4 broadly obovate or suborbicular 4 mm. long, 3-4 mm. wide. *Stamens* 4, inserted just above the middle of the corolla tube, anthers subsessile scarcely 1.5 mm. long. *Ovary* tomentose; style short, tomentose below. *Fruit* not seen.

S. TIBET. Between Gyantse and Phari, July-Sept. 1904 (Tibet Frontier Commission), *H. J. Walton*.

A barren specimen from the Kyichu valley, 15 miles east of Lhasa, also collected by Capt. Walton, probably belongs to this species.

38. **B. agathosma** Diels in Notes Roy. Bot. Gard. Edin. v. 248 (1912).

YUNNAN. On exposed cliffs to the west of Yunnan fu, 2400 m., shrub of 1.5-3 m., flowers purplish lavender, very fragrant, Feb. 1905, G. Forrest 593.

var. **glandulifera** Marquand, var. nov.; a typo differt corolla extus glandulis sessilibus dense vestita.

YUNNAN. In thickets on dry slopes on the Yang-Dza Shan, Mekong-Salween divide, lat. 28° 18' N., long. 98° 43' E., 2400-2700 m., shrub of 1-2 m., flowers deep violet-lilac, fragrant, May 1921, G. Forrest 20143.

This is a rather well-marked variety distinguished by the corolla being clothed with sessile glands on the outside.

39. **B. salviifolia** Lam. Encycl. i. 513.—*B. aurantiaco-maculata* Gilg. in Engl. Jahrb. xxx. 377 (1901). *Lantana salviifolia* Linn. Syst. ed. x. 1116 (1759).

NYASALAND. Zomba 1800-2100 m., Sept. 1859 Kirk; Zomba Plateau 1500 m., Sept. 5, 1895, A. Whyte; without precise locality, J. Buchanan 654; Nyika Plateau, 1800-2100 m., June 1896, A. Whyte; Nachari, 2400 m., Sept. 1902, J. McClounie; Kondowe to Karonga, 600-1800 m., July 1896, A. Whyte 365.

RHODESIA. Melssetter District; 1800 m., "a shrub with very strongly mignonette-scented whitish flowers," Sept. 21, 1906, C. F. M. Swynnerton 609 and Sept. 23, 1906, 675; Imyanga, Aug. 1920, J. S. Henkel in Herb. Eyles 2590. Umtali District; Vumba mountains, in forest at "Cloudlands" 1600-1700 m., July 8, 1927, "tree 5 m., flowers lilac," E. E. Galpin 9256.

TANGANYIKA. Langenburg District; Rungwe mountains, Oct. 25, 1910, flowers light reddish-brown, A. Stolz 379.

PORTUGUESE EAST AFRICA. Massekessi District; Vumba mountain, shrub 0.6-2 m., flowers lilac, Aug. 1911, M. T. Dawe 388.

SOUTH AFRICA:—Western Region: Clanwilliam Div.; Wupperthal, 1836, Drège 699c; Bull. Hoek. 150 m., Aug. 2, 1896 Schlechter 8373. Middelburg Div.; Sneeuwberg lower and middle slopes, Dec. 11, 1910, bush of 1-1.5 m., Pearson and Pillans (Percy Sladen Memorial Expedition) 5806.

Coastal Region: Bedford Div.; near Bedford, Mrs. Hutton; Stockenstrom Div.; Kat Bey, Henry Hutton; Caledon Div.; Zwart Berg, Zeyher 3526; Caledon, Oct. 1, 1846, Prior; and Jan. 22, 1894, Otto Kuntze; George Div., about the source of the Keurbooms River in Long Kloof March 20, 1914, Burchell 5077; in the wood under the mountain, George, Aug. 6, 1847, Prior; on the hill near George, 300 m., March 27, 1893, Schlechter 2418; between Gauritz River and Long Kloof, 1836, Ecklon & Zeyher 1328; Knysna Div.; Kaatjes Kraal, near Yzer Nek, March 30, 1814, Burchell 5202, between Keurbooms River and Biton River, April 10, 1814, Burchell 5284; Uitenhage Div.; between Galgebosch and Melk River, Feb. 17,

1814, Burchell 4766; banks of the Zwartkops River, Zeyher 461; valley of Zwartkops River, Dec. 30, 1847, Prior; Port Elizabeth Div.; Algoa Bay, Dec. 1847, Prior; Humansdorp Div., Karedoun Pass 300 m., March 1926, H. C. Fourcade 3221.

Central Region: Somerset Div.; on Bosch Berg, erect shrub of 2.5-3 m., June 11, 1813, Burchell 3226; (Mrs.) Barber 8; 1100 m., MacOwan 927; Queenstown Div.; near Queenstown, 1860, Cooper 193; Shiloh, Bauer 244 (pro parte); Hangklip mountain 1800-2000 m., 1893, E. E. Galpin 1623; Graaff Reinet Div.; Oude Berg 900-1200 m., Drège; Beaufort West Div.; Nieuwveld mountains, near Beaufort West 900-1500 m., Drège 699a; Albert Div.; without precise locality 1861, Cooper 697.

Ka'ahari Region: Basutoland; without precise locality 1861, Cooper 695; Lefibé, M. & Mme. Dieterlen 54; Transvaal; Magaliesberg Range, Sept., Burke 376; at the bottom of mountain ravines, Rimer's and other creeks near Barberton, shrub of 1.5-3 m., Sept. 1889, E. E. Galpin 481; Barberton, Sept. 1906, Thornecroft in Trans. Mus. Herb. 2847; Lydenberg Div.; on the sides of streams in the Macamao Gold Fields, June 1874, McLea in Herb. Bolus 467; near Lydenberg and near Spitzkop, Aug. 1887, Wilms 1027; Lydenberg May 1915, Rogers 14687; Pretoria, July 20, 1904, (Miss) Leendertz 187; Rustenberg Div.; 1300 m., Aug. 1904, without precise locality, Miss Pegler in Herb. Nation. 296; near river at Krondaal, 1300 m., Sept. 1905, Miss Nation 344; Zoutpansberg Div., without precise locality, Dec. 20, 1909, W. C. Worsdell; Pretoria, The Fountains, Oct. 1903, J. Burt Davy 2357; Forest near Pilgrim's Rest, May 1905, Grenfell 864.

Eastern Region: Tembuland: Umtata Div.; Transkei, Bazeia, Baur 244; Pondoland; between St. John's River and Umtsibeaba River, Drège; Natal, summit of Table Mountain, 1840, Krauss 447; banks of the River Umtwalumi, Gerrard 1850, and without precise locality, Gerrard 1211; Mont-aux-Sources, hillside and flats as pioneer scrub in the Lugela Valley, very common 1500 m. Feb. 15, 1926, B. McLean 84; Alexandra Div.; Dumisa, tree of 6 m., 1100 m. Aug. 22, 1911, H. Rudatis 1442; Van Reenen, 1500-1800 m. Nov. 5, 1894, J. Medley Wood 5491.

40. **B. crispa** Benth. Scroph. Ind. 43 (1835); Wall. Cat. 6404.

BALUCHISTAN. Chihil Tan and Zahree, 1851, J. E. Stocks 867; Urak, June 1886, Lace; Larchun, 2300 m., May 4, 1888, Lace 3842; Gustoi May 25, 1897, Harsukh in Herb. Duthie 20591.

AFGHANISTAN. Shaded bank, Otipore, March, Griffith 3744; shrub of 2-3 m. through the whole Kuram valley, 1879, Aitchison 189; same locality, Harsukh in Herb. Duthie 14921.

N. W. HIMALAYA. Without locality, Wallich 6404; 1200-2100 m., Thomson. Waziristan, Shakai, 1800-2100 m., April 30, 1895, Duthie 15686; Hazara, Kagan Valley 2200 m., May 18, 1896, Inayat in Herb. Duthie 19942a; Simla, 2100 m., Thomson; 1200-2100 m., 1844, Edgeworth; April 15, Lady Dalhousie; Elysium Hill

2100 m. April 21, 1877, *Gamble* 4145a, 4145c; March, *Collett*; stony places at the foot of the mountain, Krol between Kasauli and Simla 600 m., April 13, 1885, *Drummond* 2802; Ladies Mile, Jako, Simla, May 30, 1902, *Bourne* 3719; Kumaon Laharkot, 1800 m., *Strachey & Winterbottom* 1; Almorah 1600–2200 m. *Madden*; Punjab, Dalhousie Road above Donera, 900 m. Feb. 22, 1917, *R. R. Stewart* 1268a; Dharmcot, Dharmsala 2400 m. May 18, 1917, *R. R. Stewart* 1867.

BHUTAN. *Griffith* 1009, 2446.

41. **B. caryopteridifolia** *W. W. Smith* in Notes Roy. Bot. Gard. Edin. viii. 179 (1914).

YUNNAN. Open situations on the Tong Shan in the Yangtze bend, lat. 27° 20' N., 3000 m., shrub of 1.5–2 m., flowers pale lavender, Sept. 1913, *G. Forrest* 11016; east of Likiang, 1450–2100 m., flowers violet, July 3, 1914, *Handel-Mazzetti* 3405; open, dry situations on the Yung-peh mountains, lat. 26° 40' N., 2400 m., shrub of 1.5 m., flowers pale lilac-rose, fragrant, Aug. 1917, *G. Forrest* 15311; amongst rocks in dry situations on the Leilung Shan, lat. 28° 12' N., 3000 m., shrub of 60–120 cm., flowers grey, fragrant, Sept. 1917, *G. Forrest* 15317; in thickets on dry bouldery hillsides on the hills around Yung-peh, lat. 26° 40' N., long. 100° 45' E., 1500–1800 m., shrub of 1.5 m., flowers fragrant, rose-lavender, July 1921, *G. Forrest* 21188; dry stony hillsides amongst scrub on the Chien-Chuan—Mekong divide, lat. 26° 30' N., long. 99° 40' E., shrub of 60–120 m., flowers, exterior grey, interior violet-lavender, fragrant, 2700–3000 m., Aug. 1922, *G. Forrest* 23238.

var. **eremophila** *Marquand*.—*B. eremophila* *W. W. Smith* in Notes Roy. Bot. Gard. Edin. viii. 179 (1914).

YUNNAN. Arid regions above the Yangtze, 3000 m., compact dwarf shrub of 30–60 cm., May 1913, *F. Kingdon Ward* 304; above the Yangtze between Yungpeh and Likiang 1800 m., July 3, 1914, *C. Schneider* 1736; near Ndaku, lat. 27° 20' N., 1750–2250 m., Aug. 1, 1914, *Handel-Mazzetti* 4389; dry stony pasture on the Muli mountains, valley of the Litang, lat. 28° 12' N., 3000 m., shrub of 0.5–1 m., flowers dull rose, exterior grey, June 1918, *G. Forrest* 16258; open situations in thickets, Muli mountains, lat. 28° 12' N., 3000 m., shrub of 1.5 m., flowers deep blue lavender, Oct. 1918, *G. Forrest* 19139, 18687; dry stony slopes and amongst rocks on the Bey-ti Shan, lat. 27° 45' N., long. 100° 18' E., 2100 m., stunted shrub of 30–60 cm., flowers soft bluish-rose, fragrant, July 1921, *G. Forrest* 20543; open dry situations amongst scrub on the divide between the Yangtze and Yungning valleys, lat. 27° 42' N., long. 100° 30' E., 1800–2100 m., shrub of 60–90 m., flowers exterior grey, interior purplish-rose, June 1922, *G. Forrest* 21273; dry hillsides amongst scrub and rock on the hills above Feng-kou, lat. 27° 40' N., long. 100° 26' E., 1800 m., shrub of 1–1.3 m., flowers exterior grey, interior pale lavender, June 1922, *G. Forrest* 21280.

Though very distinct in its typical form with leaves scarcely 1 cm. long, this is connected with the type of *B. caryopteridifolia* by a

complete chain of intermediates so that one is forced to consider the whole series as one polymorphic species. In cultivation the species exhibits a very wide range of variation. Of the specimens enumerated above, *Handel-Mazzetti* 4389 is almost exactly equidistant between the type and variety.

var. **lanuginosa** *Marquand*, var. nov.; a typo differt foliis utrinque dense lanuginosis corollae tubo ad 1.5 mm. lato.

YUNNAN. Open dry, stony pasture, Muli mountains, lat. 28° 12' N., 3000 m., shrub of 60–90 cm., flowers deep, soft rose, exterior white, fragrant, Aug. 1918, *G. Forrest* 16639; dry bouldery slopes on the hills, north of Yungpeh, lat. 26° 40' N., long. 100° 45' E., 2400 m., shrub of 60–90 cm., flowers fragrant, exterior grey, interior rose-lavender, Aug. 1921, *G. Forrest* 21175.

This is a rather distinct variety with wider corollas than the type. The young stems and leaves are clothed with a very thick tomentum.

42. **B. brachystachya** *Diels* in Notes Roy. Bot. Gard. Edin. v. 249 (1912).

YUNNAN. In dry exposed situations amongst rocks, on the descent from the Lu-po pass to the Salween, Mekong-Salween divide, lat. about 27° N., 2100–2400 m., dwarf shrub of 30–45 cm., flowers lavender colour and fragrant, *G. Forrest* 1076.

43. **B. nana** *W. W. Smith* in Notes Roy. Bot. Gard. Edin. viii. 126 (1913).

YUNNAN. Moist open situations on the divide between the Shayang and Chu-tong valleys, lat. 25° 20' N., 2000 m., dwarf shrub of 30–60 m., flowers greyish-lavender, April 1910, *G. Forrest* 5519.

44. **B. auriculata** *Benth.* in Hook. Comp. Bot. Mag. ii. 60 (1836).

S. AFRICA:—Coastal Region: Fort Beaufort Div., Winterberg 1836, *Ecklon* (flowers white, yellow in the throat); Stockenstrom Div., Chumie Berg, 1836, *Ecklon*; Katberg, *Henry Hutton*; Klarf, summit of the Katberg, May 1869, *J. Shaw*; Katberg, 1200 m., *R. Baur* 874.

Central Region: Somerset Div., near Somerset, on Bosch Berg, May 29, 1813, *Burchell* 3157; and June 1813, *Burchell* 3179; Griqualand East, Maclear Div., Potriviers Berg, wooded kloof 1700 m., March 20, 1904, *E. E. Galpin* 6771.

Kalahari Region: Transvaal; Barberton, June 1905, *I. Thornecroft* 4343; Pietersburg, "The Downs," 1500 m., July 1917, *F. A. Rogers* 20167.

Eastern Region: Xalanga Div., Cala, hillside near Bushman's painting, 1200 m., March 29, 1910, *Alice Pegler* 1741.

var. **euryifolia** *Prain & Cummins* in Dyer Fl. Cap. iv. II. 1048.

S. AFRICA:—Kalahari Region: Transvaal: Rimer's Creek, Barberton, 900 m., shrub of 1.5–2.5 m., corolla tube orange, limb pale lilac, July 1890, *E. E. Galpin* 970; in abandoned Kaffir Kraals near

Lydenberg, June 1889, *F. Wilms* 1030; Sabie Lock, near Pilgrim's Rest, Aug. 1904, *J. Burtt Davy* 2437; Waterval Boven, June 10, 1905, *F. A. Rogers* 984; shrub of 1-2 m., Mount Fletcher, *J. R. Sims* 2536.

Eastern Region: Natal: Tugela River, *Gerrard* 1967; Griqualand East; near Kokstad, in Umzimhlava Woods 1200 m., May 1883, *Tyson* 1287.

This variety is distinguished from the type of the species in the leaves being densely pubescent on the under surface with the nerves and veins deeply impressed.

45. **B. heliophila** *W. W. Smith* in Notes Roy. Bot. Gard. Edin. viii. 126 (1913).

YUNNAN. Open, sunny situations along the base of the eastern flank of the Tali Range, lat. 25° 40' N., 2100-2400 m., shrub of 1-2 m., flowers soft magenta rose shading to crimson at base, July 1910, *G. Forrest* 6796; shrub of 1.2-1.6 m., corolla-tube lavender-rose, limb lavender, throat deep red orange, fragrant; open scrub in dry situations on the Langkong Ho-Ching divide, lat. 26° 16' N., 2400 m., May 1913, *G. Forrest* 9984; open scrub in dry situations on the Langkong divide, lat. 26° 16' N., 2400-2700 m., shrub of 2-2.5 m., flowers, tube bluish-rose, limb pale soft blue, May 1913, *G. Forrest* 9988; open thickets on the western flank of the Tali Range, lat. 25° 40' N., 3000 m., shrub of 1.5-2 m., flowers rose-lavender, fragrant, June 1917, *G. Forrest* 15622.

var. **angustifolia** *Marquand*, var. nov.; a typo differt foliis anguste lanceolatis acuminatis calyce pubescente.

YUNNAN. In open thickets by streams and on the margins of forests, Shweli-Salween divide, lat. 25° 20' N., long. 98° 56' E., 2700-3000 m., shrub 2-3 m. high, flowers soft greyish rose, strongly fragrant, April 1924, *G. Forrest* 24069.

This variety is distinguished by the thin narrow leaves, acuminate at the apex, and the sparse hairs on the calyx.

var. **pubescens** *Marquand*, var. nov.; foliis ovato-lanceolatis calyce pubescente a typo differt.

YUNNAN. Dry scrubby banks on the margins of pine forests on the hills around Beta-pu, lat. 25° 30' N., long. 99° 48' E., 2400-2900 m., shrub of 1-1.5 m., flowers pure pale soft rose-pink, drying purplish, fragrant, April 1921, *G. Forrest* 19357; dry banks amongst scrub on the margins of pine forests on the hills between Tai-ping-pu and Yangpi, lat. 25° 36' N., long. 99° 54' E., 2100-2400 m., shrub of 1.5-2 m., flowers rose-pink to soft lavender, fragrant, April 1922, *G. Forrest* 21121.

In this variety the leaves scarcely differ from the type of the species but the calyx is only sparsely hairy, not tomentose.

46. **B. officinalis** *Maxim.* in Bull. Acad. Pétersb. xxvi. 496 (1893).

SZECHUAN. Ya-chon, April 5, 1893, *Potanin*.

HUPEH. Ichang Gorge, River Yangtze, *Maries*: Ichang, shrub in glens, etc., early in the year, *A. Henry* 1117, 1291, 1447, 1527, 3110, 7884; Ichang, shrub of 1-2.5 m., flowers lavender, on cliffs, etc. March 16, 1900, *E. H. Wilson* (Veitch Exped.) 155, 155a; Ichang cliffs, etc., 300-600 m., March 24, 1908, *E. H. Wilson* (Arn. Arb. Exped.) 4005.

KWEI-CHOW. River Yangtze, without precise locality, *E. Faber* 605.

YUNNAN. Flowers lilac, Red River, 3000 m., *A. Henry* 9749.

47. **B. acutifolia** *C. H. Wright*, in Kew. Bull. 1896, 24.—*B. lavandulacea* Kränzl. in Engl. Jahrb. i. Beibl. 111, 42 (1913). *B. Mairei* Lévl. in Fedde Repert. xiii. 258 (1914).

BHUTAN. *Griffith* 2444 (Kew. Distr. No. 3745).

BURMA. Sadon, 2000 m., flowers white, Feb. 1900, *Shaik Mokim* 63; Bhamo District, Sinlum Kaba, 1500-1800 m., April 11, 1912, *Lace* 5779; Myitkyina district, Lankkaung 1300 m., April 23, 1929, *Su Koe* in *Herb. Parkinson* 9117.

YUNNAN. Very common in hedges and wastes, Mengtze, flowers lavender, fragrant, March 1893, *Hancock* 143; Szemao, February, *Bons d'Anty* 3; Mengtze, 1400 m. shrub 2 m. to tree 5 m., flowers lavender, *A. Henry* 10178; forests on mountains east of Szemao, 1500 m., shrub of 3 m., with lilac flowers, *A. Henry* 11619; hills Tai-pou, 2500 m., large shrub with lavender flowers, *E. E. Maire* 467; Mo-tsou, 600 m., *E. E. Maire* (sine numero); without precise locality, *E. E. Maire* 2487; generally in dry situations, common from Yunnan fu to Talifu, 2000-2700 m., shrub of 1-2.5 m., flowers white with lavender centre, fragrant, Feb. 1905, *G. Forrest* 2; open situations, hills to the south of Tengyueh, lat. 25° N., 1800-2100 m., shrub of 3 m., flowers interior creamy white, exterior pale purplish, fragrant, Feb. 1913, *G. Forrest* 9550; amongst scrub in open situations, south end of Kau-guai Valley, lat. 24° 30' N., 900 m., shrub of 2-3 m., flowers, tube dull lavender rose, limb buff, throat orange red, fragrant, Jan. 1913, *G. Forrest* 9494; Yunnan fu, shrub of 2.5 m., flowers white with orange throat, Feb. 8, 1914, *C. Schneider* 45; between Ssiao-ma-kai and Schin lun, flowers white within, lilac outside, March 9, 1914, *C. Schneider* 302; 1900 m., tall shrub roadsides and walls, April 20, 1916, *O. Schoch* 41; *Schneider* 361.

KWEI-CHOW. Pin-fa, April 1907, *J. Cavalerie* 3097, 8082, 8140.

KWANG-SI. On hills and glens Lungchow, shrub of 60-90 cm., flowers lavender, *Morse* 278; Lungchow, shrub of 1-1.5 m., flowers white, orange throat, *Morse* 466, 467.

48. **B. myriantha** *Diels* in Notes Roy. Bot. Gard. Edin. v. 250 (1912).—*B. asiatica* var. *stipulata* Gagnep. in Lecomte Not. Syst. ii. 189 (1912) (nomen nudum).

UPPER BURMA. In thickets of the lower ridges of the N'Maikha-Salween divide, lat. 27° 17' N., long. 98° 46' E., 2700 m., shrub of 1.5-2 m., flowers purple or soft rose-lavender, fragrant, July 1925, *G. Forrest* 27055, 27536.

S.E. TIBET. Tsarong : dry situations on the margins of thickets on the Salween—Kiu-chiang divide, lat. 28° 40' N., long. 98° 15' E., shrub of 2-2.5 m., flowers soft rose-lavender, fragrant, July 1919, *G. Forrest* 19235.

YUNNAN. Above Tali at the foot of the Sang Shan, Sept. 25, 1888, *Delavay* 3627; without precise locality, *Ducloux* 444; dry open situations on the borders of pine woods, western slopes of the Isen Shen range, Yang-pi pass, lat. 25° 40' N., 2100-2700 m. shrub of 2-3 m., flowers dull purple, Sept. 1905, *G. Forrest* 912 at the foot of the mountain near Tali fu, 2500 m., shrub of 1.5 m. flowers pale violet, Aug. 1914, *C. Schneider* 2503; in open thickets by streams on the Mekong-Salween divide, lat. 27° 36' N., long. 98° 56' E., 2400-2700 m., shrub of 2-4 m., flowers dull rose, hispid white exterior, fragrant, July 1921, *G. Forrest* 19804.

KWEI-CHOW. Shrub with white flowers, *J. Esquirol* 581.

Note. This species is very closely allied to the Szechuan species *B. alata* (No. 28).

49. **B. Fallowiana** Balf. fil. & W. W. Smith in Notes Roy. Bot. Gard. Edin. x. 15 (1917).—*B. macrostachya* Benth. var. *yunnanensis* Diels in Notes Roy. Bot. Gard. Edin. vii. 145 (1912).

YUNNAN. Dry stony situations along base of the eastern flank of the Lichiang Range, lat. 27° 12' N., 2700 m., branched shrub of 2-4 m., flowers rich lavender, throat of corolla orange, fragrant, with an odour resembling vanilla, July 1906, *G. Forrest* 2599; by streams at the north end of the Lichiang Plain, lat. 27° 20' N., 2700 m., shrub of 1.5-3 m., flowers soft lavender, throat orange, fragrant, July 1910, *G. Forrest* 6047; stony situations by streams on the eastern flank of the Lichiang Range, lat. 27° 30' N. 2700-3000 m., shrub of 1-1.5 m., flowers lavender, throat orange, strongly fragrant, Aug. 1910, *G. Forrest* 6285; Lichiang Range, lat. 27° 15' N., 2500-3000 m., July 1913, *G. Forrest* 10591; shrub of 2 m., flowers lilac. Ngu leh-keh in the neighbourhood of Lichiang, 3000 m., July 29, 1914, *C. Schneider* 2054; at the foot of the snow clad mountains near Lichiang, 3000 m., Aug. 6, 1914, *C. Schneider* 3399; open pasture on the hills around Tengyueh, lat. 25° N., 1800 m., compact shrub of 1-1.5 m., flowers fragrant, very dark rose-lavender, May 1919, *G. Forrest* 17790; open thickets by streams on the N. W. flank of the Lichiang Range, lat. 27° 20' N., long. 100° 10' E., 3000 m., shrub of 1.5-2.5 m., flowers fragrant, soft lavender-purple, Aug. 1922, *G. Forrest* 23179.

There are several forms of this species in cultivation differing slightly in flower colour.

50. **B. candida** Dunn in Kew. Bull. 1920, 134.

EASTERN HIMALAYA. Outer Abor Hills, low bushes scattered in the sward, Sidi river mouth and opposite Yambung on the north side of the Dihang, *Burkill* 37631; Tsangpo gorge, Gompa Ne, on cliffs and rocks in open sunny places in the river bed and up the

bracken and grass clad slopes above, 1500 m., shrub of 2-3 m. with very flannelly whitish leaves and small racemes of violet flowers, Dec. 9, 1924, *F. Kingdon Ward* 6372; Dihang valley, Abor Hills, small shrub 2.5-3 m. high, leaves flannelly, the young shoots with a matt bronzy look, on rocks in the bed of the river, above flood level, growing in almost pure sand, 300 m., flowers probably quite small, in long spikes, Feb. 13, 1928, *F. Kingdon Ward* 7863.

51. **B. stenostachya** Rehder & Wilson in Sargent Pl. Wilson. i. 565 (1913).

SZECHUAN. Flowers pale purple, thickets Mupin, 1200-2400 m., Oct. 1908, *E. H. Wilson* (Arn. Arb. Exped.) 1351.

52. **B. tibetica** W. W. Smith in Rec. Bot. Surv. Ind. iv. 270 (1911).—*B. Whitei* Kränzl. in Engl. Jahrb. l. Beibl. 111, 46 (1913).

TIBET. Llalung valley, 3400 m., June 10, 1906, *J. C. White* 72.

var. **Farreri** Marquand.—*B. Farreri* Balf. fil. & W. W. Smith in Notes Roy. Bot. Gard. Edin. ix. 84 (1916).

KANSU. Arid places crevices, walls and banks; Ha Shui fang, Siku, Feng S'an Ling, and at the edge of the subalpine coppice below Chago, Sha-Tan-yu valley on the borders of the province, bush of 1.5-2 m., May 8, 1914, *Farrer & Purdom* 44.

SZECHUAN. Arid places 3400 m., shrub of 1.5 m. (without precise locality), July 1904, *E. H. Wilson* (Veitch Exped.) 4122; Wen chuan hsien near Scha pei, 1600-1700 m., April 26, 1914, *Limpricht* 1310.

var. **grandiflora** Marquand in Journ. Linn. Soc., Bot. xlviii, 202 (1929).

TIBET. Tsela Dzong, varying much in size and habit, scrubby thick bushes only 30-60 cm. high on the open rocky sun-scorched face of the mountain, to a large thick bush or tree in villages and by streams in more sheltered situations, "flowers lilac, purple, or almost white with orange eye, leaves variable, covered with silver or golden fur," 2700-3000 m., May 22, 1924, *F. Kingdon Ward* 5693; Tsangpo valley below Tsetang, small scraggy tree or large untidy bush up to 4-6 m. high, flowers bright purple with deep orange eye, fragrant, no leaves yet showing, 3000-3400 m., April 29, 1924, *F. Kingdon Ward* 5635.

var. **truncatifolia** Marquand.—*B. truncatifolia* Lévl. in Fedde Repert. xiii. 342 (1914).

YUNNAN. Brittle shrub with white woolly leaves, flowers pink, Kiao-tche-keou, 2550 m., *E. E. Maire* (sine numero); valley of Tche-ka, 2500 m., large shrub, branches white, leaves cottony, flowers violet, rare, May (sine anno) *E. E. Maire* 376; open thickets on the western flank of the Tali Range, lat. 25° 40' N., 300 m., shrub of 2-3 m. foliage only, Aug. 1913, *G. Forrest* 11528; Ouai-gai-tchai, 2500 m., large bushy shrub, leaves and young branches white tomentose, flowers bluish-violet, hedges, *E. E. Maire* 329.

var. *glandulifera* Marquand, var. nov.; a typo differt paniculis lateralibus ad 9 cm. longis 4 cm. latis corolla extus glandulis sessilibus dense vestita.

YUNNAN. Open dry situations on the Chungtien plateau, lat. 27° 45' N., 3400 m., shrub of 1.5-3 m., flowers greenish-rose, fragrant, June 1917, G. Forrest 13871.

This is a very well marked variety. The inflorescences are much larger and less compact than the type and the exterior of the corolla is glandular.

Key to the varieties of *B. tibetica*.

Exterior of the corolla eglandular:

Branchlets tetragonous; flower 6-8 mm. long.....*tibetica* (type)

Branchlets terete; flower usually exceeding 10 mm. in length:

Panicle (up to 20 cm. long, 15 cm. wide) branches spreading at right angles; corolla glabrescent on the exterior...var. *Farreri*

Panicle lateral compact (up to 5 cm. long, 3 cm. wide); corolla tomentose on the exterior:

Leaves cordate at the base; petiole not winged; nerves conspicuous on the underside.....var. *grandiflora*.

Leaves truncate at the base; petiole winged; nerves hidden by the very dense tomentum.....var. *truncatifolia*.

Exterior of the corolla glandular.....var. *glandulifera*.

Index of species and synonyms.

acosma 13; *acuminata* 29; *acuminatissima* 33; *acutifolia* 47; *adenantha* 14; *agathosma* 38; *alata* 28; *albiflora* 18; *alternifolia* 3; *amentacea* 2; *asiatica* 33; *asiatica* var. *stipulata* 48; *aurantiaco-maculata* 39; *auriculata* 44.

brachystachya 42.

candida 50; *carnea* 9; *caryopteridifolia* 41; *Colvillei* 15; *Cooperi* 32; *crispa* 40; *curviflora* 9; *cylindrostachya* 24.

Davidii 35; *Delavayi* 36; *discolor* 33; *Duclouxii* 19.

eremophila 41.

Fallowiana 49; *Farreri* 52; *foliata* 29; *Forrestii* 16.

Giraldii 18; *glabrescens* 36; *Griffithii* 30; *gynandra* 1.

Hancockii 27; *hastata* 37; *heliophila* 45; *Hemsleyana* 18; *Henryi* 27; *Hookeri* 26.

incompta 13; *insignis* 7; *intermedia* 7.

japonica 8.

lanceolata 33; *lavandulacea* 47; *Legendrei* 4; *limitanea* 31; *Lindleyana* 7; *longifolia* 20.

macrostachya 25; *macrostachya* var. *Griffithii* 30; *macrostachya* var. *yunnanensis* 23, 49; *Mairei* 47; *Martii* 25; *myriantha* 48.

nana 43; *Neemda* 34; *nivea* 23.

officinalis 46.

paniculata 21; *polystachya* 29; *Powellii* 29; *pulchella* 22; *Purdomii* 11.

salicifolia 7; *salicina* 33; *Saltiana* 29; *salviifolia* 39; *serrulata* 33; *stenostachya* 51; *subserrata* 33.

taliensis 17; *tibetica* 52; *truncatifolia* 52; *tsetangensis* 5.

usambarensis 22.

variabilis 35; *venenifera* 10; *virgata* 33.

Wardii 6; *Whitei* 52; *Woodii* 22.

yunnanensis 12.

Doubtful species.

B. acuminata Poir. Encyc. Suppl. i. 745 (1810)—Type (in Herb. Jussieu) not seen. India.

B. nepalensis Colla in Mem. Acad. Torino, xxxv. 182 (1835) (Hort. Ripul., App. 4, 38). Nepal.

B. otophylla Hassk. in Versl. en Med. Kon. Akad. Wentensch, v. 97 (1857). The type of this species has not been seen. In the original description it is compared with a Brazilian species.

B. Poirerii Spreng. Syst. Veg. i. 430 (1825). No specimen seen, origin doubtful.

B. ternata Lour. Fl. Cochinch. 72 (1790). The type of this species has not been seen, but from the description it is not a species of *Buddleja*.

B. truncata Gagnepain in Lecomte, Not. Syst. ii. 187, 192 (1912). No specimen has been seen, but this is stated to differ from *B. officinalis* Maxim. in the leaves being more bullate, abruptly truncate or cordate at the base and dentate. Collected by Delavay in Yunnan.

Excluded Species.

B. diversifolia Vahl. Symb. Bot. iii. 15 (1794).

= *Nicodemia diversifolia* Tenore Cat. Ort. Napol. 88 (1845).

B. incompta Linn. fil. Suppl. 123 (1781).

= *Gomphostigma incomptum* N.E. Br. in Kew Bull. 1929, 143.

B. indica Lam. Encyc. i. 513 (1785).

= *Nicodemia diversifolia* Tenore Cat. Ort. Napol. 88 (1845).

B. madagascarensis Lam. Encyc. i. 513 (1785).

= *Nicodemia madagascarensis* R. N. Parker, Forest Fl. Punjab. ed. 2, 357 (1924).

B. Missionis Benth. Scroph. Ind. 43 (1835).

= *Wendlandia Notoniana* Wall. ex Wright & Arn. Prod. 403 (1834).

B. plectranthoidea Lévl. Cat. Pl. Yunnan, 171 (1916).

= *Leucosceptrum plectranthoideum* (Lévl.) Marquand comb. nov.

B. virgata Linn. fil. Suppl. 123 (1781).

= *Gomphostigma scoparioides* Turcz. in Bull. Soc. Nat. Mosc. xvi. 53 (1843).

= *Gomphostigma virgatum* O. Kuntze Rev. Gen. iii. II. 201 (1893).

In addition to the above, the following Mascarene species are referred to the genus *Nicodemia* for the reason stated in the Introduction:—

- B. candelabrum* Kränzl. in Engl. Jahrb. l. Beibl. III, 40 (1913).
B. comorensis Baker in Journ. Linn. Soc. xx. 206 (1884).
B. cuspidata Baker in Kew Bull. 1895. 113.
B. fusca Baker in Journ. Linn. Soc., Bot. xx. 205 (1884).
B. rondeletiaefolia Benth. in DC. Prod. x. 445 (1846).
B. sinuata Willd. ex Roem. & Schult. Syst. Mant. iii. 97 (1827).
B. sphaerocalyx Baker in Journ. Linn. Soc., Bot. xxii 505. (1887).
B. sphaerocephala Baker in Journ. Linn. Soc., Bot. xxi. 425 (1885).

XX.—A NEW BERBERIS FROM BURMA.

H. K. AIRY-SHAW.

In view of the note in a recent issue of the Gardeners' Chronicle,* respecting the successful raising from seed (F. K. Ward 6787) of what proves to be a new species of *Berberis* of a somewhat aberrant type, it seems desirable to name and describe this plant adequately as soon as possible. Material was collected both before and after the flowering season (in May and again in October, 1926), and consequently mature expanded flowers are not represented on the specimens upon which the following description is based. This should be borne in mind when considering the description and measurements here given of the parts of the flower.

The species presents several features of interest, especially from the morphological point of view, in that it departs even further from the usual type of the genus than does its nearest ally, *Berberis insignis* Hook. fil. & Thoms., the morphology of which has already attracted attention.† It is hoped to deal more fully with these and other points in a further account, to appear in a future issue of the journal referred to above.

Berberis hypokerina† *Airy-Shaw*, sp. nov. (Sect. Wallichianae § Insignes), ab affini *B. insigni* Hook. fil. et Thoms. habitu humiliore, foliis ramorum longorum multo crassius coriaceis haud acuminatis subtus papilloso-ceratis albo-glaucis, nervis primariis angulum acutiorem cum costa efformantibus, foliis e ramulis abbreviatis nunquam ut videtur evolutis, petalis integris, praecipue distinguenda.

Frutex humilis, usque circiter 0.75 m. altus. *Rami* rigidi erecti subcaespitosi: *annotini* (et vetustiores) in speciminibus praesentibus 4–5 mm. diametri haud excedentes cortice cinereo-fusco plus minus fissis instructi; *hornotini* recti teretes usque 4 mm. diametro, cortice floriferorum rubido-purpureo, sterilium (iuniorum) ochraceo-

* T. W. Bolas in Gard. Chron. lxxxvii. 186 (8th March, 1930), sub: "Plants New or Noteworthy."

† Hooker fil. et Thomson, Flora Indica i. 226, 227 (1855); C. K. Schneider in Bull. Herb. Boiss. sér. 2, v. 37, 39 (1905).

‡ Name derived from ὑπὸ below and κήρυκος *waxen*, in allusion to the most prominent feature of the leaves.

brunnescente; bases omnium ramorum (veterum aequae ac iuniorum) perulis persistentibus imbricatis, deltoideis acutis usque lanceolatis spinoso-acuminatis, usque 1.2 cm. longis circumdatae; internodia 3.5–9.5 cm. (plerumque 5–6 cm.) longa. *Folia ramorum longorum* foliacea nec spiniformia, oblongo-elliptica, usque 12 cm. longa 6.5 cm. lata (spinis inclusis), valde coriacea rigida glaberrima, marginibus incrassatis revolutis cartilagineis regulariter sinuato-dentatis, sinibus rotundatis, dentibus utrinque 8–9 (raro usque 15) triangularibus 4–5 mm. longis spina valida pungentissima 2–3 mm. longa brunnescente terminatis; pagina superior (e collectore) fusco-viridis, exsiccata surde olivacea levis, inferior ob rorem cereum sub lente minutissime sed distinctissime globuloso-papillosum per totam superficiem obductum, vi deterrentem, splendide argenteo-alba (in foliis iunioribus rufo-glaucis); nervi costaque supra minime prominentes sed viventes fere sine dubio impressi, quod vero etiam in his speciminibus nonnunquam fit, infra conspicue nec tamen argute elevatis; nervi primarii plerumque tot quot dentes principales angulo acutiusculo (40–45°) e costa orti circa medium bifurcati ramificatione superiore saepe costae plus minus parallelae utraque cum proxima anastomosante, unde areolae subrhomboidales vel oblique pentagonales, vena singula ab anastomosibus in quemque dentem excurrente; petioli brevissimi 4–5 mm. longi basi crassa semiamplexicauli fere aequae lata cum laminae basi angustata conspicue articulati, infra ipsam articulationem in stipulas binas minutas subulatas nonnunquam excurrentes. *Folia ramulorum abbreviatorum* haud evoluta. *Fasciculi* axillares circiter 6–10-flori, perulis multis imbricato-congestis ovatis vel lanceolatis usque subulatis acutissimis 2–5 mm. longis laete brunneis suffulti; pedicelli alabastrorum glaberrimi circiter 1 cm. longi crassiusculi superne paulum ampliati; bracteolae tres sepalis extimis arte adpressae exacte deltoideae 2 mm. longae lataeque crassae marginibus tenues apice acutae dorso obtuse carinatae. *Flores* ex alabastris tantum cognitae. *Sepala* novem, subaequalia orbiculata valde concava carnosula 2–2.5 mm. diametro quinquenervia nervis duobus exterioribus (marginalibus) quam ceteris subduplo brevioribus obscurioribus. *Petala* sex, obovato-spatulata vix 2 mm. longa, 1–1.5 mm. lata, apice integerrima, trinervia nervis lateralibus nectarium elliptico-fusiforme basin versus gerentibus. *Stamina* filamenta basi petalorum leviter adnata crassa brevissima, thecae oblongae connectivo medio angustato apice truncato paulo superatae. *Ovarium* circiter 1 mm. longum ovoideum apice contractum, stigmate sessili latissime pileiformi-capitato. *Baccae* (vix maturae) pendulae, pedicellis usque 1.5 cm. longis brunneo-aurantiacis striatis fere 1 mm. diametro gestae, ellipsoideae utrinque angustatae usque 7 mm. longae et 4 mm. diametro, stylo brevissimo stigmate 1–1.25 mm. lato. *Semina* (in fructu unico dissecto) quatuor, quorum duo tantum maturescere (ceteris abortis) videbantur, 5–6 mm. longa 2.5–3 mm. lata, applanato-subtrigona tertia facie angustissima, testa indurata brunnea. *Fructus maturi* e collectore "fusiformes, surde

subcaeruleo-violascentes, iis specierum *Mahoniae* quorundam persimiles."

NORTH-EAST UPPER BURMA. Base Camp, Seingku Wang, alt. c. 2700-3000 m., 29 May 1926, *F. Kingdon Ward* 6787 (Type! Herb. Kew.); Valley of the Seingku, 28° 5' N., 97° 30' E., alt. c. 2700-3000 m., 24 Oct. 1926, *F. Kingdon Ward* 7611.

Collector's field notes:

6787. "As seen, a small, almost dwarf shrub, with stiff branches, growing in the dense thickets of tanglewood which clothe the high ridge and precipitous face of the mountain. Leaves stiff, leathery, dark green above, brilliant silver-white beneath; on the upper surface the midrib and lateral veins show through like inlaid malachite. Flowers not open. Stems purple, or warm red."

7611. "Young shoot of no. 6787, also fruit [immature]. The fruits are in bunches, fusiform, dull bluish violet in colour, and closely resemble those of some species of *Berberis* § *Mahonia*; they hang down beneath the stem on short pedicels like those of most of the simple leafed *Barberries*. The leaves may reach a considerable size, some I saw being 4 in. long; but the plant itself hardly ever exceeds 2-2½ feet. In the dense thickets where it grows its habit is rather obscure, but the plant sends up a number of stiff shoots, more or less erect, forming a fairly compact clump. It is commoner in this single locality (i.e. on the limestone ridge) than I had supposed, and I found it in increasing numbers as I ascended to about 10,000 [feet; c. 3000 m.]; but I have seen it nowhere else. It does best in shade, and is fairly common as part of the undergrowth amongst small *Rhododendron*, *Enkianthus*, *Vaccinium*, etc."

XXI.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: I. NEW AND LESS-KNOWN SPECIES OF SCHLEGELIA. N. Y. SANDWITH.

It is interesting to note how this genus in the tribe Crescentieae of Bignoniaceae, which is certainly unlike its congeners, has a facies so strongly recalling that of the well-known *Citharexylum* in Verbenaceae that it has repeatedly provided a pitfall for botanists from the time of Linnaeus down to the present century. Thus the type specimens of *Citharexylum cinereum* L., "parasiticum scandens" of the *Plantae surinamenses* p. 10, no. 78 in Amoen. Acad. viii. p. 258 (1775), are the common *Schlegelia* of the section *Euschlegelia* of the Guiana forests, which was originally described and figured by Aublet as *Besleria violacea*, and later described by Miquel as *S. lilacina* and *S. elongata*, the latter being considered conspecific with the former by subsequent writers such as Seemann, K. Schumann and Pulle. This was first reported by Seemann in a paper on the Crescentiaceae in Trans. Linn. Soc. xxiii. 15 (1862), in which he treated Miquel's *Schlegelia* as a section of the genus *Tanaecium*; it was quoted by K. Schumann in Martius' *Flora Brasiliensis* vol. viii.

pars ii. p. 401 (1896-7); and the identification has more recently (1923) been verified by Mr. N. E. Brown, who matches the specimens exactly with *Jenman* 4318 from the Lower Demerara River, British Guiana. Fortunately no change of name is necessitated by this mistake of Linnaeus, since the name *Citharexylum cinereum* had already been applied to another species. This earlier *Citharexylum cinereum* L. of Sp. Pl. ed. ii. 872 (1763), as can be seen from the description and the references to Patrick Browne, Plumier and Plukenet, is a true *Citharexylum*, conspecific with *C. fruticosum* L. of Systema Naturae ed. x. 1115 (1759); and *C. cinereum* L. (1763) is accordingly sunk in synonymy under *C. fruticosum* L. by O. E. Schulz in his conspectus of the West Indian species of *Citharexylum* in Urban, Symb. Antill. vi. 61 (1909).

Two recent examples of the confounding of new species of both sections of *Schlegelia* (Section *Euschlegelia* K. Schum. with a long, leafless, thyrsoïd, terminal inflorescence; and section *Paratanaecium* K. Schum. with short, lateral, axillary inflorescences) with *Citharexylum* have lately come to light in the Kew Herbarium, involving in one instance a new combination and emended description, and in the other a complete description, since the plant was published as a *nomen ineditum* in a list of names and localities.

***Schlegelia* (*Paratanaecium*) *Ramizii* Sandwith sp. nov.; *S. paraensi* Ducke affinis, calycibus corollisque parvis statim distinguenda.—*Citharexylon Ramizii* Glaziov in Bull. Soc. Bot. France, lviii. Mém. iii. 545 (1911), nomen.**

Frutex scandenti-epiphyticus; ramuli summi cortice generis typico praediti, 5 mm. diametro; internodia summa 2-3 cm. longa. *Folia* elliptica, apice obtusa rotundata, basi in petiolum crassum 5-8 mm. longum 2-3 mm. latum attenuata vel fere rotundata, 8-13 cm. longa, 5-6.5 cm. lata, crasse coriacea, nitida, glabra, utrinque ut in aliis speciebus valde nervosa reticulata, nervis primariis in utroque latere costae 10-12 versus marginem anastomosantibus, utrinque praesertim subtus conspicue punctata. *Inflorescentiae* axillares, breves, paniculatae, 1-2.5 cm. longae; pedunculi pedicellique pilosuli; bractae bracteolaeque scariosae, pilosulae, lanceolato-subulatae, 1-2.5 mm. longae; pedicelli 4-7 mm. longi. *Calyx* campanulatus, glaber, 4-5 mm. longus, 3-4.5 mm. latus, truncatus atque inaequaliter 0.5-1.5 mm. lobulatus. *Corolla* "alba," extra glabra; tubus cylindricus, ad 7 mm. longus, 2-3.5 mm. latus, superne paulum ampliatus, intus circa insertionem staminum papillosus; limbus expansus circiter 1 cm. diametro, lobis rotundato-obovatis intus papillosis 4-5 mm. longis ad 3 mm. latis. *Stamina* medio tubi affixa; filamenta papillosa, circiter 1.2 mm. longa; antherae 1 mm. longae. *Ovarium* subglobosum, glabrum, 2.2 mm. longum atque diametro; stylus glaber, apice dilatatus, cum lobis 0.5 mm. longis 6 mm. longus; placentatio atque ovula numerosa generis typica. *Fructus* ad 1.2 cm. diametro.

BRAZIL: Rio de Janeiro; Itamaraty near Petropolis and Tijuca, fl. March-April, *Glaziou* 15327 (type); 4929 (fide *Glaziou*, l.c., not seen). "Arbuste épiphyte, sur les arbres et les rochers."

Schlegelia (*Paratanaecium*) **Spruceana** K. Schum. in Mart. Fl. Bras. viii. pars ii. 400 (1896-7); descr. hic ampliata. *Tanaecium parasiticum* Seem. in Bonplandia iv. 127 (1856) and Trans. Linn. Soc. xxiii. 16 (1862), non Swartz.

This species of the section *Paratanaecium*, originally found by Spruce at San Gabriel on the Rio Negro, occurs in BRITISH GUIANA: forests near the Kaieteur Savannah, Potaro River, Sept.-Oct. 1881, *Jenman* 1239; climbing up trunks of forest trees, Macreba Falls, Kurupung River, Aug. 1925, *Altson* 363.

The description given by Schumann may be amplified as follows: racemes up to 3 cm. long; pedicels 3-15 mm. long, pilosulous; calyx campanulate, dark and granulate except at the paler scarious rim, sparingly pilosulous or glabrescent, of variable length like the pedicels, 4-10 mm. long, up to 9 mm. broad, truncate and entire, or very obscurely toothed; flowers "vermilion, very fleshy" (Spruce); corolla tube up to 2.2 cm. long, cylindrical but slightly narrowed at each end, up to 6.5 mm. broad in the middle, papillose round the insertion of the filaments within, otherwise glabrous; lobes very fleshy and irregular, oblong to obovate, 2-3 mm. long, up to 2.2 mm. broad, very minutely papillose under a strong lens; stamens inserted far below the middle of the tube, 5-6 mm. above the base, 8-9 mm. long, conspicuously papillose below, otherwise glabrous; ovary glabrous, ovoid-subglobose, up to 2.25 mm. long and 3 mm. diameter, attenuate into the style which, including the lobes, is up to 1.5 mm. long; fruit (in *Jenman's* specimen) 1 cm. long, 6 mm. in diameter.

The important features of the inflorescence are the shape of the corolla tube, the small size of the fleshy lobes in proportion to that of the tube, and the position of the insertion of the filaments. The pedicels of the Guiana specimens (3-5 mm.) are always shorter than the shortest of those of Spruce's plant (6-15 mm.) but no differential value should be attached to this character on present evidence.

Schlegelia (*Paratanaecium*) **darienensis** *Sandwith* sp. nov.; foliis partis inferioris ramulorum sterilis late ovatis cuspidatis, inflorescentiis fastigiato-cymosis plurimis in axillis foliorum parvorum secus apicem ramuli elongatum dispositis distinctissima. *Tanaecium lilacinum* Seem. in sched.; Seem. Bot. Herald 182 (1854) excl. syn.; Seem. in Bonplandia iv. 128 (1856) quoad pl. darien., excl. syn.; Seem. in Hook. Journ. Bot. ix. 84 (1857) quoad pl. darien., excl. syn. omn.; Seem. in Trans. Linn. Soc. xxiii. 16 (1862) quoad pl. darien., excl. syn. omn.; K. Schum. in Mart. Fl. Bras. viii. pars ii. 400 (1896-7) syn. sub *S. lilacina* Miq.

Frutex scandens; ramuli summi ad 5 mm. diametro, internodiis 3-6 cm. longis. *Folia* partis ramulorum sterilis late ovata, apice

abrupte breviter acute 0.5-1 cm. cuspidata, basi rotundata vel etiam cordata, 7-14 cm. longa, 4.5-9 cm. lata, tenuiter coriacea, glabra, subnitida, utrinque praesertim subtus nervosa reticulata, nervis supra nonnunquam impressis inconspicuis, primariis in utroque latere costae paucis distantibus circiter 6 sursum valde arcuatis denique per venulas intricatas prope marginem anastomosantibus; petiolus crassus brevis, 4-5 mm. longus, ad 4 mm. latus. *Inflorescentiae* fastigiato-cymosae, plurimae, axillis foliorum pusillorum secus apicem ramuli singularem ad 35 cm. longum per paria opposita regulariter dispositae; internodia 1-2 cm. longa; folia subsessilia, ovata, apice attenuata acutissima, basi rotundata, 1.5-2 cm. longa, 0.8-1.5 cm. lata, versus apicem sensim decrescens, ceterum eis partis ramulorum sterilis similia; cymae breviter pedunculatae, breves, densae, congestae, compositae, multiflorae, 0.7-1.5 cm. longae atque latae; pedunculi pedicellique intricati insigne lignosi vel ossei, terminales nonnunquam herbacei, minutissime puberuli, longitudine valde (2-10 mm.) variabili; bractee bracteolaeque triangulares, puberulae, 1-2 mm. longae, ad 1.5 mm. latae. *Calyx* campanulatus, glaber, 5-7 mm. longus, 4-5 mm. latus, inaequaliter ad 1.5 mm. lobulatus. *Corolla* tubo glabro basi 2 mm. lato sursum ad 3.5 mm. latitudinem ampliato, 1 cm. longo; lobi rotundato-obovati, utrinque papilloso, 5 mm. longi, 4 mm. lati. *Stamina* paullo infra medium tubum inserta; filamenta inferne papillosa, delapsis antheris 4 mm. longa; antherae 1 mm. longae. *Ovarium* subglobosum, glabrum, 2.5 mm. longum atque diametro; stylus brevis, cum lobis ad 1.5 mm. longus, supra fructum juniorem ad 6 mm. elongatus. *Fructus* 8 mm. diametro, calyce persistente accrescente insidens.

COLOMBIA: Cauca; Ardita, Cape Corrientes, ann. 1848, *Seemann* 1084 (type in Herb. Kew., also in Herb. Brit. Mus.); Rio Micay, Dec. 1898, *Lehmann* B.T. 555.

It seems almost unaccountable that Seemann should have identified this plant, collected by himself in Darien, with the species of the Guiana forests, which has a different kind of inflorescence and belongs to the other section of the genus. But in those days little or no material was to be seen for comparison in British herbaria. Seemann's own specimens are scrappy, and in the sheet at the British Museum all the small leaves subtending the inflorescences have fallen off. Moreover, this species does seem to connect the section *Paratanaecium* with the section *Euschlegelia* in a very interesting manner. On the label of the Kew sheet we find in Seemann's handwriting "*Tanaecium lilacinum*!! sp. nov." It looks as if Seemann wrote this before he discovered the existence of *Schlegelia lilacina* Miq., and then was persuaded by the coincidence of the identity of the specific epithet to identify his plant with Miquel's. His descriptions of the composite *Tanaecium lilacinum* are so vague that they might apply to either. Presumably Schumann had not seen these specimens. The locality cited by Seemann in the Botany of the Herald is Cupica, north of Cape

Corrientes, and no collecting number is given, but there can be no doubt that the plant mentioned is the species described here.

Schlegelia (*Euschlegelia*) **violacea** (Aubl.) Griseb. Fl. Brit. West Indies 445 (1861), emend. *S. lilacina* Miq. in Bot. Zeit. ii. 786 (1844); in Linnaea xxii. 74 (1849); Stirp. Surinam. 116, t. 36 sinistr. (1850); K. Schum. in Mart. Fl. Bras. viii. pars ii. 400 (1896-7). *S. elongata* Miq. in Linnaea xxii. 73 (1849); Stirp. Surinam. 118, t. 36 (1850). *Tanaecium lilacinum* Seem. loc. cit. supra sub *S. darienensis*, partim quoad syn. *Besleria violacea* Aubl. Hist. Pl. Guiane. 630, t. 254 (1775); verosimiliter etiam *B. caerulea* Aubl. l.c. 631.

This combination must be used for the well-known climber of the forests of Guiana, in spite of the fact that Grisebach's description, or the major part of it, applies to *Tabebuia stenocalyx* Sprague et Stapf, vide Urban in Fedde Repert. Spec. Nov. xiv. 304 (1916). The species is very variable in the size and shape of the leaves, the size of the calyx, and the breadth of the corolla tube. Aublet's specimen at the British Museum sets the identification beyond doubt; the leaves are 11-15 cm. long and 6-10 cm. broad, the branches of the inflorescence 1-1.5 cm. long, the calyx in the dried state 5-6 mm. long. A search for the specimen of Aublet's *Besleria caerulea*, which is presumably a colour-form of *violacea*, was unsuccessful.

The following specimens have been seen:—

FRENCH GUIANA: Cayenne, Aublet (Herb. Brit. Mus.); Poiteau in Herb. Gay, a form with very long and narrow leaves. SURINAM: Hostmann 553, 698. BRITISH GUIANA: Mazaruni River, Sept. 1880, Jenman 697; Macreba Falls, Kurupung River, Mazaruni River, Aug. 1925, Altson 354; Upper Arawau River, Aruka River, North-west District, May, 1929, Martyn 58; Lower Demerara River, Dec. 1887, Jenman 4318; Essequibo River, Sept.-Oct. 1881, Jenman 1335; Moraballi Creek, Essequibo River, Aug. 1929, Sandwith 4; Kaieteur Savannah, Potaro River, Sept.-Oct. 1881, Jenman 838, 839.

The species was abundant in several types of forest by the Moraballi Creek, Essequibo River, climbing up the trunks by rootlets (cf. *Marcgraviaceae* spp. and *Marckea*) to the canopy, where the pinkish-mauve flowers of the terminal inflorescences could frequently be seen on the edges of clearings.

Schlegelia (*Euschlegelia*) **scandens** (Briquet et Spruce) Sandwith, comb. nov. *Citharexylum scandens* Spruce ms. in sched.; Briquet et Spruce in Bull. Herb. Boiss. iv. 341 (1896).

BRAZIL: Panuré, Rio Uaupes, Oct. 1852, Spruce 2485 (type no. in Herb. Delessert and Herb. Kew.).

The specimens immediately suggested section *Euschlegelia* of the genus *Schlegelia*, and on dissection the ovary showed the characteristic placentation and numerous ovules. It is clear that Dr. Briquet had incomplete material before him, and that he did not dissect a

mature flower and examine the ovary, which would have given him the clue to the family. His description may be further emended from the Kew material as follows:—corolla-tube up to 1.5 cm. long, 2.5 mm. broad; lobes up to 4 mm. long and 3 mm. broad; stamens inserted at about the middle of the tube; ovary 2-2.5 mm. long and diam.; style 3.5 mm. long. Spruce notes that the flowers are pinkish and odoriferous. The species is closely allied to forms of *Schlegelia violacea*, which is so plentiful in the Guiana forests, but appears to differ from them in the characters of the inflorescence; the narrow elliptic-lanceolate leaves do not quite approach those of any sheet of *S. violacea* except Poiteau's from French Guiana, in which they are proportionately longer and more reticulate. Provisionally it is kept as a distinct species.

XXII.—MISCELLANEOUS NOTES.

AUGUSTINE HENRY.—It is with great regret that we record the death, on the 23rd of March last, of Professor Augustine Henry, late Professor of Forestry at University College, Dublin.

Professor Henry was born in 1857, and, after studying medicine at Edinburgh, was for some years attached to the medical staff of the Chinese Imperial Maritime Customs. It was during this period, whilst stationed at Ichang, on the Yangtze, that he first turned his attention to botany, and it was here that he made his first collections of plants. The flora of this region was then practically unknown; and the interest and importance of his collection established his reputation in the botanical world. From then until he resigned his post with the Chinese customs, Henry spent the whole of his leisure time and local leave in collecting and studying the native vegetation of those parts of China and Formosa in which he was stationed. He sent his collections to Kew, and, as a result of the interest which they aroused, a friendship developed between Henry and many of those at Kew, which was to last the whole of his lifetime.

The material which he collected was enumerated by Hemsley in the Index Florae Sinensis, and it can have been given to few to discover so many genera and species of plants which were new to botanical science and which were also such welcome additions for horticultural purposes.

He resigned his post in China in 1900, and having determined to devote himself to arboriculture he studied forestry at Nancy for two years. In 1907 he was appointed Reader in Forestry at the University of Cambridge, and subsequently became Professor of Forestry in the College of Science, Dublin, from which post he retired in 1926. The following appreciation is contributed by Mr. W. J. Bean:—

There were two phases in Henry's life which will keep his name from falling into oblivion. One, of course, was his work as a plant collector in China, the other, his collaboration with Henry John

Elwes in the production of "The Trees of Great Britain and Ireland."

It was in connection with the latter that I came most closely in contact with him, although I first made his personal acquaintance nearly thirty years ago. In the early years of the century he went to France to study forestry at Nancy, and in 1904 I spent about a fortnight with him in that country visiting nurseries and notable tree and shrub collections. He returned to England soon after to commence his work with Elwes on the book about Trees.

He made Kew his headquarters and was given the use of two rooms in Cambridge Cottage. As my working office was in the same building I saw a good deal of him for several years. We used to make excursions together, especially on Sundays to the parks and places near London where fine trees were known or reputed to exist.

When he commenced his work he knew comparatively little about trees cultivated in British Gardens, but by the time he had finished it he was certainly the leading authority in this country, perhaps in the world, on the particular genera which came under his and Elwes' purview. Their work deals more especially with trees of large, timber-producing size, and Henry never took much interest in the small flowering trees or in shrubs. His part of the work was almost wholly botanical. Elwes dealt with statistics, history, timber and cultivation. The first volume was published in 1905 and the final or seventh in 1913.

Henry was undoubtedly a most careful and conscientious worker. When he started on a problem he would evolve various and sometimes rather startling theories in the course of its solution, but his work as it stands to-day, seventeen years after its completion, shows that in the end he pretty nearly always found the right one. His work on such difficult genera as *Populus* and *Ulmus* was admirable, and no one has done so much as he to clear up the obscurity that surrounded the origin and identity of the hybrid poplars.

I have always thought the keys he invented for the identification of cultivated trees were particularly clever. They are based almost entirely upon characters of leaf and stem, and whilst this limitation made them much more difficult to construct it has made them particularly useful to the cultivator, because so many exotic trees do not flower until they reach a considerable age, often not at all. Personally I have often had occasion to use these keys and shall always remember their inventor with gratitude.

The joint labours of Henry and Elwes made "The Trees of Great Britain and Ireland" the finest book that has ever been published on its particular subject. Its monetary value has been increasing year by year since the final volume was issued, and it is likely to keep its present high position because it has all the components of a good book—genuinely scientific as well as practical information, numerous excellent illustrations, excellent paper and printing.

After Henry became Professor of Forestry at Cambridge, and subsequently at the College of Science in Dublin, he interested himself largely in hybrid trees. *Populus generosa* was, on his suggestion, raised at Kew by crossing *P. angulata* with the pollen of *P. trichocarpa*. He published a very interesting pamphlet on the London Plane (*Plantanus acerifolia*), in which he upheld the theory that this tree originated at or near Oxford by the hybridisation of *P. occidentalis* and *P. orientalis*.

During the many excursions I made with him and during many evenings spent in his company, I always found him a most entertaining companion. His work as a collector of plants in China provided, of course, a never failing topic of interest, but after he retired from the Chinese Customs Service about 1900 he spent much of his time in travelling—notably in North America, Spain and in the Carpathians. His main object was always to increase his knowledge of the large trees, but he took a keen interest also in the various populations, especially in the peasantry, of the countries he visited.

He possessed a good deal of the Irishman's proverbial raciness and charm, and conversation never flagged or failed in interest when he was present. He has left innumerable friends scattered over the world who will always treasure his memory and feel it a privilege to have known him.

J. R. ANDERSON.—We have received, with regret, the news of the death of Mr. J. R. Anderson, the veteran Naturalist of Victoria, British Columbia, on April 9th, as the result of an accident. He had nearly lost his eyesight, and was knocked down and killed instantly by a passing motor car.

Mr. Anderson devoted himself to the study of the plants of British Columbia and was keenly interested in the project of establishing a Botanic Garden at Victoria for the display of the rich native vegetation of Western North America in particular. Among his publications, "The Trees and Shrubs, Food, Medicinal and Poisonous Plants," published by the Board of Education, British Columbia, with its wealth of excellent illustrations, is a very valuable book.

When I visited British Columbia in 1926 and was the guest of the Lieutenant Governor, Mr. Randolph Bruce, Mr. Anderson met me at Victoria and took me with the Governor to see a beautiful stretch of virgin forest near Victoria which he was most anxious to have created as a reserve. The forest was a thoroughly characteristic piece of native vegetation of great charm, which ought to be preserved for all time, and it is to be hoped that steps will be taken to reserve about 1,000 acres of this forest, with its glades and rich collection of wild British Columbian plants, as a memorial to one to whom we owe so much of our knowledge of the British Columbian Flora.

A.W.H.

The Botanical Name of the "Flat-crown" tree.—The tree which forms the subject of the present note received its English vernacular name from its extraordinarily flat-topped crown (recalling that of *Acacia litakunensis* Burch.), which may reach a diameter of 40 ft., often even exceeding the height of the tree itself. In virtue of this it gives, when growing gregariously, a characteristic appearance to the landscape.

The species is widely distributed through Africa—from Senegambia and Abyssinia southwards to Angola on the west and Portuguese East Africa and Natal on the east coast, extending in the latter as far south as the Umzimvubu River in Griqualand East, and occurring also in Madagascar. It might have been supposed that the nomenclature of a species so widely distributed and so well-known would long ago have been adequately investigated, but in 1919 Macbride (Contr. Gray Herb. n. s. lix. 4) found it necessary to form a new binary combination for it owing to the discovery of an earlier specific epithet than the one then in current use.

In 1835 Ernst Meyer described a new species, *Zygia fastigiata*, from specimens collected by Drège in Natal, and this name was adopted by Harvey (Fl. Cap. ii. 285 : 1861-62) for the species under consideration. Oliver, however, transferred it to *Albizzia* as *A. fastigiata* (Fl. Trop. Afr. ii. 361 : 1871), erroneously citing Ernst Meyer as the authority for the new combination, while Baillon, who placed *Albizzia* under *Acacia*, proposed (Drake, Hist. Pl. Madag. i. 71 : 1902) the name *Acacia Sassa* for the species, based on *Inga Sassa* Willd. (Sp. Pl. iv. 2, 1027 : 1806), which long antedates the specific epithet given by Ernst Meyer; and in 1919 Macbride accordingly adopted the epithet *Sassa* under *Albizzia*. Willdenow had established his *Inga Sassa* on a plant described and figured under the vernacular name "Sassa" by Bruce, Trav. v. 27, 29, 32, tt. 4, 5 (1790). But all authorities from Willdenow onwards seem to have overlooked the existence of the still earlier name *Sassa gummifera* Gmel. (Syst. 1038 : 1791), based also on Bruce's plant as figured by him in his Travels, and on this name the new combination *Albizzia gummifera* (Gmel.) must now be based in accordance with International Rules, thus adding an eleventh name to the ten previously proposed for the species.

The detailed synonymy of the species is as follows :—

***Albizzia gummifera* (Gmel.) C. A. Sm., comb. nov.**

Sassa gummifera Gmel. Syst. 1038 (1791).

Inga Sassa Willd. Sp. Pl. iv. 2, 1027 (1806); DC. Prodr. ii. 440 (1825).

Mimosa Sassa Bruce e Poiret, Dict. Suppl. i. 49 (1810).

Mimosa adiantifolia Schum. & Thonn. Beskr. Pl. Guin. 322 (1827).

Zygia fastigiata E. Mey. Comm. Pl. Afr. Austr. 165 (1835); Harv. Gen. S. Afr. Pl. 415 (1838); Benth. in Hook. Lond. Journ. Bot. iii. 93 (1844); Harv. in Harv. & Sond. Fl. Cap. ii. 285 (1861-62); Harv. Gen. S. Afr. Pl. ed. 2, 93 (1868).

Zygia Sassa Benth. e Schweinf. Reliq. Kotschyanae, 10 (1868), in obs.

Albizzia fastigiata Oliv. Fl. Trop. Afr. ii. 381 (1871); Benth. in Trans. Linn. Soc. Bot. xxx. 570 (1875); Fourcade, Rep. Natal For. 106 (1889); Engl. Pflanzenw. Ost-Afr. C. t. 21 (1895); Hiern, Cat. Welw. Afr. Pl. i. 317 (1896); Wood & Evans, Natal Pl. i. 24, t. 27 (1898); Sim, For. Fl. Cape Col. 213, t. 62 (1907), & For. Fl. Port. E. Afr. 59, t. 58 (1909); Engl. & Drude, Veget. d. Erde, ix. i. 1, 325 (1910); Eyles in Trans. Roy. Soc. S. Afr. v. 4, 361 (1916); Wissensch. Ergeb. Zweit. Deut. Zentr.-Afr.-Exped. ii. 67 (1922); Marloth, Fl. S. Afr. ii. 1, 50, f. 30 (1925).

Feuilleea Sassa O. Kuntze, Rev. Gen. i. 186 (1891).

Acacia Sassa Baill. in Drake del Castillo, Hist. Pl. Madag. i. 71 (1902).

Albizzia Sassa Macbride in Contrib. Gray Herb. n.s. lix. 4 (1919); Hutchinson & Dalziel, Fl. West Trop. Afr. i. 2, 363, f. 140 (1928).

C. A. SMITH.

The Macadamia Nut.—The cultivation of the comparatively little known "Queensland" or "Macadamia" nut (*Macadamia ternifolia* F. v. M.) for edible purposes (see K.B. 1914, p. 200) or as a potential source of oil continues to attract attention. The tree is native to subtropical Eastern Australia but has now been successfully grown in other parts of Australia, in South Africa, the southern U.S.A., certain Mediterranean countries, and the island of Hawaii. In the last-mentioned country the cultivation of the nut has been very much encouraged in recent years and is claimed to be rapidly assuming the proportions of an industry.

The original discovery of this nut-yielding tree is credited to Walter Hill, the first Director of the Brisbane Botanic Gardens, while engaged in a study of the flora of the Moreton Bay district, and the generic name was given in honour of Dr. John Macadam, who was President of the Philosophical Society of Victoria.

The tree occurs chiefly on the alluvial soils bordering rivers and creeks in the coastal districts of southern Queensland and north-eastern New South Wales. It is found in coastal scrub. In its native habitat it generally attains a height of about fifty feet with a clean straight trunk which seldom exceeds twelve inches in diameter. When grown as an orchard tree, however, it branches from near the base. Though adapted to a wide range of moisture conditions the tree cannot withstand low temperatures. A variety (var. *integri-folia*) bearing a smaller, smooth-shelled and more spherical nut is known. Among the numerous strains of *M. ternifolia* in cultivation interest is chiefly centred in those with a comparatively thin-shelled nut, for with the thick-shelled forms the difficulty in cracking and the relatively high proportion of shell to kernel are naturally undesirable factors.

Propagation has in the past been effected mainly from seed. This presents no difficulty but it has been found that, as with most

fruit- and nut-yielding trees, great variation exists in the nuts from seedling trees. Vegetative propagation is regarded as essential in order to propagate desirable or improved strains on a commercial scale. Experimental work in this direction, and on the cultural requirements of the tree generally, has been carried on at the Hawaii Agricultural Experimental Station during the last seven or eight years, and an interesting account of this work has recently been given by W. T. Pope.* At this station, rooted cuttings and side-tongue-grafting were found to be the most practical methods of vegetative propagation. It is thought that in subtropical countries, or at higher altitudes in the tropics, the resistance of the tree to cold, and of the root-system to low soil temperature, may call for investigation into the use of more resistant root-stocks. In this connection it is possible that other species of *Macadamia* in Australia, not at present of interest, may prove of value.

Experience in Hawaii has shown that where strong winds prevail protection to the orchards in the form of wind-breaks is essential. It has been found that young trees, particularly at the age of two to five years, are very liable to be blown down, not as a result of being uprooted but owing to their breaking off in the ground immediately above the spread of the root-system. The planting distance recommended is 30 ft. by 30 ft. which allows of about 48 trees per acre, young trees of twelve to eighteen months, previously established in pots or tins, being used. In windy localities it is advisable for young trees to be firmly supported by means of stakes. Early pruning is advisable in order that the trees should develop into a desirable and symmetrical shape. Wiring down of the early first-formed erect branches has proved effective in leading to the formation of a flat-spreading top.

The age of bearing and the period of flowering and fruit-formation varies very much with seedling trees and is of course influenced by environmental conditions. Trees have been known to commence flowering in their fourth year but it is not until about the seventh year that bearing generally commences. Under less favourable conditions bearing may not take place until the tenth year or even later. The harvesting of the nuts is a simple matter. As the fruits ripen they split open and the nuts fall to the ground where they can be collected. If left on the ground and allowed to come into contact with moisture they soon commence to germinate. If gathered as soon as they fall from the trees they are considered to be too fresh for immediate use, but can be eaten after being stored for a few weeks. Storage should be effected under perfectly dry conditions and precautions taken against mice and insects. There are at the present time very few definite records relating to yield. It is apparent, however, that the yield varies greatly and that differences

* "The Macadamia Nut in Hawaii," W. T. Pope, Horticulturist, Hawaii Agric. Exp. Station, Honolulu, Hawaii, Bulletin No. 59. 23 pages. (Nov. 1929).

are due to both seedling variation and to environment. It is held that under favourable conditions mature trees in Hawaii average about three hundred pounds of nuts annually. Nut production with the *Macadamia* is believed to compare favourably with that of the pecan, the walnut and the almond. A growing demand is said to have arisen in Australia for the nuts, which are collected from the forests and from the groves of farmers. Grading is not customary and prices in Australia are quoted as being in the neighbourhood of 6d. to 10d. wholesale and 1s. to 1s. 6d. retail, per pound.

The kernels are rich in an edible non-drying oil (65-75 per cent.), and are similar in general composition to most other edible nuts. The oil, which is almost colourless and tasteless, possesses a faint odour and has a low iodine value. According to Smith and Meston* the kernels are free from starch and from cyanogenetic glucoside, and contain 5.6 per cent. of non-reducing sugar. The oil is reputed to compare favourably with the best grades of edible olive oil and to be capable of being used in place of them for salads, high grade soap-making, and medicinally. The kernel possesses a superior flavour and is excellent as a dessert nut, as a salted nut, and for high-class confectionery.

F.N.H.

The Gnetales.†—This is one of the important series of Cambridge Botanical Handbooks edited by Prof. A. C. Seward, who supplies a preface to the present volume, explaining its history. Prof. Pearson, who undertook to write a general account of the Gnetales for the series of handbooks referred to above, died in 1916, having written the greater part of the book, but leaving the final chapter and the revision of the earlier part of the work uncompleted. The revision of the text has been carried out by Mrs. Thoday, who also assisted the editor in preparing the work for the press.

The book is divided into five chapters, the subjects being:—(1) Habit, Distribution, Ecology and Taxonomy; (2) Vegetative Morphology and Anatomy; (3) the Inflorescence and Flower; (4) Reproduction; and (5) Theoretical. Such portions of Pearson's manuscript as appeared to be in final form are published with as little alteration as possible, supplementary matter derived from more recent literature being added, and square brackets being used to indicate sections inserted by Mrs. Thoday.

The descriptive part presents all available information of importance regarding the morphology of the three genera *Ephedra*, *Gnetum*, and *Welwitschia*, which has a bearing on their relationships. The work is very fully supplied with references to the literature quoted in the text, and is well illustrated by figures, many of which

* "Some Oil-Bearing Seeds indigenous to Queensland," R. F. Smith and L. A. Meston. Proc. Roy. Soc. Queensland, 26, pp. 15-17.

† Gnetales, by the late H. H. W. Pearson. The University Press, Cambridge, 1929, pp. vi + 194, frontispiece, plates 3, figures 90, tables 5. Price 18s. net.

are taken from Pearson's published researches. It will be of great value to those studying the morphology of the Gymnosperms, and also to anyone carrying out further research work on the Gnetales.

In the extremely useful and interesting final chapter, the subjects discussed are the inter-relationships of the Gnetales, the comparative morphology of the inflorescence and flower, the gametophyte and trophophyte, and the relationships of the Gnetales to other groups, the varied opinions of different authors on the questions involved being passed in review.

The fact that so many problems have to be left unsolved indicates, to some extent, the need for further research, and also the isolated systematic position of the Gnetales.

L.A.B.

Orchids for the outdoor garden.*—This ambitious work of 467 pages describes in a very concise manner 977 species of orchids. To many this will seem to be far beyond the number possible of cultivation out-of-doors in this country, and many of them are certainly not in cultivation as hardy orchids at present. The book, which contains twenty-two full-page illustrations by the author, is printed on excellent paper and is well bound. The introduction indicates the more important books and periodicals consulted in the work of compilation. There is a plate illustrating the various parts of an orchid flower, an excellent glossary of botanical terms, and sections on the propagation, protection and importation of hardy orchids. The book is well indexed, but it is a pity that it is not more fully illustrated, for the very excellent plates are a considerable help in the identification of the various genera and species. It is written for the use of the amateur gardener, but it will provide a fund of information for all those interested in outdoor orchid culture, especially those favoured persons owning gardens on our westerly and south-westerly coasts where conditions are much more favourable than elsewhere. Except in such situations it is doubtful whether many of the species described as hardy will ever be grown with success, though there can be little doubt that many of the orchids now treated as tender are quite hardy out-of-doors in our islands under suitable conditions.

How to Grow Roses.†—This comprehensive handbook deals with the various phases of rose cultivation in a very clear and concise manner, and includes chapters on the use of the various classes of roses in the garden, the location and preparation of sites and planting of the beds. Concise yet full details are given of the various operations, including propagation, pruning and training, also pro-

*By A. W. Darnell. L. Reeve & Co., Ltd., Lloyds Bank Buildings, Bank Street, Ashford, Kent, 1930, pp. xx + 467, plates 21, 1 coloured. Price £2 2s. 0d.

†By Robert Pyle, J. Horace McFarland & G. A. Stevens. The Macmillan Company, New York, 1930, pp. 210, plates coloured 33, half-tone 30. Price 8s. 6d.

tection during the winter, which practice is so important in many parts of the United States of America. The control of diseases and insect pests is also fully dealt with.

There is a long list with brief descriptions of the best species and garden varieties. Separate lists are also given of the varieties most suitable for different parts of the States.

An interesting feature is a chapter giving a complete list, so far as is known, of all important books and pamphlets dealing with the Rose, and the various libraries and institutions in the U.S.A. where they may be seen and consulted.

The numerous illustrations in colour and in black and white are generally of a high standard.

Plant Proteases.*—A pamphlet by Professor S. H. Vines, summarizing in a useful manner his researches on protein digestion, published in the *Annals of Botany* between 1897 and 1910, has been received. It is now accepted, partly as a result of the pioneer work of the author, that various plant-extracts digest protein; that the higher proteins (fibrin, albumin, etc.) are digested to albumoses and peptones; that the proteoses (albumoses and peptones) are digested to amino-acids, the well-known tryptophane-reaction giving evidence that this decomposition has taken place. It has, however, been disputed that two enzymes, the one a protein-digesting "pepsin" and the other peptone-digesting "erepsin," are involved in the digestive processes. Professor Willstätter, for example, upholds the view that the two digestive processes are effected by one and the same enzyme. The latter part of the pamphlet gives reasons for the author's belief that Professor Willstätter's conclusions are not final.

W.B.T.

Fungous Diseases of Plants.†—In 1927-28 Dr. Eriksson published, in two parts, a second German edition of his work of 1912 which was entitled "*Fungoid Diseases of Agricultural Plants*." Part I dealt with agricultural plants, while Part II considered diseases of garden and ornamental plants and thus much enlarged the scope of the original work. Dr. Goodwin's translation includes the whole in one volume, hence a certain amount of rearrangement and condensation has been necessary, to the improvement of the work as a whole. Further, in the English edition some new material is included which was not available at the time of publication of the German edition, notably in regard to cereal and grass rusts and certain diseases of peach, chestnut and elm.

*The Proteases of Plants. A record and a reply, by S. H. Vines, F.R.S. Macmillan & Co., Ltd., St. Martin's Street, London, 1930, pp. 32. 1s. net.

†Fungous Diseases of Plants in Agriculture, Horticulture and Forestry. By Dr. Jakob Eriksson. Second Edition, translated from the German by Dr. William Goodwin. London, Baillière, Tindall & Cox, 1930, pp. vi + 526, 399 figs. Price 35s. net.

After a very brief introduction the various chapters deal each with special groups of fungi, and in each group the diseases are arranged according to the host plants. After the description of a disease a useful list of references is given. These are, however, in some cases not up-to-date, and it is difficult to judge whether certain omissions are deliberate or due to oversight. The use of such names as *Polyporus radiciperda* (Hart.) Rostr. and *Phoma abietina* Hart. may probably be attributed to unfamiliarity with modern systematic work, but the author's repetition of his view of 1915 as to specific differences between *Rhizoctonia violacea* Tul., *R. Medicaginis* DC., *R. Asparagi* Fuck., and *R. Crocorum* DC., with no reference at all to more recent work, which has all tended to prove their identity, appears to be due to the same "weary persistence" with which he still keeps up his mycoplasma theory, now discredited by the majority of botanists.

The translation appears to be very well done, and in clearness of print and illustrations the publishers have greatly improved on the German edition. Misprints are very few, the most obvious one being the heading of the chapter "Perisporiaceae" (p. 304) for Perisporiaceae, a mistake which has been repeated in the Contents.

E.M.W.

Seedless Pawpaws.—The presence of seedless fruits in the Pawpaw (*Carica papaya* L.) is not of uncommon occurrence. Such fruits are generally considerably smaller than the normal seeded fruits, but are otherwise similar and develop and ripen in the normal fashion. Conflicting views have existed as to the nature of these fruits and their development, whether lack of seeds is due to lack of pollination or whether pollination takes place but not fertilization. Cheema and Dani* working on isolated female trees in the Punjab found that fruit formation occurred but that all the fruits were seedless. Partial pollination was found to result in partial seed-setting, the carpels in which seed was "set" corresponding to the stigma branches which had been pollinated. The weight of the fruit was found to be more or less proportionate to the number of seeds set. Their observations do not appear to bear out the contention put forward by other observers that the parthenocarpic tendency is inherited.

The peculiarities of sex in the Pawpaw are exhibited in many ways. The interesting teratological phenomenon of intra-ovarial fruits has often been recorded. These intra-ovarial fruits, which occur on the placentae, cannot with certainty be regarded as metamorphosed ovules. It is possible they arise from buds which develop adventitiously in places which would normally be occupied by ovules. In some cases these intra-ovarial fruits are exact models in miniature of the normal fruits.

F.N.H.

*Agric. Jour. of India. Vol. xxiv, Pt. iii, pp. 206-207.

BULLETIN OF MISCELLANEOUS INFORMATION No. 6 1930 ROYAL BOTANIC GARDENS, KEW

XXIII.—AGRICULTURE IN SIERRA LEONE. H. C. SAMPSON.

Mr. Sampson attended the Second West African Agricultural Conference, held in the Gold Coast in October, 1929, at the request of the Secretary of State for the Colonies and with the concurrence of the Empire Marketing Board. He was enabled, also, to visit The Gambia, Sierra Leone, and in addition to undertake a tour in Nigeria. The following account of agricultural matters in Sierra Leone is the outcome of his tour in that Colony and Protectorate.

A. W. H.

Except in the matter of the cultivation of wet-land rice, the agriculture of Sierra Leone is more primitive than that of any of the other British West African Colonies. This is, I imagine, largely due to the rainfall; for it is not easy for primitive races to develop a permanent type of dry-land farming under conditions of such heavy rainfall.

Throughout the Protectorate, except where modified by peculiar local conditions, the general method of agriculture is much the same. It consists of cutting and clearing forest growth for temporary clearings. At the commencement of the rainy season these clearings are sown with hill paddy. A small proportion of guinea corn and millet is sown with the paddy while frequently one sees scattered plants of *Phaseolus lunatus* which are trained up erections made of poles that have been saved when the clearing was made. A small admixture of perennial cotton is sometimes sown, and cassava may also be planted. The cotton gives no crop in the first season, and since no cultivation is given to the clearing except the preparatory hoeing when the seed is sown, it has to compete with the secondary forest growth and annual weeds which spring up on the land. In the next year a fresh clearing is made. It can thus be seen that the present method of farming is progressively destructive. As virgin forest land becomes scarcer, resource has to be had to old clearings which have been allowed to revert to "bush." As the interval between successive clearings becomes shorter, so the fertility of the land decreases and the size of the holdings tends to become larger, until in some areas one sees land which now grows chiefly grass, and on which very little forest growth survives.

The cultivation of wet-land rice in the Scarcies area is of great interest and promise. I have not seen better rice farming anywhere in Africa. I was informed that this method of rice cultivation was of recent origin, but in the appendix to the report delivered by the Court of Directors of the Sierra Leone Company in 1794 and based on two reports made to them by Mr. Afzelius, their Botanist, it is stated that "on the plains of the Bulam shore and other such tracts, it (rice) grows as luxuriantly as in Carolina." This seems to indicate that even at this early date rices which could withstand wet conditions were being grown.

The Scarcies rice is grown under real wet-land conditions. The area available, however, is limited. The rice fields are found on land adjacent to the river above where it is influenced by salt water during the rainy season, and as far up the rivers as these are flooded at high tide. Along the lower reaches the land has been reclaimed from Mangrove swamp and is a rich black loam. The soil is peculiar in that when the tide is out and the fields are drained, it is quite possible to walk on the land without sinking in, though at the same time the soil is quite soft and a stick can be driven into the mud with the greatest of ease. The upper reaches of this rice area are not so rich and the land is much more difficult to work. It is only flooded at spring tides and in consequence weeds are liable to get the upper hand. One sees large mounds of weeds dotted among the rice fields, which show what an amount of care is taken by the people to keep their crops clean. Nowhere are any attempts made to enclose water in the fields by the aid of earthen bunds, as is done in all rice areas in the East. If this were done it is probable that not only would heavier yields be obtained, especially on the upper reaches of this rice area, but the difficulties on account of weed growth would be greatly lessened since very few weeds can survive if they are kept completely submerged. The only form of field enclosure to be seen consisted of reed fences built along the river bank. These are made in order to keep out fish which are said to feed on the young rice stalks and thus damage the crop. The people are fully conversant with the methods and advantages of transplanting their crops, and make their nurseries on elevated lands behind the rice areas. It is probable, however, that much could be done to improve the raising of seedlings, and this is necessary as the resulting rice crop is greatly influenced by the quality of the seedlings in the nursery. There is evidence that the people are not entirely satisfied with their existing varieties of wet-land rice. This was shown by the several new varieties which they have obtained, and their constant search for new ones. One, which was produced by a rice grower whom we met, was procured from a few grains of paddy which he found in a gin case. Judging by the large amount of red rice seen in all varieties, they could quickly be improved by selection, and as soon as a station is started this should be one of its first duties. The results would be immediate, and would give the people confidence in the work of the Department.

There are signs of the extension of wet-land rice cultivation along both banks of the Lokko Creek and Estuary, as well as along the banks of the Bagru river towards Sembehun, and on the lower reaches of the Bum river, above the region affected by salt tidal water and below that where the high floods of the rainy season prevail. Wet-land rice is also finding its way into cultivation in the small inland swamps and valleys, and this extension is being fostered by the Administration. Everywhere there is evidence that the people are taking, or will take, an interest in wet-land rice cultivation. This is a most encouraging sign, as the first interest of any Agricultural Department is to attend to the proper food requirements of a country. The assurance of an ample food supply not only lowers the cost of living, but enables the people to take an interest in the production of money crops, the profits of which supply them with the means of purchasing other requirements, whether they are essential or otherwise. This inland swamp cultivation is of quite recent origin and it is encouraging to see that the people have in addition, and of their own initiative, seen the value of these swamps for the dry season cultivation of sweet potatoes. It is hoped that the Agricultural Department may be able to develop this use of the land in the dry season.

In the upper reaches of the estuary of the Bum river is to be seen yet another type of agriculture. It is not at present extensive though there seems ample scope for development. Here are to be seen very extensive areas of tall swamp grass country. These are level lands which during the rains are inundated with from six to fourteen feet of water, but in the dry season they are above flood level. Attempts are being made by the people to grow root crops such as sweet potatoes and cassava on these lands. From all appearances these soils are extremely rich in organic matter and it is possible that there is scope for a further development in the cultivation of these and other garden and vegetable crops.

Sierra Leone bears a striking resemblance to the South Kanara district of Southern India. Not only is the climate and rainfall very similar but the soils also resemble each other very closely. The South Kanara district, besides running up into the Western Ghats, comprises all the wide undulating plain between these and the Indian Ocean, and when one sees Sierra Leone one can almost visualise how the present day agriculture of that part of India has developed.

South Kanara is at present a very prosperous district. Its main crop is wet-land rice. Including double crop land there are annually nearly half-a-million acres under cultivation. Including the Ghats area the district comprises about 2,500,000 acres, and carries a population of about one and a quarter million. Rice is the principal agricultural export from the district and as long ago as 1882 this export was valued at £175,000. I have not more recent figures with me. The forests cover 25 per cent. of the district, and 50 per

cent. consists of hills and waste land. Most of the remainder is under cultivation with rice and garden crops.

Sierra Leone closely resembles what I imagine to have been the state of South Kanara several hundred years ago. There is no doubt that hill paddy was at one time an important crop in that part of India. It is grown to the present day under special regulations in certain sparsely populated parts of the district, and in much the same way as hill paddy is grown in Sierra Leone, though for the protection of its forest cover general cultivation of hill paddy is not now allowed. As forest areas degenerated, however, the productive power of such hill or dry lands decreased and the stress of population must have forced people to develop wet-land rice cultivation. This stage is now being reached in Sierra Leone and as time goes on one may expect to see less dry-land areas under crop and much more attention paid to the inland valley swamps.

The development of these river valleys in South Kanara, which presumably were once similar to the valley swamps of Sierra Leone, is instructive. In the first instance, one can imagine that the people were content to cultivate only the flat lands in the valley, but as time went on it was found necessary to increase the wet-land rice areas and so the lower and more fertile slopes of these valleys were terraced and the fields thus made were bunded to hold up water. The upper fields made in this way are entirely dependent on the rain that falls and on surface flood water from the upper slopes. These are the first lands to be planted after the rains commence, as they are the most uncertain. The valley lands immediately below them are next planted, and lastly the lowest lands in the valley. By thus spreading out the planting and the harvesting season a much greater production is possible from the labour available.

In South Kanara the question of maintaining the fertility of these inland valley rice fields must at one time have been acute, for there exists a customary law in that country that the hill land, adjoining the valley rice fields as far as the watershed of the valley, is the property of the owner of the rice land. This law has arisen doubtless from the custom universal throughout the Peninsular of manuring rice lands with leafy branches collected from waste lands and from the jungle. Unregulated cutting of such leaves will quickly destroy forest growth and the source of such manure; and thus the very wise course was adopted of making the owner of the rice lands responsible in his own interests for maintaining a forest cover on the hillsides by not over-cutting. The result has been that the hillsides adjoining rice lands are maintained as small private forest reserves, except the lower and more level lands which are often utilised for growing domestic, and possibly economic, crops. The method of utilising these forest leaves is peculiar to that part of India and has been evolved presumably to save forest growth. If forest leaves were cut only at the season of the year when the rice crop was being planted, forest cover would be seriously damaged, for

this is just at the end of the dry season when there is very little new leaf growth. The people, therefore, have adopted a practice of collecting a few head-loads of leaves daily throughout the year and of using these for bedding down their cattle, which are housed at night in loose boxes. At short intervals these leaves are removed from the loose box and are made into manure heaps, which are situated either adjoining the cattle shed or on a raised area adjoining the rice fields, the manure being carried there in large basket head-loads. This practice has anticipated the discovery of methods recently devised of making "artificial" farm-yard manure.

As regards the economic crops which are grown in that district there is little that is applicable to Sierra Leone. Such crops were developed at a time in the history of India when the country was entirely dependent on internal markets. Areca nuts and black pepper are the most important crops grown for sale, though there are also domestic crops such as coconuts, fruits, turmeric, sugar cane, ginger, etc. Sierra Leone, with the world as its market, has a distinct advantage as regards crops which can be grown supplementary to rice.

One result of the development of wet-land rice in the South Kanara district has been that in the more populous parts practically all forest vegetation on the hillsides has now disappeared, except where the private reserved forests exist. This has been caused by cattle grazing, collecting leaves for manure, and collecting thatching grass. To all intents and purposes it is communal land and every one gets all he can out of it. The cultivated area represents only about one-sixth of the total area of the district. Much of the valley rice lands carry two crops a year, the second crop being irrigated by putting temporary brushwood dams across the streams. In spite of this low proportion of cultivated area, the district is most prosperous and supports a population of nearly 300 to the square mile.

This description of a part of India may seem to be out of place, but I have given it as it illustrates the evolution of an agricultural country which is very similar to Sierra Leone, and the problems which have been met there will doubtless arise in Sierra Leone as the country develops.

Though wet-land rice is likely to become of increasing importance in Sierra Leone, both as a domestic crop and as a crop which can be exported to other parts of West Africa, it is doubtful whether it will be able to compete on the world's markets with that of other rice-producing countries, which have greater facilities for cheap production. There are no really large areas where production can be concentrated and where a water supply can be assured as there are in India, Burma, and Indo-China. Though not lessening the importance of this crop to the country, yet it seems essential that other types of farming should also receive attention, and that, in addition to work on rice, the Agricultural Department should investigate the possibilities of a permanent form of arable dry land farming

in lieu of the existing system of shifting cultivation, and should also extend the work which has been started at N'jala of seeing what permanent plantation crops it is possible to introduce.

Permanent arable farming.

In a country having such heavy and concentrated rainfall one of the first lines of investigation would be to devise methods of working the land so as to prevent soil erosion. I am of opinion that much of what is called soil exhaustion in West Africa is really due to soil erosion. In the more heavily farmed areas of lesser rainfall which occur in the Gambia, in the Northern Territories of the Gold Coast, and in Nigeria, one finds that everywhere the natives have adopted a system of ridge and furrow cultivation and that these invariably follow the contour of the land. They are not continuous, but are broken at intervals. This method of cultivation not only holds up rain water and allows it to soak in, but it checks any tendency there is for heavy rain to form runoffs and streams. One comes across a somewhat similar practice in East Africa, where it is frequently the custom to throw the field up into contiguous mounds on which the crop is planted. This ensures that surface water has no means of forming straight runoffs. In spite of this one finds that where the stress of population on the land is not too great—here usually some system of manuring is adopted—land is generally allowed to revert to “bush” in order to recoup its fertility. There is no doubt that lack of soil aeration and depth of cultivation has much to do with the so-called loss of soil fertility. The question of the maintenance of soil fertility has received much attention in recent years by the Agricultural Department of Nigeria and the knowledge gained there would be of value to Sierra Leone, though the methods adopted might not be found altogether applicable to the higher rainfall conditions which prevail.

As regards crops which could be grown under such a system of farming, it would be necessary to introduce some intensively farmed crop into a rotation, to which it would be worth while applying manure. Ginger is already cultivated to some extent in the Protectorate and doubtless its cultivation could be considerably extended, provided that, by better methods of cultivation, a better quality of produce could be secured. It should also be possible to grow chillies as a rain-fed crop which would ripen its fruit after the end of the rains, and there would appear to be a satisfactory market in West Africa for this commodity, if a good class of chillie could be grown. There is a possibility that cotton might be developed as a dry land crop, though it is doubtful whether the quantity produced would ever be more than sufficient for local consumption. It is not an ideal cotton country. There is too sudden and marked a change from the rainy to the dry season. Some of the single plant strains which are being grown at N'jala appear to be worth going on with, but several show signs of being contaminated by Allens Long Staple. These should be at once rejected as it is essential to obtain strains

which are immune to jassid attack. Tobacco is also a crop which might do well on the more sandy soils of the Protectorate, but I hesitate to suggest this at the present stage of development of agriculture in the country, for if grown on a field scale it requires better manurial treatment and more careful farming methods than those to which the people are accustomed.

For the cereal part of the rotation in addition to hill rice, *Eleusine coracana* is worthy of trial. There are some excellent varieties of this in East Africa. It is a cereal which can withstand heavy rain and, since it tillers freely and can also stand close planting, it might prove a better protection against soil erosion than hill paddy. Some of the small millets such as *Panicum miliare* and *P. miliaceum* might also be tried. These would very likely prove useful as catch crops if grown in the same way as *Digitaria exilis*.

Of the pulses *Phaseolus lunatus* is already extensively cultivated in the country. The form grown is very similar to that imported into Europe under the name of Madagascar beans and which generally fetch a good price. It might be worth while to try and raise strains of this selected for white colour, as this is considered of importance by the wholesale trade in this country. If such strains can be evolved there seems to be no reason why this pulse should not be more extensively grown for export. I would deprecate the introduction of seed from outside as the local variety seems to be devoid of purple coloration, which frequently detracts from the value of commercial samples received from Madagascar.

The pigeon pea is worthy of extension on better drained laterite gravel soils. It is grown under similar soil and climatic conditions in Western India and it is of value for local consumption. It would also be useful to collect varieties of Cowpeas from other parts of West Africa. There seem to be very few varieties in cultivation in this Protectorate. Something better could probably be obtained.

Root crops. There appears to be considerable scope for increasing the quantity of root crops grown in the country, but it is likely that these will only prove profitable on deeper and better classes of soils. The Agricultural Department have already done useful work in this direction and I was much impressed with the apparent demand that existed for “seed” of introduced yams, cassava varieties, etc., which are being grown at the small station attached to the Provincial Superintendent of Agriculture's headquarters at Makump. It is evident that the natives appreciate the importance of root crops in their diet.

Green manure crops. In order to maintain or develop, it is not clear which, the fertility of the soil, it may be necessary to introduce a green manure crop into the rotation. *Mucuna aterrima* has been found to be the most suitable crop for this purpose in Southern Nigeria and this was seen also in Sierra Leone. *Calopogonium mucunoides* has been introduced by the Agricultural Department and is being grown at N'jala as well as at other demonstration

stations. This makes excellent growth and produces a very complete cover. Thus for a green fallow and for the suppression of weeds it appears to be admirably suited. If a crop which will return some form of pulse is required, I would suggest the trial of *Phaseolus aconitifolius*, which is one of the smaller pulses of India.

There would seem to be, therefore, an ample variety of crops with which to institute some system of permanent arable farming, and if this could be combined with the use of cattle for draught purposes, a considerable addition to the manure supply would be obtained. Wood ash from the houses is always greatly valued in India on laterite soils as a manure, and its use in Sierra Leone should be considered, as besides adding to the fertility of the land it would improve the sanitation of the villages.

With regard to the use of draught cattle, I consider that very much more work must be done by the Agricultural Department before the use of ploughs and other implements of cultivation are advocated for the natives. The object of using draught animals is not only to break up the land more efficiently than can be done with the hoe, but to extend their use in the preparation of the seed bed, and, if necessary, for the after-cultivation of the crops. After seeing the work which is being done in this connection at Badkano, it appears to me that the areas ploughed for one man are too large. There is too much work involved in preparing the seed bed for sowing and in weeding the rice crop after it is up. I saw the rice crop on the area which had been ploughed last year and, even though it had been flooded since, the ground was still very rough and it was difficult to see the rice crop for weeds. For wet rice cultivation animals are used for ploughing, puddling and levelling, while for dry cultivation for ploughing, cultivating, clod crushing, harrowing, possibly ridging, and if necessary for intercultivation after the crop is established. It is this extended use of cattle which makes for efficiency and good farming and until this is accomplished it is difficult to see how the use of draught animals can be appreciated and brought into more general use. If they can once be brought into use and be owned by the people who cultivate the land, it will go a long way towards solving the question of the manure supply.

Permanent plantation crops.

There is a considerable collection of permanent plantation crops in existence at the N'jala Agricultural Station, but up to the present little use has been made of this material for experiment, beyond keeping records of yield of some of the more promising crops. There is scope for work in order to find out not only what will grow but how to grow it. Little has been done to ascertain what type of soils suits different crops, and, as much of the area of this farm is alluvium and not typical of the general soils of the Colony, conclusions drawn as to their suitability for more general cultivation may be misleading. Comparison between different varieties and species of crop have, as far as I could learn, never been made. There are at

least four different species of coffee being grown, but no definite experiment has been made to find out under what conditions of soil these thrive best nor how the one species compares in crop value with another. Certainly three of these are grown in close proximity to each other, but it happens that the site is on a slope showing considerable variations in soil types, while in some parts the behaviour of the tree is masked by the spread of bermuda grass. Another thing noticed about these coffees was the great variation in the size of the bean even among trees of the same species, while in some cases individual trees appear to form beans of varying size. I was unable to ascertain whether any commercial valuations of well-prepared samples of these coffees had ever been obtained. The Imperial Institute examined samples from Sierra Leone of *Stenophylla* coffee in 1924, but these did not appear to have been cleaned or graded as they contained peaberry, broken beans and pieces of husk. It seems very evident, therefore, that one of the first things to do in connection with coffee is to submit properly *cleaned and graded* samples of the different species and strains for valuation. I gather that the French firms in West Africa at present buy up all the *Stenophylla* coffee available on account of its superior quality, and since it is the native hill coffee of the country, and as it appears to thrive on less fertile soils than do other species, there appears to be scope for more detailed experiment with this species.

Oil palms. The trial of Southern Nigerian oil palms at N'jala shows great promise, and there is no doubt that these are much more vigorous than any of the local strains of this tree, besides which for a given weight of fruit they give a much greater quantity of Palm Oil. Whether this trial will ever lead to the formation of Oil Palm Plantations I do not know, nor whether the land tenures of the country would admit of large plantations, but even if this cultivation is only extended to native planting it is bound to be of great value to the country in filling a local demand for this product.

Coconuts. There appears to be considerable scope for the planting of coconuts for domestic consumption on the better drained soils adjoining wet rice lands, and it is possible that in time these will become a familiar feature of the landscape even in the interior along the alluvial slopes above the rice swamps, as well as on the alluvial soils on the upper reaches of those rivers which are not liable to high flood. The planting of coconuts on the sea coast such as has been attempted, both on the Bulam shore and on Turner's Peninsula where the soil is almost entirely sea sand containing the minimum of plant food, is not likely to succeed, and I suggest that no further official encouragement be given to this undertaking. Even in a country such as the Malabar coast of India where every available space is planted up with this tree, attempts to plant up such soils are very seldom made. I have never seen a successful plantation made on similar sands though individual trees adjacent to human dwellings may prosper. I myself have tried to make a plantation under such

conditions, but it has only been possible to make the trees grow by constantly supplying them with plant food in the shape of manure, and it can never be a profitable undertaking. Unless coconut trees are healthy they are likely to become a serious menace to other plantations. The attempts to induce natives to plant coconuts along the Bum river emphasised this. With the exception of one place, where the people had cultivated cassava among the trees and the ground had thus had cultivation and weeding, the trees were seriously attacked by scale. I put this down to the fact that the trees during the rainy season send their feeding roots to the surface and these are subsequently killed when the ground dries out in the dry weather, with the result that the trees are starved and become unhealthy.

Black pepper. This is a crop which I consider should have a favourable chance of becoming established in the Colony. The climate seems admirably suited to its cultivation, and it is a form of cultivation which brings in a good return for a small acreage. Prices have for the last few years been very high. The plant is very similar in habit to *Piper guineense* which occurs wild in the country. I am arranging to send a few plants out to the Agricultural Department in a Wardian case from Kew.

I cannot close this report without expressing my thanks to His Excellency the Governor, the Colonial Secretary, the Acting Director of Agriculture and his officers for their hospitality and for all the arrangements which were made for my comfort and conveyance through the Protectorate.

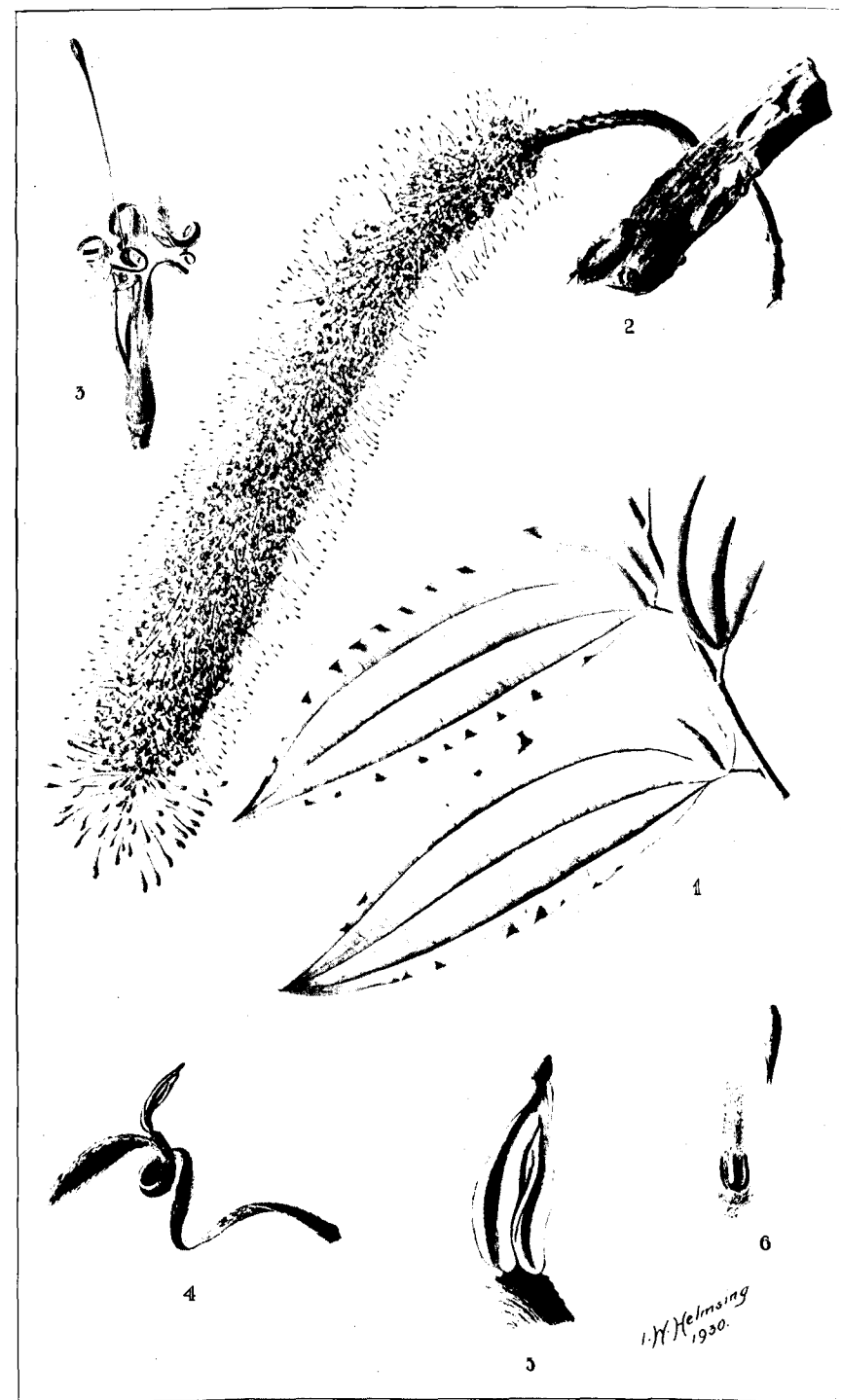
XXIV.—A NEW GENUS OF PROTEACEAE FROM NORTH QUEENSLAND. C. T. WHITE.

In the rain-forests of north-eastern Queensland, though the Malaysian element may predominate as regards genera, the degree of endemism among the species is fairly high, but perhaps the most peculiar feature of the flora is the development of a number of small (in some cases monotypic) genera among the Proteaceae as *Bleasdalea*, *Buckinghamia*, *Cardwellia*, *Carnarvonia*, *Darlingia*, *Hollandaea*, *Musgravea*, *Placospermum* and the one here proposed *Austromuelleria*.

Austromuelleria C. T. White, gen. nov.*

Flores hermaphroditi, regulares. *Perianthium* cylindraceum rectum, tubo gracili, limbo incrassato ovoideo, laminis concavis. *Stamina* ad basin laminarum affixa, filamentis latis perbrevibus, connectiva lato ultra loculos in apiculo producta. *Gynaecium* rectum, stylo gracili, stigmate oblongo-clavato, ovario sessili, glandulis hypogynis 3 liberis lineari-oblongis. *Fructus* ignotus.—Arbor.

* Commemorating the name of Baron Sir Ferdinand von Mueller; similar combinations are *Indokingia* and *Sinowilsonia* both of Hemsley.



Austromuelleria trinervia. 1, Leaves, $\frac{1}{2}$ nat. size. 2, Raceme, $\frac{1}{2}$ nat. size. 3, Flower $\times 3$. 4, Perianth segment $\times 7$. 5, Stamen $\times 15$. 6, Pistil $\times 5$.

Folia alterna, pinnata, foliolis trinerviis. *Flores* mediocres, geminatim pedicellati, in racemos longos densos simplices valde deflexos e ramulis infra folia orientes dispositi.

A. trinervia C. T. White, sp. nov.

Arbor mediocris, ramulis junioribus robustis pilis longis floccosis ferrugineis vestitis. *Folia* alterna, pinnata, rachide ferrugineo-pubescente ad 50 cm. longa, foliolis 12-19 petiolulatis, petiolulis 0.5-1 cm. longis, ferrugineo-pubescentibus, laminis 10-15 cm. longis, 2-3 -plo longioribus quam latis, ovato-lanceolatis, rectis vel falcatis, glabris, nervis ad basin exceptis, prominenter trinerviis, venis transversis et reticulatione utrinque prominulis. *Racemi* simplices, densiflori, deflexi e ramulis infra folia orientes, rachide cum pedunculo brevi ad 40 cm. longa, pilis ferrugineis velutinis vestita, pedicellis geminatis 1 mm. longis. *Perianthii* segmenta 2 cm. longa, pilis longis ferrugineis vestita. *Stamina* ad basin laminarum brevium affixa, filamentis latis perbrevibus, connectivo lato ultra loculos in apiculum producto. *Gynaecium* rectum, *stylo gracili*, in parte inferiore hirsuto, stigmate glabro oblongo-clavato, ovario sessili, glandulis hypogynis 3 glabris oblongo-linearibus 1 mm. longis.

NORTH QUEENSLAND. Boonjie, Atherton Tableland, Jan. 1923, C. T. White (sine no.).

In floral structure the present plant seems to come closest to *Orites*, but the leaves are totally different from anything else in the Proteaceae, and until fruit is known its position in the family must remain in doubt. I forwarded specimens to Dr. L. Diels, who is writing the Proteaceae for the new edition of the "Pflanzenfamilien," and he replied "The Proteaceous tree collected by you in 1923 near Boonjie is a puzzle to me. I have seen nothing like it. The inflorescence and flowers seem to be very similar to *Orites* incl. *Musgravea* but the leaves are extraordinary."

It is with some hesitation that I describe the plant as the type of a new genus, but since I collected it in 1923 I have asked various people to look out for further material without obtaining any, and I consider it desirable not to wait any longer in bringing such a remarkable tree under notice. *Austromuelleria trinervia* is evidently a very rare tree, for Mr. S. F. Kajewski, a very careful observer, who recently spent some months in North Queensland on behalf of the Arnold Arboretum, tells me he only saw a very few trees in one locality near Boonjie and none of these unfortunately was in flower or fruit.

Specimens from the type gatherings have been placed in the herbaria at the Royal Botanic Gardens, Kew; Arnold Arboretum, Boston; Botanic Garden and Museum, Berlin-Dahlem; and Botanic Museum and Herbarium, Brisbane.

XXV.—ZOMBIANA, THE SUPPOSED TROPICAL AFRICAN MEMBER OF THE MYOPORACEAE.

J. HUTCHINSON.

In the *Flora Australiensis* (5: p. 2) Bentham stated that the genus *Myoporum* was represented by a few species in the Indian Archipelago and the Pacific Islands, and by one species in tropical Africa. The reference to tropical Africa was evidently based on an unnamed specimen collected by Barter in West Africa and labelled in brackets "Myoporineae." Barter noted that the plant was a "small shrub, flowers red, among rocks in the river Avon, growing almost entirely in the water; Yoruba; Niger Exped. Barter no. 1143." The duplicates of Barter's collection were distributed from Kew, and a specimen bearing a copy of this legend was apparently sent to the Paris Museum.

Some time after the appearance of Bentham's note a dissection and drawing of the flowers was apparently made by Fitch and the true systematic position of the plant was ascertained. In 1888, Baillon, in his *Histoire des Plantes* (9: 420), described under the name *Zombiana*, a supposed new genus of *Myoporeae*—a group which he treated as a series of *Scrophulariaceae*—and indicated that it came from West Tropical Africa. It is clear now that he misread the writing of the well-known place-name *Yoruba* as *Zomba*, the latter being a place-name unknown in West Africa.

So matters remained until the time arrived for dealing with the later *Gamopetalae* in the *Flora of Tropical Africa*. The identity of *Zombiana* was evidently a matter of speculation, for Bentham in the *Genera Plantarum* (2: 1124) had remarked with reference to *Myoporum* "Benth. Fl. Austral. v. 2 (ubi errore species una Africae incola dicitur)." But Bentham omitted to say what had become of the specimen upon which he had based his former opinion. The *Myoporaceae* for the *Flora of Tropical Africa* were allotted to the late R. A. Rolfe, whose task was complicated by the disappearance of Barter's specimen from the covers of the family. It seems that enquiries were then sent to Paris, and a fragmentary specimen without flowers or fruits was returned to Kew. With this material and Baillon's description, Rolfe wrote out his account of the family for the *Flora*, "*Zombiana africana*" being the sole genus and species represented in the area. In a footnote he referred to Bentham's published notes (mentioned above) and to the fact that Dr. J. Briquet had studied the histology of the plant and suggested that it might belong to the *Selaginaceae* or *Verbenaceae*; but Rolfe remarked that the fruit did not agree with the former family, nor the position of the radicle with the latter. He made it clear that the generic name, derived from a place-name "*Zomba*"—not *Zomba* in Nyasaland—was apt to mislead, as the plant had been found only on the western side of the continent.

In taking up the matter for part 3 of the *Flora of West Tropical Africa*, I have now been able to solve the identity of the supposed

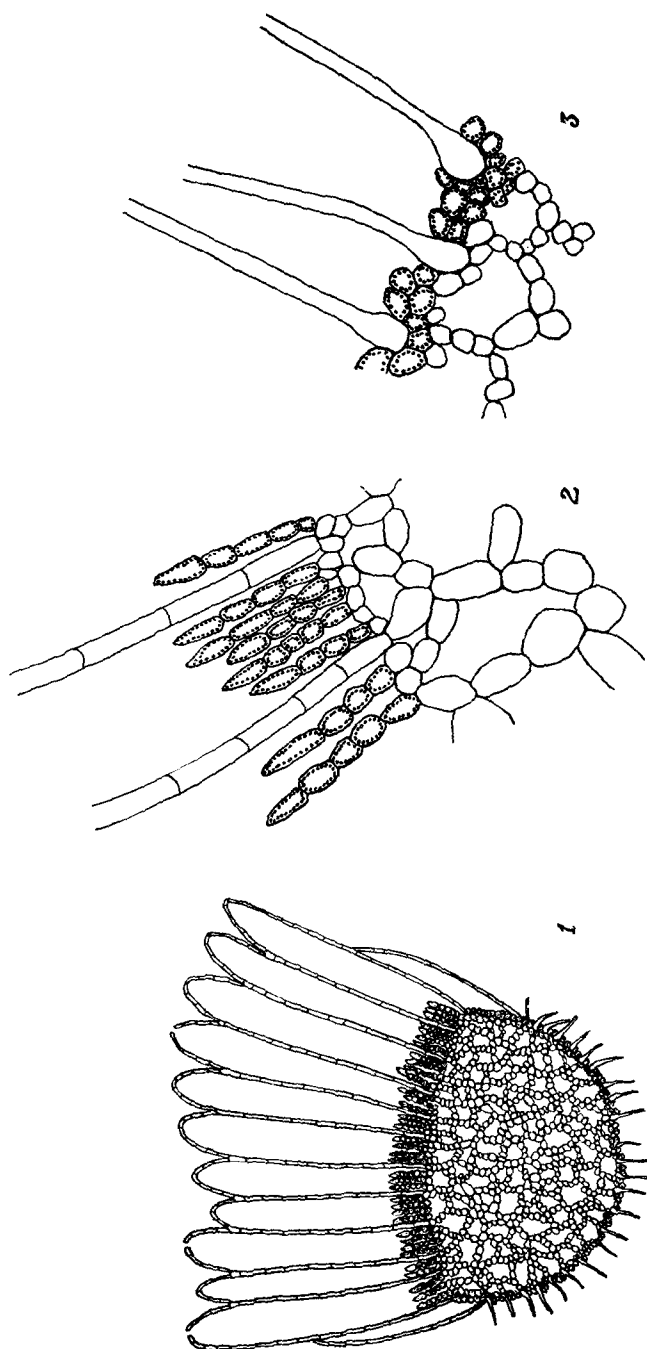
Myoporaceous plant. It is *Rotula aquatica* Lour. (*Rhabdia lycioides* Mart.), a widely spread Boraginaceous shrub. In the cover of that species in the Kew Herbarium I discovered the original Barter specimen, upon which Mr. N. E. Brown had rewritten the locality as the well-known Yoruba, near Lagos. Thus Tropical Africa still lacks the family *Myoporaceae*.

XXVI.—A NEW SPECIES OF EXORMOTHECA FROM SOUTH AFRICA. C. V. B. MARQUAND.

The subject of this note was received for identification from the Section of Plant Pathology, Division of Plant Industry, Department of Agriculture, Pretoria. It was reported to have been sent to Pretoria on several occasions, always in the same condition. Despite the fact that it is said to have been growing in soil that was moist throughout the year it is a remarkable example of a species capable of withstanding prolonged drought. Although the specimens had been collected in March, 1929, and were sent to Kew some months later completely dried up in a small box, the thalli immediately started to grow when the soil in which they were received was placed in a jar of water, and it was at first hoped that archegonia and antheridia might be developed and sporogonia might be produced. This hope, however, was not realized, but when another thallus, which had been dried up throughout, was tested twelve months after it was collected, it was found to be alive. When the living plant is viewed from above, the green colour of the body of the thallus is visible through the stomata, but in the dried state the hyaline stomata are whitish in colour. As the vegetative characters very definitely place it in the genus *Exormotheca*, while it is distinct from all previously described species of that genus in the very tall stomata, its publication from sterile specimens only may be justified.

Exormotheca megastomata Marquand sp. nov.; affinis *E. africanae* Steph. sed thallo multo latiore pallidiore, squamulis non ciliatis inter alia differt.

Sterile. Thalli simple, scattered, 8–11 mm. long, 5–6 mm. wide, 4 mm. deep, ovate or shortly once dichotomously branched. Dorsal surface with a slight furrow or nearly straight, completely covered with stomata and the margins with closely invested scales. Stomata conical, about 2 mm. high, whitish, closely packed, forming an epidermis composed of a single layer of narrow rectangular thin-walled cells devoid of contents, supported by the thin-walled elongate-celled partitions seen in section. Marginal scales minute, multicellular, unistratose, trifid or quadrifid, adpressed to the exterior stomata; cells small, narrow rectangular, the upper ones hyaline, the lower cells with dark purple contents. Assimilating layer immediately below the stomata, not exceeding $\frac{1}{2}$ their height, composed of densely packed pillars of chlorophyllose cells 4–10 cells deep, the apical cell conical, rounded at the apex, lower cells



Exormolheca megastomata.

1. Transverse section of the thallus showing the stomata. In three of the stomata the osteole can be seen, $\times 15$.
2. Portion of dorsal surface in transverse section, showing the pillars of chlorophyllose cells and bases of supporting walls of the stomata, $\times 170$.
3. Portion of ventral surface of same showing the attachment of the rhizoids, $\times 170$.

rounded. Both this layer and the supports of the stomata arise from a narrow layer of small rounded cells without trigones which bounds the tissue filling the thallus. *Loose reticulate tissue* about 1.5 mm. in thickness, composed of rounded or ovoid empty cells varying in size, in reticulate chains with large air spaces, filling the main body of the thallus. Below the growing point this tissue is much denser, the air spaces are few or absent and the cells small. *Ventral surface* concave, carried up to the marginal scales of the dorsal surface in a hemispherical curve, composed of a very narrow layer of small round densely chlorophyllose cells with the rhizoids covering the whole surface. *Rhizoids* long, slender, pellucid, unicellular, with their deeply inserted bases enlarged, bulbous. *Ventral scales* O.

S. AFRICA. Transvaal: on krantz, 3 miles north of Middelburg, aspect southerly on soil which is moist all the year round, associated with *Encephalartos*, *Riccia*, etc., March and October, 1929, *Union Dept. Agric. Cryptogamic Herb.* 214 (type specimen in *Herb. Kew.*).

XXVII.—PLANTS NEW TO ASSAM: II.* C. E. C. FISCHER.

Beesia calthifolia Ulbr. [Ranunculaceae].

Known from N. Burma and W. China.

Mishmi, Delei Valley, 6000–7000 ft., July, *Kingdon Ward* 8473.

“Flowers white; amongst undergrowth in the rain-forest.”

Ilex Hookeri King [Ilicaceae].

Found in Sikkim.

Mishmi, Delei Valley, 10,000–11,000 ft., June, *Kingdon Ward* 8276, “Evergreen shrub or small tree in Rhododendron thickets. Petals greenish edged with dull-purple.”

Ilex intricata Hook. f. var. **oblata** Evans [Ilicaceae].

The species is known from Sikkim and E. Nepal, and the variety from Yunnan.

Mishmi, Delei Valley, 8000–9000 ft., June, *Kingdon Ward* 8167, “A small moss-covered tree in the upper temperate rain-forest.”

Ilex odorata Ham. [Ilicaceae].

Previously found in the Himalayas from Sikkim to Nepal.

Mishmi, Delei Valley, 6000 ft., April, *Kingdon Ward* 8092, “A small shrub of the upper rain-forest. Flowers pale chocolate.”

Euonymus rongchuensis Marq. & Shaw [Celastraceae].

Reported previously from S.E. Tibet.

Mishmi, Delei Valley, 10,000–11,000 ft., June, *Kingdon Ward* 8312, “A small undershrub in the conifer-Rhododendron forest. Common along the ridge. Flowers bright chocolate-red.”

Sabia parviflora Wall. [Sabiaceae].

Known from the Himalayas from Kumaon to Sikkim.

* Continued from *K.B.* 1929, p. 254.

The species which forms the subject of this note was described and figured by Jacquin as *Lachenalia lanceaefolia* in his Ic. Pl. Rar. ii. 17, t. 402 (1786-93), from specimens of bulbs cultivated by him and collected by Scholl and Boos, two Viennese gardeners, at the Cape, most probably in the Albany division. The brief specific diagnosis first given by Jacquin was later much amplified by him in his Collect. v. Suppl. 69 (1796).

By about the year 1800 the same species had been introduced into several of the big English gardens, e.g. Kew (Ait. Hort. Kew. Ed. 2, ii. 287), and three years later was figured under the same name by Curtis, Bot. Mag. xvii. t. 643, the figure agreeing in all essential details with that of the nomenclatural type, i.e. in the spotted, long-acuminate, broadly ovate-lanceolate leaves, and in the relative lengths of inflorescence (including the peduncle) and leaves.

Then in 1811, Gawler (Bot. Mag. xxxiv. sub t. 1380) transferred the Jacquinian species to *Drimia* Jacq., along with several others previously referred to *Lachenalia*, thereby preparing the ground for a fair amount of confusion which followed. Baker, who was the first clearly to discriminate between the genera *Scilla*, *Lachenalia*, and *Drimia*, thus refers to this state of affairs (Saund. Ref. Bot. iii. Append. 1-2: 1870): "It was, we think, under a complete misapprehension that Gawler put into it [i.e. *Drimia*] his *D. lanceaefolia*, which Jacquin had described under *Lachenalia*, inasmuch as it wants all the distinctive characters upon which *Drimia* as a genus can be upheld. Unfortunately *lanceaefolia*, being a plant which at that time was widely diffused in cultivation, got to represent popularly the idea of *Drimia*; and Kunth, who saw that it was impossible to characterise genera and keep *lanceaefolia* and the Jacquinian *Drimiae* together, unaccountably [Enum. iv. 338: 1843] restricted *Drimia* to *lanceaefolia* and the plants which correspond with it in structure, and made for the Jacquinian *Drimiae* a new genus under the name of *Idothea*."

Baker, however, had for some time prior to 1870 been actively engaged on describing plants belonging to these genera (chiefly from Cooper's rich collection from the Cape) for Saunders' Refugium Botanicum, and was able to characterise (loc. supra cit. pp. 2-4) the genera *Scilla* and *Drimia* in such a way as to restore order to the then existing confusion. But, in describing one of Cooper's plants as *Scilla lanceaefolia* (Saund. Ref. Bot. iii. t. 182), Baker erroneously identified this with *Lachenalia lanceaefolia* Jacq., a careful comparison of the description and the excellent plate (t. 182) with that of the Jacquinian plant clearly indicating important differences in leaf and inflorescence characters.

The name *S. lanceifolia* (Jacq.) Baker cannot, therefore, be correctly applied to the plant described by Baker, but should be restricted to the Jacquinian species, while Baker's plant must have a new name. This, with the details of synonymy, is as follows:—

***S. guttata* C. A. Sm., nom. nov.**

S. lanceaefolia Baker in Saund. Ref. Bot. iii. t. 182 (1870), quoad descr. et ic., sed excl. syn.; & in Journ. Linn. Soc. xiii. 251 (1873), excl. syn. et var. *ovatifolia* Baker (loc. cit. 252); & in Dyer, Fl. Cap. vi. 487 (1897), excl. syn.

SOUTH EASTERN REGION. Natal, Durban Div.: near Durban (?), Cooper, dried cultivated specimen! (type, K*). Inanda Div.: Inanda, Wood 181! (BM).

Cooper's original specimen (of the cultivated plant) is represented in the Kew Herbarium by a single raceme and a leaf, the label accompanying it giving no indication of the original place of collection. There is, however, an excellently dried and preserved specimen in Herb. Mus. Brit., collected by Wood at Inanda, Natal, which agrees in all respects with the plate and description of *S. lanceaefolia* Baker. From this fact, the type locality of the species would in all probability be in the Durban area, where Cooper collected in 1862, Inanda being in an adjoining area.

(N.B. The specimens cited under *S. lanceifolia* Baker in Fl. Trop. Afr. vii. 557, do not belong to this species, but appear instead to belong to several undescribed species).

The detailed synonymy of the real *S. lanceifolia* is as follows:—

***S. lanceifolia* (Jacq.) Baker** in Saund. Ref. Bot. iii. sub t. 182 (1870), quoad syn. Jacq., sed excl. descr. et ic.

Lachenalia lanceaefolia Jacq. Ic. Rar. Pl. ii. 17, t. 402 (1786-93); & Collect. v. Suppl. 69 (1796); Willd. Sp. Pl. ii. 1. 178 (1799); Gawler in Curt. Bot. Mag. xvii. t. 643 (1803); Ait. Hort. Kew. Ed. 2, ii. 287 (1811); Poir. Encycl. Suppl. iii. 231 (1813); Tratt. Aug. Taf. Archiv ii. tt. 125, 126: 1813 (ex Ind. Lond.); Link, Enum. Pl. Hort. Berol. i. 332 (1821).

Drimia lanceaefolia Gawler in Curt. Bot. Mag. xxxiv. sub t. 1380 (1811), incl. var. *major* Gawler (loc. cit.); Schrad. Blumenb. 29 (1827), incl. var. *densiflora* Schrad. (loc. cit.); Spreng. Syst. Veg. ii. 75 (1825); Schult. & Schult. f. Syst. Veg. vii. 594 (1829); Kunth, Enum. Pl. iv. 339 (1843).

Lachenalia lanceaefolia var. *maculata* Tratt. Archiv Gewächsk. ii. 132, t. 168 (1814).

Drimia acuminata Lodd. Bot. Cab. xi. t. 1041 (1825), nomen; Kunth, Enum. iv. 339 (1843), descr.

Sugillaria lanceaefolia† Baker in Journ. Linn. Soc. xiii. 251 (1873), in syn.

*In citing specimens in this article, the following abbreviations have been inserted after the numbers to indicate the Herbarium where the specimen is to be found:—BM, British Museum (Natural History). K, Royal Botanic Gardens, Kew. Pa, National Herbarium, Division of Plant Industry, Pretoria. R, Herbarium of F. A. Rogers.

†In the reference given Baker attributes this combination to Salisbury (Gen. Pl. Fragm. 18: 1866), but the latter never effected this combination. He merely indicated that his genus *Sugillaria* was based on *Lachenalia lanceaefolia* Jacq.

For purposes of easy reference, Jacquin's diagnosis, as emended by him in his Collect. v. Suppl. 69, is here given in full detail :—

“Crescit ad Promontorium bonae Spei, florens apud nos a Junio ad Augustum, tota glabra et inodora. *Bulbus* ovatus, tunicatus, sescunciam diametro aequans, externe fuscus. *Folia* radicalia plura, lanceolato-acuminata, integerrima, plana cum solis apicibus subcanaliculatis, carnosula, firmula, utrinque pallide et sine nitore virentia, supra maculis magnis sordideque atrovirentibus tota picta, inferiora in orbem prostrata, interiora juniora erecta, majora quinque uncias longa et sescunciam lata. *Scapi* axillares, solitarii, foliis longiores, teretes, graciles, inferne obsolete maculati, prostrati, racemosi, multiflori. *Pedicelli* uniflori, semunciales, cum in flore tum in fructu patentissimi, in flore purpurei, dein virides, bracteola suffulti minutissima. *Flores* parvi, petalis utrinque sordide virentibus cum punctis minutis sanguineis; filamentis basi albis, caeterum rubris; antheris flavescentibus; stylo rubro, et superne albo. *Fructus* figura quam maxime dissimilis a germine, saepius sine omni sulco teres. *Semina* paucissima ad maturitatem perveniunt; saepe unicum, totam tunc capsulam implens, veluti unilocularem, propter destructa tunc ab aucto semine dissepimenta. Hinc capsula rarissime talis est, qualem in charcatere generico describam, et qualis ex germinis structura semper esse deberet. Bractee steriles in hac specie, uti et in *Lachenalia patula*, contra morem congenerum nullae racemum terminant.

[Character genericus].

Cal. nullus.

Cor. Petala sex, oblonga, obtusa, apice inflexo et calloso fornicatula, omnia aequali et saimillima, tria exteriora inferne connata cum tribus interioribus, supra concretionem omnia primum patentissima, dein reflexa; tandem iterum erecta et emarcida persistentia in fructu.

Stam. Filamenta sex, ex basi petalorum orta, subulata, erecta, longitudine corollae. Antherae oblongae, erectae.

Pist. Germen superum, pedicellatum, late conicum, obtusissimum, sexsulcatum. Stylus subulatus, sexsulcatus, erectus, longitudine staminum. Stigma obsolete trifidum, muricatum.

Per. Capsula oblonga, obtusissima, triloba, sexsulcata, longitudine corollae, trilocularis, trivalvis.

Sem. in quolibet loculamento gemina, oblonga, teretia.”

So far as available herbarium material goes, the above species seems to be unrepresented, and known only from the illustrations already cited in the above synonymy.

Further investigation into the synonymy of *S. lanceifolia* as given by Baker in the references already cited, brought out the following points :—

(i) The plant described by Gawler as *Drimia lanceaefolia* var. *minor* (Curt. Bot. Mag. xxxiv. t. 1380: 1811) was recognised as a

distinct species by Schrader who named it *D. Gawleri* (Blumenb. 30: 1827), excluding *Lachenalia reflexa* Andr., which Gawler regarded as synonymous with his variety already noted. Andrew's specific name is invalidated by the prior homonym *L. reflexa* Thunb. (Prodr. i. 64: 1794), and the species was renamed by Schrader (loc. cit. 38) under *Drimia* as *D. lanceolata*. Baker, however, recognised the species as a *Scilla* (§ *Ledebouria*) and transferred it to this genus as *S. lanceolata* (Schrader) Baker in Saund. Ref. Bot. iii. Append. 14 (1870), but, in so doing, apparently failed to recognise that this name was invalidated by the much earlier *S. lanceolata* Viviani (Fl. Cors. Prodr. Append. Alt. 3: 1830), which is a Mediterranean species. The South African species must therefore have another name, for which the following is proposed :—

***S. doratophylla* C. A. Sm., nom. nov.**

Lachenalia reflexa Andr. Bot. Rep. v. t. 299 (1803); Tratt. Archiv Gewächsk. ii. 132, t. 169 (1814); non Thunb. (1794).

Drimia lanceolata Schrad. Blumenb. 28 (1827); Schult. & Schult. f. Syst. Veg. vii. 594 (1829); Kunth, Enum. iv. 339 (1843).

Scilla lanceolata Baker in Saund. Ref. Bot. iii. Append. 14 (1870); & in Journ. Linn. Soc. xiii. 254 (1873); & in Dyer, Fl. Cap. vi. 492 (1897); non Viv. (1830).

(ii) The figure of *Drimia lanceaefolia* Lodd. (Bot. Cab. iii. t. 278: 1818) was not accompanied by any specific diagnosis or citation of authority for the name, and it certainly does not represent the plant which had been so named by Gawler (Bot. Mag. sub. t. 1380). Schrader therefore (Blumenb. 30: 1827) correctly renamed it *D. ovalifolia*, but if Loddiges' plate is the basis of Schrader's species, then *D. Gawleri* above noted, is conspecific with *D. ovalifolia*, as a comparison of the descriptions and the figures involved readily shows. Both further agree with Baker's diagnosis of a species described by him as *S. revoluta* (Ref. Bot. iii. Append. 6: 1870), to which he referred them. It should be noted, however, that it is indeed very doubtful whether this species is identical with *Hyacinthus revolutus* Linn. f. (Suppl. 204: 1781), based on a Thunberg specimen, the descriptions given by Baker of his specimens differing markedly from that given by Thunberg (Fl. Cap. Ed. Schult. 326: 1823) of the type plant, which Baker had not seen. *S. revoluta* (Linn. f.) Baker being a nomenclatural synonym of *Hyacinthus revolutus* Linn. f., cannot be applied to another species. The choice of an epithet for the species under consideration thus lies between *D. Gawleri* and *D. ovalifolia* Schrad., the specific epithet of one of which has to be taken up under *Scilla*. Hence :—

***S. ovalifolia* (Schrad.) C. A. Sm., comb. nov.**

Hyacinthus revolutus Ait. Hort. Kew. i. 458 (1789); & Ed. 2, ii. 283 (1811); non Linn. f. (1781).

Drimia lanceaefolia var. *minor* Gawler in Curt. Bot. Mag. xxxiv. t. 1380 (1811), excl. syn. Andrews.

D. lanceaefolia Lodd. Bot. Cab. iii. t. 278 (1818), nomen; Link, Enum. Pl. Hort. Berol. i. 330 (1821), descr.; non Gawler (1811).

D. ovalifolia Schrad. Blumenb. 30 (1827); Schult. & Schult. f. Syst. Veg. vii. 596 (1829); Kunth, Enum. iv. 339 (1843).

D. Gawleri Schrad. loc. cit. 30; Schult. & Schult. f. loc. cit. 595 Kunth, loc. cit. 339.

Xeodolon sp. Salisb. Gen. Pl. Fragg. 18 (1866).

Scilla revoluta Baker in Saund. Ref. Bot. iii. Append. 6 (1870); & in Journ. Linn. Soc. xiii. 246 (1873); & in Dyer, Fl. Cap. vi. 485 (1897), quoad. descr. sed excl. syn. Linn. f., Pers. & Kunth.

Xeodolon revolutum Baker in Journ. Linn. Soc. xiii. 246 (1873); & in Dyer, Fl. Cap. vi. 485 (1897), in syn.

(iii) The plant described by Wood (Natal Pl. iii. 4, t. 202: 1900) as *Scilla lanceaefolia* agrees neither with the figure of the nomenclatural type (Jacq. Ic. Rar. Pl. ii. t. 402: 1786-93), nor with the plant described by Baker (Saund. Ref. Bot. iii. t. 182: 1870) under that name (= *S. guttata* C. A. Sm.). It differs from both very markedly in the shape of its leaves, in the relative lengths of leaf and raceme, and in the peculiar truncate apices of the scales of the bulb. Wood does not cite any particular specimen under his description, merely stating that the plant figured was collected round Durban, but there are specimens (in Herb. Kew. & Mus. Brit.) of *Krauss* 464, collected on "grassy places at the foot of Tafelberg (near Pietermaritzburg) and round Natalbaai" (Durban bay), which agree in all essential details (such as those noted above) with Wood's figure and description. The name used by Wood belonging to a different plant, the species described by him must have a new name, and the following is here proposed:—

S. cicatricosa C. A. Sm., nom nov.

S. lanceaefolia Wood, Natal Pl. iii. 4, t. 202 (1900); non Baker (1870).

(iv) Trattinick (Archiv. Gewächsk. ii. 132, t. 167: 1814) erroneously identifies the plant figured by Redouté (Lil. i. t. 59), which he reproduces almost exactly (tab. 167), as the typical *Lachenalia lanceaefolia* Jacq., though he mentions neither the source of his figure nor Jacquin's. He then (p. 132), describes a var. *maculata* of the above species, basing this on Bot. Mag. t. 643, which is again almost exactly reproduced (tab. 168). In describing how the var. *maculata* differs from the species, he states that it differs in: "1. foliis rotundo maculatis, glaucescentibus; 2. inflorescentia fertiliori; 3. floribus 3 plo majoribus; 4. petalis non simul reflexis; 5. thecaphoro seu germine pedicellato," and concludes with "Si varietas, tamen attentionis dignissima!" The error in the above of course lies in the fact that Bot. Mag. tab. 643, which is typical *L. lanceaefolia* Jacq., is made the type figure of a variety of that species, but the interest of Trattinick's distinctions between the "species" and the "variety" lies in this—he was the only author to call

attention to the very manifest differences existing between Redouté's plant as represented by his exquisite coloured plate and that of the typical form of the species as represented by the Bot. Mag. figure. Trattinick's differential characters above noted are by no means convincing, but when Redouté's plate is compared with the Jacquinian figure, the very striking differences in leaf and especially inflorescence characters in the plants represented are so evident as to warrant specific separation for Redouté's plant.

Careful comparison of type material at Kew of those species which appeared to come nearest to Redouté's plant, showed that the latter agrees exactly in all essential details with the type of *S. livida* Baker; for although Redouté's plate shows the leaves to be remotely spotted, a condition not met with in Baker's species, Redouté thus describes this character (loc. cit. sub t. 59): "... marquées à la surface supérieure de taches vertes ovales ou oblongues; ces taches s'évanouissent dans les feuilles adultes."

The detailed synonymy of *S. livida* Baker may thus be cited as follows:—

S. livida Baker in Gard. Chron. xx. 166 (1883); & in Dyer, Fl. Cap. vi. 490 (1897).

Lachenalia lanceaefolia Red. Lil. i. t. 59 (1802); Tratt. Archiv. Gewächsk. ii. 132, t. 167 (1814); non Jacq. (1786-93).

SOUTH AFRICA. Without precise locality, *cult. spec. e Hort. Horsman!* (type, K).

If should further be noted that the plant—"Natal; cultivated specimen, *Hort. Kew!*"—cited by Baker (Fl. Cap. vi. 490) as the above species, certainly does not belong here at all, but appears to represent *S. spathulata* Baker (Saund. Ref. Bot. iii. t. 187). This material is, however, imperfect, consisting only of a single leaf, and the part of one inflorescence, so that either Redouté's description (loc. cit.), or that of the Gard. Chron. (loc. cit.) should be consulted for the specific diagnosis of *S. livida* Baker, that of the Flora Capensis, apart from its brevity, being misleading.

(v) Another plant, *Scilla maculata* Schrank (loc. infra cit.), has often been cited as being conspecific with the older Jacquinian species, *Lachenalia lanceaefolia*, but from the latter, as well as other closely allied species, it is readily distinguished by its unusually long-pedicelled flowers, and its leaf and inflorescence characters. Thus Schrader was led to regard (Blumenb. 30: 1827) Schrank's species as a varietal form (var. *longipedunculata* Schrad.) of *Drimia lanceaefolia* (Jacq.) Gawler, but the characters presented by Schrank's plant, as shown in his fairly good plate, are sufficiently distinctive to warrant its specific separation, and since the work in which Schrader published the species may not be readily accessible to South African taxonomists, the original diagnosis is here reproduced:—

S. maculata Schrank, Pl. Rar. Hort. Acad. Monac. ii. fol. 100, t. 100 (1820).

Drimia lanceaefolia var. *longipedunculata* Schrad. Blumenb. 30 (1827); Kunth, Enum. iv. 339 (1843).

"S. racemo-pyramidalis, multifloro; pedunculis longissimis, patentibus, junioribus coloratis; petalis staminum longitudine, post anthesin reflexis; foliis lanceolatis, superne saturatius maculatis.

BULBUS tunicatus, fere dupla magnitudine Strobili Pini sylvestris.

FOLIA radicalia, lanceolata, amplexicaulia, acuta, patentia, apice sub-reflexa, laete viridia, maculis saturatioribus in pagina superiori (*sic*) picta, longa pollices transversos circiter tres, lata in basi unum.

SCAPI plures, teretes, foliis plus duplo longiores (cum Racemo), apice racemum ferentes.

RACEMUS tres digitos altus, multiflorus, laxis. Pedunculi sparsi, longissimi (plusquam pollicares), patentes, in juventute rubenti-violacei, deflorati virides, demum fructiferi erecti. Flores minimi, vix trilineares.

PERIGONIUM subcalycinum, hexaphyllum, persistens. Petala oblonga, erecta, dorso atropurpureo, margine subalbido, dein medietate superiore patula, patentia pro gradu maturitatis diverso, deflorata reflexa, viridia, dorso sordidata.

STAMINA sex. Filamenta filiformia, basi perigonii adnata, ejusque longitudine, purpurei. Antherae ovatae, atropurpureae, biloculares. Pollen flavum.

PISTILLUM. Ovarium brevissime pedicellatum, globoso-hexagonum, viride. Stylus subulatus, purpureus, staminibus paulo brevior. Stigma simplex.

FRUCTUS. Capsula globoso-hexagona.

PATRIA. Promontorium Bonae Spei, unde D. Prems Bambergensis bulbos misit, qui altero anno floruerunt."

(vi) Although it has not been found practicable to re-identify all the specimens cited by Baker under *Scilla lanceaefolia* (Fl. Cap. vi. 487-488), as well as those subsequently identified by him and others as this species, the following have thus far been placed specifically:—

Wood 41 (K).	<i>S. ovatifolia</i> Baker.
Wood 181 (BM).	<i>S. guttata</i> C. A. Sm.
Krauss 464 (BM, K).	<i>S. cicatricosa</i> C. A. Sm.
Burke s.n. (K).	<i>S. inquinata</i> C. A. Sm. (vide infra).
Phillips 3068 (Pa).	<i>S. climacocarpha</i> C. A. Sm. (vide infra).
Pont 298 (Pa).	<i>S. climacocarpha</i> C. A. Sm. (vide infra).

Cooper 3286 & 3287 (K). can only be doubtfully referred to *S. polyantha* Baker owing to defective material.

S. (Ledebouria) inquinata C. A. Sm., sp. nov. [Liliaceae-Scillaee]; *S. graminifoliae* Baker affinis, sed foliis latioribus et brevioribus facile distinguenda.

Bulbus ovideus, tunicatus, usque 3.5 cm. diam., apice in collum breve (circiter 1 cm. longum) crassum productus, tunicis exterioribus tenuibus, punctis vel maculis purpureis pulchre notatis vel lineis purpureis interruptis cinctis. Folia 6-10, adscendentia, linearia, acuta, basi non manifeste attenuata, usque 1.5 cm. longa et 2 mm. lata, carnosio-herbacea, glabra, viridia, basi et (ut videtur) subtus solum maculata. Inflorescentiae 2-3, praecoces, foliis circiter duplo longiores. Racemi multiflori, oblongi, usque 2 cm. longi et 1.2 cm. lati. Scapi adscendentes vel recurvo-adscendentes, glabri, basi obscure maculati. Pedicelli patentes, filiformes, rosei, usque 7 mm. longi. Tepala oblonga, obtusa, herbacea, carina brunneo-viridia, marginibus pallidiora; exteriora calloso-cucullata. Filamenta superne purpurea. Stylus purpureus. Capsula globoso-hexagona, angulis obtusa, basi truncata, 6-loba, brevissime stipitata.

TRANSVAAL. Pretoria Div.: near Pretoria, along the Aapies River, 1400 m., Oct., Burke! s.n. (type, K), Zeyher 1702! (BM); in a vleij, near Pretoria, Oct., Gilfillan in Herb. Galpin 6081! (Pa, partim in Herb. Kew.)

S. (Ledebouria) climacocarpha C. A. Sm., sp. nov. [Liliaceae-Scillaee]; *S. lanceifolia* Baker affinis, sed foliorum et bulbi characteribus differt.

Bulbus ovideus, tunicatus, usque 6 cm. diam., apice in collum distinctum productus, tunicis exterioribus submembranaceis, apice truncatis, sensim decrescentibus. Folia 6-8, patentia, late lanceolata-ovata usque ovato-elliptica, in apicem acutum longe angustata, basi attenuata, usque 16 cm. longa et 4.5 cm. lata, carnosio-herbacea, glabra, saturate viridia, nitidula (ut videtur), immaculata. Inflorescentiae 2-3, foliis coaeteneae et subaequantes. Racemi cylindrici, circiter 5 cm. longi et 3 cm. lati. Scapi adscendentes vel decumbentes, glabri, immaculati. Pedicelli patentes, pallide virides, usque 2 cm. longi. Tepala oblonga, obtusa, herbacea, purpurea, marginibus pallidiora; exteriora apice calloso-cucullata. Filamenta dimidio superiore saturate purpurea. Stylus 3-gona, crassiusculus, purpureus, stigmatibus pubescente. Capsula globoso-hexagona, angulis obtusa, basi truncata, breviter stipitata.

ORANGE FREE STATE. Bethlehem Div.: near Bethlehem in a damp shady ravine, 1525 m., Dec., Phillips 3068! (type, Pa). Kroonstad Div.: in shade on the Vals River at Kroonstad, 1400 m., Nov., Pont 298! (Pa.).

Pont 298 differs from the type only in the longer peduncles (scapes) and in the longer neck to the bulb, the latter being thus very much more deep-seated, but as a note by the collector states "sun plants much shorter in bulb and leaves," there can be very little doubt about referring it to the above species.

(vii) The following new combination must replace *S. lorata* Baker, as will be evident from the synonymy:—

***S. apertiflora* (Baker) C. A. Sm., comb. nov.**

Drimia apertiflora Baker in Saund. Ref. Bot. i. t. 19 (1868).

S. lorata Baker in Saund. Ref. Bot. iii. Append. 14 (1870); & in Journ. Linn. Soc. xiii. 253 (1873); & in Dyer, Fl. Cap. vi. 493 (1897).

Baker appears deliberately to have discarded the earlier specific epithet, for he states (Ref. Bot. iii. Append. 14) "placing this [i.e. the above species of *Drimia*] in *Scilla*, the specific name first given is appropriate no longer."

(viii) Through the courtesy of Mr. F. A. Rogers, the writer was able to examine a series of specimens collected by him in South Africa, more particularly, in the Albany and Knysna Divisions. Among these were two numbers, Rogers 25351 and 28366, which agreed in all essential details with specimens in the Kew Herbarium collected by Ecklon and by Zeyher, which had, moreover, been referred to *Scilla Ludwigii* (Miq.) by Baker himself (Fl. Cap. vi. 488: 1897). Now this species was based on a cultivated specimen, which had originally been described as *Drimia Ludwigii* Miq. (Bull. Sc. Phys. Nat. Néerl. i. 39: 1839), and of which bulbs were doubtless received from the celebrated Baron von Ludwig, then resident at the Cape. In referring the Ecklon and the Zeyher plants to *S. Ludwigii*, however, Baker overlooked two points: (i) In leaf, bulb and inflorescence characters the Ecklon and the Zeyher specimens do not agree with Miquel's description of his *D. Ludwigii*. (ii) These specimens were distributed under the name *Drimia ensifolia* Ecklon, and Drège (Linnaea, xx. 235: 1847) cites Zeyher 4262, one of the numbers in question, under this name, though without a description of the species. Thus, when Baker took up *D. ensifolia* Ecklon as a 'nomen nudum' under *S. Ludwigii* (e.g. Fl. Cap. vi. 488), he overlooked the fact that *D. ensifolia* Ecklon was a valid name, since it had long before been published with a sufficiently full description by Ecklon in his 'Catalogue' of Uitenhage plants, which appeared in the S. Afr. Quart. Journ. i. 358-380 (1830). This was first pointed out by Britten in a short paper, "Overlooked Cape Plants" (Journ. Bot. xlv. 200-201: 1908), where he then transfers Ecklon's species to *Scilla* as *S. ensifolia* (Eckl.) Britten. In the Kew Herbarium there is a specimen of Ecklon (distributed by MacOwan in 1884), which bears Ecklon's original label with the following details in his hand: "No. 10. *Drimia ensifolia* Herb. E. Auf den Sanddünen am Zwartkopsrivier, lsten. höhe [i.e. 0-500 ft.]. Jan. [18]30," and there can be very little doubt that this particular number represents Ecklon's type number, and it was, moreover, distributed from the South African Museum Herbarium, which contains the bulk of Ecklon's Herbarium. Further the specimen was collected several months prior to the publication of Ecklon's paper (loc. supra cit.), which deals exclusively with those plants collected round Uitenhage during the period July, 1829, to February,

1830, and which appeared in the 4th number of the "Quarterly Journal," i.e. after September, 1830.

It should further be noted that Baker's description of *S. Ludwigii* was very largely taken from Zeyher (III) 4262* in the 1870 and 1872 references given below, since Ecklon's specimens were not rendered available until distributed by MacOwan in 1884. Since, according to MacOwan, Zeyher was collecting in the Western Cape during January, 1830, his No. 4262 could not have been collected at the same time as the type, but the two are certainly conspecific. Hence *S. Ludwigii* Baker (not *Drimia Ludwigii* Miq.), becomes synonymous with the earlier *S. ensifolia* (Eckl.) Britten, so that the following synonymy (with citations) must take the place of that given for the species in current literature:

***Scilla ensifolia* (Eckl.) Britten** in Journ. Bot. xlv. 201 (1908).

Drimia ensifolia Ecklon in S. Afr. Quart. Journ. i. 364 (1830); Drège in Linnaea, xx. 235 (1847).

Scilla Ludwigii Baker in Saund. Ref. Bot. iii. Append. 9 (1870); & in Journ. Linn. Soc. xiii. 248 (1872); & in Dyer, Fl. Cap. vi. 488 (1897), quoad. descr. tantum; non *Drimia Ludwigii* Miq. (1839).

SOUTH WESTERN REGION. Uitenhage Div.: near Uitenhage, on sandy hills on the Zwartkops River, 15-150 m., Jan., Ecklon 10! (type, K); in a valley and on an adjoining hill on the Zwartkops River, 15-150 m., Zeyher 4262! (K).

SOUTH EASTERN REGION. Albany Div.: Manley Flats, 550 m., Dec., Rogers 25351! (R), 28366! (Pa, R).

It should be noted that Drège 8618a! from between the Katberg and the Klipplaat River (Cathcart Div., Central Region), cited by Baker (Fl. Cap. vi. 488) under *S. Ludwigii*, should be referred to *S. pusilla* Baker, so that Mr. Rogers' rediscovery of the above species, in a different locality, appears to have been the first record for the species for close upon a century.

Another fortunate discovery (by the same collector) which deserves mention is that of a plant which is an almost exact duplicate of the type specimen of *Scilla Rogersii* Baker, collected about 1879 in the George-Mosselbay area by, and named after, Mr. Rogers' father, who is perhaps better known for his work on the British species of *Rubus*. It is indeed a singularly happy coincidence that the species named after the father, and of which only one specimen was known, should have been rediscovered by the son. The second record—Rogers 26719! (R)—comes from the Knysna Div., near Plettenberg's Bay, and therefore in an area adjoining the type 'locality.'

In concluding this note the writer wishes to express his indebtedness to Mr. J. Ramsbottom, O.B.E., Keeper of the Dept. of Botany,

* The (III) here inserted refers Zeyher's number to the third series of sets issued by him for sale.

British Museum (Natural History), for facilities to consult type material, and to Mr. N. E. Brown, A.L.S., for critical advice on the determination of some of the species.

XXIX.—A SUPPLEMENT TO THE GRASSES OF THE FIJI ISLANDS. V. S. SUMMERHAYES & C. E. HUBBARD.

In 1927* we published an account of the grasses recorded at the time from Fiji. Dr. J. D. Tothill, lately Superintendent of Agriculture, Fiji, and Mrs. Tothill, had been studying the flora of the islands for several years previous to this date, and in 1929 very kindly presented their joint collections to Kew. Dr. Tothill had studied in particular the grasses, collecting altogether over 400 numbers of this family. The majority of these were collected during two trips to the smaller islands of the group. During the first, made in June, 1926, the islands of Tomberua (near the S.W. corner of Viti Levu), Moturiki and Leleuvia (both near Ovalau) were visited. In July and August, 1927, however, a much more extended tour was made, in which visits were made to many islands around Viti Levu and also in the Lau Group. The chief islands visited and the dates of the visits are given below, the information having been compiled from Dr. Tothill's labels.

Vatu Lele	...	July	5th	Mango	...	July	26th
Kandavu	...	"	9th	Thikombia-i-Lau	...	"	26th
Koro	...	"	12th	Nayau	...	"	27th
Nairai	...	"	?	Lakemba	...	"	28th & 29th
Ngau	...	"	17th	Kambara	...	"	29th
Mbatiki	...	"	18th	Fulanga	...	"	30th
Vanua Mbalavu	...	"	21st	Matuku	...	Aug.	2nd
Naitamba	...	"	23rd	Totoya	...	"	3rd
Kanathea	...	"	24th	Moala	...	"	4th

As a result of Dr. Tothill's collecting, and also further collecting by Mr. Greenwood, 3 more genera (*Saccolepis*, *Pennisetum* and *Dactylis*) and 12 fresh species (one new to science) have been added to the grass flora of the islands. Also our knowledge of the distribution of most of the species already recorded has been considerably augmented, while Dr. Tothill's notes in many instances contain valuable information as to the time of arrival or progress of spread of many of the introduced species. In a few cases the examination of the new material has enabled us to correct our determinations given in 1927. Even now the island of Vanua Levu has been little explored botanically, and further additions to the grasses may be expected when this is carried out.

The additional material received since the previous paper was written is enumerated below, the genera being arranged as in the

* *Kew Bull.* 1927, p. 18.

previous paper, and the new genera inserted according to their position in the arrangement adopted at Kew. Short descriptions of the fresh species are provided for comparison with those given previously. In the enumeration all specimens were collected by Dr. and Mrs. Tothill unless otherwise stated. The dates of collection of the specimens, where not mentioned, may be obtained from the table given above.

1. COIX Linn.

C. Lacryma-Jobi Linn. Sp. Pl. 972 (1753).

Viti Levu: Mountains near Lautoka, 2000 ft., May 1929, *Greenwood* 186z; Nasalai, planted, July 1926, *Tothill* 418. Vanua Levu: Mathuata Coast, Nanduri, Nov. 1928, no. 428. Vanua Mbalavu: no. 188. Moala: dominating a wet field of about an acre, no. 109.

The last two specimens approach var. *stenocarpa* Stapf in possessing relatively narrower, ellipsoid-ovoid false-fruits, which however differ widely from those of the variety.

3. ISCHAEMUM Linn.

I. aristatum Linn. Sp. Pl. 1049 (1753).

Vanua Levu: Tabacola, forming dense masses of creeping stems and roots in moist places in cane fields, etc., June 1924, *Greenwood* 590z.

I. rugosum Salisb. Ic. Stirp. Rar. i, t. 1.

Differs from *I. aristatum* in having the lower glume closely and prominently transversely ridged in the lower two-thirds where it is hard and yellowish, the upper third being membranous and green.

Vanua Levu: Wainikoro, near sea level, March 1924, *Greenwood* 743.

China, Indo-Malaya; introduced elsewhere.

I. vitiense Summerhayes.*

Differs from *I. aristatum* in the following:—Culms up to 18 in. high, nodes glabrous. Leaves quite glabrous. Racemes 3–5 in. long. Spikelets $\frac{1}{4}$ – $\frac{1}{3}$ in. long, sessile one slightly longer, hairy, awn of sessile spikelet nearly 1 in. long.

Fulanga: only two clumps seen, *Tothill* 152.

Restricted to Fiji.

4. IMPERATA Cyt.

I. exaltata Brongn. Voy. Coq. Bot. 101. *I. cylindrica* var. *Koenigii* Summerhayes & Hubbard in Kew. Bull. 1927, 26, non Dur. & Schinz.

Tufted *perennial*. Culms $1\frac{1}{2}$ –6 ft. high. Leaf-blades narrow at base, widened above, $\frac{1}{2}$ – $2\frac{1}{2}$ ft. long, $\frac{1}{2}$ – $\frac{3}{4}$ in. wide, the upper very short. Spikelets mostly paired, unequally stalked, on the continuous branches of a silvery, silky, narrowly lanceolate, rather loose panicle, 3–20 in. long by $\frac{3}{4}$ –3 in. wide; spikelets all alike, falling at

* A formal diagnosis of this species in latin is supplied on p. 264.

maturity, $\frac{1}{2}$ in. long, two-flowered, upper floret alone perfect, awnless, enveloped by long silky hairs from the base; stamen 1.

Viti Levu: Lautoka, Dec. 1925, *Greenwood* s.n.; Nandarivatu, Feb. 1927, *Tothill* 61; Suva, reclamation, Jan. 1929, no. 54. Kandavu: probably common on dry leeward plains, no. 134. Moturiki: no. 53. Ngau: no. 387. Lakemba: no. 337. Moala: no. 119. Matuku: not uncommon on the drier hillsides, no. 287.

Malaya, Polynesia.

Vern. name: Plume Grass.

5. MISCANTHUS Anderss.

M. japonicus Anderss. in Oefvers Vet. Akad. Stockh. 1855, 166.
Vatu Lele: not common, *Tothill* 139.

8. VETIVERIA Thouars.

V. zizanioides Nash in Small, Fl. S.E. U.S. 67.

Viti Levu: Suva, The Point, an escape from cultivation, May 1926, *Tothill* 29. Matuku: Mulimuli, ornamental grass, no. 280.

9. CHRYSOPOGON Trin.

C. aciculatus Trin. Fund. Agrost. 188.

Viti Levu: Lautoka, Dec. 1925, *Greenwood* 172; Suva, on lawn, April 1926, *Tothill* 50. Vatu Lele: one plant only, no. 138. Moturiki: no. 6. Mbatiki: Manuku, a yellow variety, fairly common, no. 218. Ngau: nos. 399, 411. Koro: at lighthouse and about several native towns, nos. 98, 98a. Kanathea: no. 244. Vanua Mbalavu: *R. W. Paine in Herb. Tothill* 170. Mango: no. 271. Lakemba: no. 348. Moala: no. 123. Totoya: no. 195. Matuku: common, but not yet abundant, no. 297.

Vern. name: Stickseed Grass.

10. POLLINIA Trin.

P. glabrata Trin. in Bull. Acad. St. Pétersb. i (1836) 70.

Mbatiki: *Tothill* 232a. Ngau: nos. 407, 415. Moala: several patches in heavy shade in woods, no. 108.

11. AMPHILOPHIS Nash.

A. glabra Stapf in Prain, Fl. Trop. Afr. ix. 172.

Viti Levu: Lautoka, Dec. 1925, *Greenwood* 12. Mbatiki: *Tothill* 232. Ngau: no. 409. Nairai: no. 382. Kanathea: no. 249. Nayau: no. 318. Lakemba: no. 335. Totoya: no. 193a. Matuku: an occasional plant seen in suitable situations, no. 285.

The specimens from Nairai and Mbatiki are sterile and their identification is therefore only tentative. Of the latter Dr. Tothill says: "This is the bluish grass that lends colour and character to the Caboni and Nanuku districts of Viti Levu." All the specimens enumerated above belong, so far as can be seen, to the epunctate variety or form of the species.

12. DICHANTHIUM Willemet.

D. caricosum A. Camus in Lecomte, Fl. Gen. l'Indo-Chine, vii. 318.

Viti Levu: Nasinu Experimental Stn., April 1926, *Tothill* 44. Vanua Levu: Lambasa, Sept. 1923, *Greenwood* 594a.

D. annulatum Stapf in Prain, Fl. Trop. Afr. ix. 178.

Viti Levu: common near Casey's Baths, Suva, April 1926, *Tothill* 3; August 1927, no. 242.

13. CYMBOPOGON Spreng.

C. refractus A. Camus in Rev. Bot. Appl. i. 279 (1921).

Viti Levu: Lautoka, April 1919, *Greenwood* 178z. Nandarivatu, Feb. 1927, *Tothill* 70. Kandavu: abundant on the dry leeward plains west of the Mission, no. 126. Kanathea: no. 251. Lakemba: no. 346. Totoya: no. 193. Matuku: nos. 281, 301.

C. coloratus Stapf in Kew Bull. 1906, 356.

Viti Levu: Nasinu Experimental Station, an escape from cultivation, 8 feet high, *Tothill* 42.

14. HETEROPOGON Pers.

H. contortus Beauv. ex Roem. & Schult. Syst. Veg. ii. 836.

Viti Levu: Latoka, March 1919, *Greenwood* 97z. Matuku: only a single clump seen, *Tothill* 310.

16. DIGITARIA Hall.

D. pruriens Buese in Miq. Pl. Jungh. 379.

Viti Levu: Lautoka, March 1919, *Greenwood* s.n.; Nandarivatu, Feb. 1927, *Tothill* 63, 68a; Suva, on lawn, 1926, no. 36. Kandavu: common by road, in cultivated fields and in shady places between Cape Washington Lighthouse and Mission, nos. 132, 135, s.n. Vatu Lele: very common as a weed of cultivation, nos. 141, 146, 147. Tomberua: no. 21. Moturiki: no. 4. Mbatiki: not uncommon in the few suitable situations, no. 238. Ngau: nos. 392, 394, 404. Nairai: nos. 378, 379. Koro: not very common but generally distributed, nos. 92, 103. Kanathea: nos. 257, 258. Vanua Mbalavu: *R. W. Paine in Herb. Tothill* 172. Mango: no. 268. Nayau: no. 323. Lakemba: nos. 332, 344. Kambara: nos. 353, 360. Fulanga: nos. 158, 160. Moala: nos. 121, 122. Totoya: nos. 191, 198. Matuku: nos. 296, 299.

D. longiflora Pers. Syn. i. 85.

Viti Levu: Lautoka, May 1919, *Greenwood* s.n.; Nandarivatu, Feb. 1927, *Tothill* s.n.; Suva, the Point, common on coast just above tide level, April 1926, no. 37; in a lawn, April, 1926, no. 38. Moturiki: no. 9. Mbatiki: common at Naingani, no. 231. Ngau: nos. 393, 394a, 402. Koro: uncommon, evidently a recent introduction, nos. 92a, 95. Vanua Mbalavu: no. 182. Mango: no. 262. Moala: thoroughly established along the paths, no. 114. Totoya: no. 205. Matuku: common, no. 294.

D. chinensis Hornem. Hort. Hafn. Suppl. 8.

Viti Levu : Nandarivatu, Feb. 1927, *Tothill* 68, 77, 99 ; Suva, April 1926, no. 55. Ngau : no. 412.

D. marginata Link, Hort. Berol. i. 229, var. *fimbriata* Stapf in Prain, Fl. Trop. Afr. ix. 440.

Differing from *D. pruriens* in the following :—*Annual*. Spikelets $\frac{1}{2}$ – $\frac{3}{4}$ in. long, stalked spikelet with spreading hairs on both sides, often mixed with short yellow bristles, forming a prominent fringe.

Viti Levu : between Penang and mountains, creeping on sides of drains and watercourses on open poor hillsides, 200 ft., March 1929, *Greenwood* 753.

Pantropical, but rare in America.

17. ERIOCHLOA H.B. & K.

E. procera C. E. Hubbard comb. nov. *E. ramosa* O. Ktze. Rev. Gen. Pl. ii, 775 ; Summerhayes and Hubbard in Kew Bull. 1927, 32. *Agrostis procera* Retz. Obs. iv. 19 (1786). *Milium ramosum* Retz. Obs. vi. 22 (1791).

Viti Levu : Suva, the Point, near seashore, April 1926, *Tothill* 33.

18. BRACHIARIA Griseb.

B. distachya Stapf in Prain, Fl. Trop. Afr. ix. 565 (1919), in obs. ; Summerhayes and Hubbard in Kew. Bull. 1927, 32.

Viti Levu : Suva, the Point, just above high tide, April 1926, *Tothill* 31 ; Lautoka, Dec. 1925, *Greenwood* 932. Moturiki : *Tothill* 12a. Mbatiki : fairly common in sandy situations, no. 224. Koro : no. 88. Kanathea : nos. 253, 259. Vanua Mbalavu : R. W. Paine in Herb. *Tothill* 174, *Tothill* 177. Mango : not common, no. 275. Kambara : nos. 167, 361. Fulanga : nos. 162, 165. Matuku : no. 293.

B. mutica Stapf in Prain, Fl. Trop. Afr. ix. 526.

Viti Levu : Suva, April 1926, *Tothill* 39. Mbatiki : one small patch near Naingani, no. 219.

Common throughout the river flats on Viti Levu.

20. PASPALUM Linn.

P. conjugatum Berg. in Act. Helv. vii. 129, t. 8.

Viti Levu : Lautoka, March 1921, *Greenwood* 1742 ; Nandarivatu, Feb. 1927, *Tothill* 71 ; Suva, April 1926, no. 57. Moturiki : no. 10. Leleuvia : no. 14. Mbatiki : no. 233. Ngau : no. 401. Nairai ; no. 381. Koro : fairly common but not yet abundant, no. 91. Naitamba : *Tothill* s.n. Vanua Mbalavu : no. 181. Mango : common, no. 273. Nayau : nos. 324, 325. Lakemba : no. 333. Kambara : no. 359. Moala : no. 111. Totoya : no. 202. Matuku : well established but in most places not common, no. 289.

P. vaginatum Sw. Prodr. Veg. Ind. Occ. 21.

Viti Levu : Suva, brackish swamps, covered at high tide, April 1926, *Tothill* 56. Kandavu : not uncommon along banks of

tidal creeks, no. 125. Tomberua : no. 22. Mbatiki : not common, no. 225. Ngau : no. 400. Koro : not uncommon on tidal creeks, no. 83. Kanathea : no. 256. Vanua Mbalavu : no. 187. Thikombia-i-Lau : no. 313. Mango : no. 266. Lakemba : no. 342. Moala : salt marsh grass, no. 115. Totoya : no. 200. Matuku : no. 304.

This is the common grass of the tidal flats just behind the dog (Bruguiera) zone (*Tothill*).

P. orbiculare Forst. Prodr. 7.

Viti Levu : Suva, April 1926, *Tothill* 59 ; Nandarivatu, Feb. 1927, no. 72. Vanua Levu : Lambasa, July 1923, *Greenwood* s.n. Moturiki : *Tothill* 5. Mbatiki : no. 227. Naitamba : *Tothill* s.n. Vanua Mbalavu : no. 180. Mango : no. 264. Nayau : no. 329. Moala : no. 110. Totoya : no. 197. Matuku : common, no. 279.

var. **cartilagineum** Summerhayes and Hubbard comb. nov. *P. cartilagineum* Presl. Rel. Haenk. i. 216.

Differs from the type in the lemma of the lower floret being cartilaginous instead of membranous.

Kandavu : between Cape Washington lighthouse and mission, not common, *Tothill* 127. Ngau : no. 389. Nairai : no. 373.

Distrib. of var. : Indo-Malaya and Polynesia, local.

Vern. name (of both species and variety) : Co-dina.

P. dilatatum Poir. in Lamk. Encycl. Méth. v. 35.

Viti Levu : Suva, Feb. 1927, *Tothill* 58 ; Nandarivatu, naturalised, Feb. 1927, no. 43.

Increasing rapidly in the Colony.

P. Urvillei Steud. Syn. Pl. Glum. i. 24 (1854) ; A. Chase in Contr. U.S. Nat. Herb. xxviii. 173, f. 108 (1929). *P. Larranagai* Arech. in Anal. Mus. Nac. Montevideo, i. 60, pl. 2 (1894). *P. Vaseyanum* Scribn. in U.S. Dept. Agric. Bull. 17. 32, f. 328 (1899).

Differs from *P. dilatatum* in the following respects :—Culms coarser and taller and erect, whereas in *P. dilatatum* they are geniculate at the base. Racemes more numerous, from 10–25 in number. Spikelets $\frac{1}{2}$ in. long.

Viti Levu : Nandarivatu, naturalised, Feb. 1927, *Tothill* 66.

Brazil to Argentina ; introduced into very many parts of the world.

Used mainly as a fodder grass and grown for hay in the United States. It flourishes best on wet, heavy land but can also withstand severe drought.

Vern. Name : " Vasey Grass."

21. STENOTAPHRUM Trin.

S. secundatum O. Ktze. Rev. Gen. Pl. ii. 794.

Viti Levu : Suva, Nasesi, just above tide level, April 1926, *Tothill* 49. Kanathea : no. 254.

A cultivated specimen was also collected on Mango. The field at Mango is said to "keep the working bullocks and cows in excellent condition."

S. subulatum Trin. in Mém. Acad. St. Pétersb. Sér. vi. Sci. Nat. iii. 190.

Leleuvia : *Tothill* 19. Mbatiki : no. 229. Ngau : on sea-shore, no. 405. Vanua Mbalavu : *R. W. Paine in Herb. Tothill* 171 ; *Tothill* 175a. Thikombia-i-Lau : no. 315. Lakemba : no. 340. Kambara : on or near the beach, no. 364. Fulanga : no. 155. Totoya : no. 194. Matuku : no. 309.

22. UROCHLOA Beauv.

U. reptans Stapf in Prain, Fl. Trop. Afr. ix. 601.
Ngau : *Tothill* 391.

U. paspaloides Presl, Rel. Haenk. i. 318.

Viti Levu : between Lautoka and Nadi, 100 ft., April 1929, *Greenwood* 593b ; Suva, on lawn, April 1926, *Tothill* 30. Kandavu : very common in western half, no. 133. Vatu Lele : very common, no. 144. Moturiki : no. 12. Leleuvia : no. 20. Mbatiki : common, no. 224a. Ngau : nos. 388, 395. Nairai : no. 377. Koro : very common, nos. 82, 99. Naitamba : no. 211, *R. W. Paine in Herb. Tothill* 213. Kanathea : *Tothill* 246. Vanua Mbalavu : no. 184. Thikombia-i-Lau : no. 314. Mango : not common, no. 277. Nayau : nos. 319, 326. Lakemba : no. 336. Kambara : no. 351. Moala : no. 117. Totoya : no. 204. Matuku : no. 300.

23. ECHINOCHLOA Beauv.

E. colona Link, Hort. Berol. ii. 209.

Viti Levu : Lautoka, May 1919, *Greenwood* s.n. ; Nandarivatu, Feb. 1927, *Tothill* 65 ; Suva, April 1926, no. 34. Vatu Lele : common around all three villages, no. 137. Moturiki : no. 7. Mbatiki : not yet common, no. 226. Ngau : no. 406. Koro : not common, only recently introduced, no. 89. Kanathea : no. 260. Vanua Mbalavu : *R. W. Paine in Herb. Tothill* 173. Mango : *Tothill* 274. Nayau : no. 322. Lakemba : no. 334. Kambara : no. 368. Moala : no. 118. Matuku : not common, no. 298.

24. OPLISMENUS Beauv.

O. hirtellus Beauv. Agrost. 54, 168.

Viti Levu : Nasinu Experimental Farm, under a tree, April 1926, no. 2a. Vatu Lele : one patch in fairly deep shade, no. 136. Mbatiki : no. 235. Ngau : no. 403. Nairai : no. 380. Koro : no. 101. Kanathea : no. 261. Vanua Mbalavu : no. 185. Mango : common in the few woodland situations remaining, no. 276. Kambara : nos. 352, 354. Fulanga : no. 164. Moala : no. 106. Totoya : nos. 192, 196. Matuku : no. 305.

O. compositus Beauv. Agrost. 54.

Viti Levu : Lautoka, April 1919, *Greenwood* 222z ; Nandarivatu, Feb. 1927, *Tothill* 62. Kandavu : common in shady places by path between C. Washington lighthouse and mission, no. 131. Vatu Lele : one of the commonest grasses in the woods, no. 143. Moturiki : no. 11. Mbatiki : not uncommon in the few shady woodland areas, no. 239. Ngau : no. 414. Nayau : no. 328. Lakemba : no. 338. Moala : no. 113.

O. imbecillis Roem. & Schult. Syst. Veg. ii. 487.

Viti Levu : Nasinu Experimental Farm, under a tree, April 1926, no. 2.

25. PANICUM Linn.

P. maximum Jacq. Ic. i. 2, t. 13.

Viti Levu : April 1919, *Greenwood* s.n. ; Suva, April 1926, *Tothill* 35.

P. decompositum R. Br. Prodr. 191.

Kanathea : on rock cliffs close to sea-shore, with reed, *Tothill* 243.

26. CYRTOCOCCUM Stapf.

C. oxyphyllum Stapf in Hook. Ic. Pl. t. 3096.

Kandavu : in shady places between C. Washington lighthouse and mission, uncommon, *Tothill* 130. Moturiki : no. 13. Mbatiki : no. 234. Ngau : no. 408. Koro : uncommon, in shady places in the woods, no. 87. Naitamba : *Tothill* s.n. Vanua Mbalavu : no. 182a. Mango : no. 272. Moala : no. 107. Totoya : no. 199. Matuku : no. 286.

26a. SACCOLEPIS Nash.

S. indica A. Chase in Proc. Biol. Soc. Washington, xxi. 8. *Panicum indicum* Linn. Mant. ii. 184.

Annual. Culms slender, simple or branched, $\frac{1}{2}$ –2 $\frac{1}{2}$ ft. high. Leaf-blades narrow, 1–6 in. long, $\frac{1}{12}$ – $\frac{1}{8}$ in. wide, usually glabrous, flat. Spikelets alike, awnless, falling entire from their very short stalks, on the axis of a cylindrical dense spike-like panicle up to 3 in. long by $\frac{1}{4}$ in. wide. Spikelets obliquely ovate, $\frac{1}{10}$ – $\frac{1}{8}$ in. long, strongly nerved, minutely hairy, 2-flowered with the upper floret alone perfect.

Viti Levu : Nasinu, common, April 1926, *Tothill* 1 ; Aug. 1927, no. 241. Also common at Quaraniqio on the Central Road, Suva.

27. SETARIA Beauv.

S. pallidifusca Stapf & Hubbard comb. nov. *S. glauca* Auct. ; Summerhayes and Hubbard in Kew. Bull. 1927, 38 ; non Beauv. *Panicum pallide-fuscum* Schumacher, Beskr. Guin. Pl. 58.

Tufted annual. Culms slender, usually geniculate at the base, up to 2 $\frac{1}{2}$ ft. high. Leaf-blades narrow, 2–12 in. long, $\frac{1}{12}$ – $\frac{1}{4}$ in. wide, glabrous except for a few long hairs near the base. Spikelets alike, awnless, each supported by about 8 persistent bristles, falling entire

from their very short stalks, on the axis of a dense cylindrical golden-brown spike up to 3 in. long, by $\frac{1}{4}$ – $\frac{1}{2}$ in. wide; bristles $\frac{1}{4}$ – $\frac{1}{2}$ in. long. *Spikelets* $\frac{1}{12}$ – $\frac{1}{10}$ in. long, 2-flowered, upper floret alone perfect.

Viti Levu: Lautoka, April 1925, *Greenwood*, s.n.; Nandarivatu, Feb. 1927, *Tothill* 67; Suva, April 1926, no. 48. Mbatiki: not yet common, no. 221. Koro: no. 104. Matuku: only near the Buli's town of Murimuri, no. 308. Common throughout Fiji (*Tothill*).

Tropical and South Africa, Indo-Malaya, Queensland and Polynesia.

Vern. name: Cat-tail Grass.

S. barbata Kunth, Rev. Gram. i. 47.

Annual. Culms slender, more or less branched, 1–6 ft. high, usually glabrous. *Leaf-sheaths* with hairy margins and usually hairy otherwise; blades narrowly lanceolate, 3–12 in. long by $\frac{1}{8}$ – $1\frac{1}{2}$ in. wide, closely pleated and crinkled when young, with rather long fine scattered hairs. *Spikelets* alike, awnless, each usually supported by a single bristle, very shortly stalked, on the branches of a narrow greenish rather loose and often irregularly interrupted panicle up to 9 in. long by $1\frac{1}{2}$ in. wide; bristles up to over $\frac{1}{2}$ in. long. *Spikelets* oblong or ovate, $\frac{1}{10}$ – $\frac{1}{8}$ in. long, 2-flowered, upper floret alone perfect.

Koro: common on the east side between Matana and the lighthouse, *Tothill* 81, 86. Not seen elsewhere in Fiji.

A native of West Africa; introduced into Tropical America, Mascarene Islands and Tropical Asia.

28. RHYNCHELYTRUM Nees.

R. roseum Stapf and Hubbard ex Bews, *The World's Grasses*, 223. *R. Dregeanum* Nees in Lindl. *Introd. Nat. Syst.* ed. ii. 447; Summerhayes and Hubbard in Kew. *Bull.* 1927, 38. *Tricholaena rosea* Nees, *Cat. Sem. Hort. Vratisl.* 1835 and in *Linnaea*, xi. Lit. Ber. 129.

Viti Levu: Lautoka, Dec. 1925, *Greenwood* s.n.; Suva, April 1926, *Tothill* 46. Naitamba: *Tothill* s.n.

Also common in the Bua province of Vanua Levu (*Tothill*).

28a. PENNISETUM Rich.

P. polystachyon Schult. in Roem. and Schult. *Syst. Veg.* ii. Mant. 146.

A tufted annual or perennial. Culms slender to stout, $\frac{3}{4}$ – $4\frac{1}{2}$ ft. high, simple or branched. *Leaf-blades* narrow, 2–16 in. long, $\frac{1}{8}$ – $\frac{1}{4}$ in. wide, glabrous or hairy. *Spikelets* alike, awnless, surrounded by numerous bristles and falling with them, from the axis of a dense yellowish or purple spike 2–10 in. long by $\frac{2}{3}$ – $1\frac{1}{2}$ in. wide; bristles densely hairy at the base, unequal, one longer than the rest, $\frac{2}{3}$ –1 in. long. *Spikelets* about $\frac{1}{8}$ in. long, 2-flowered, the upper floret alone perfect.

Viti Levu: Nasinu Experimental Station, wild in places, April 1926, *Tothill* 40.

A native of Tropical Africa and India.

A useful fodder grass, readily established from seed.

Vern. Name: Mission Grass.

P. macrostachyum (Brongn.) Trin. in Mém. Acad. St. Pétersb. Sér. vi. Sc. Nat. iii. II. 177.

Differing from *P. polystachyon* in the following:—A tall graceful perennial up to 8 ft. high. Culms stouter. *Leaf-blades* $\frac{3}{4}$ – $1\frac{1}{2}$ in. wide, rounded at the base, glabrous. *Spikes* up to 14 in. long and 1– $2\frac{1}{2}$ in. wide; bristles glabrous, longer ones of equal length, $\frac{3}{4}$ – $1\frac{1}{2}$ in. long.

Viti Levu: Tanavua, near Suva, semi-naturalised in a garden, *Tothill* 417.

Malaya, Philippines, New Guinea, Solomon Islands.

29. CENCHRUS Linn.

C. calyculatus Cav. *Ik.* v. 39, t. 463.

Kandavu: only one patch seen between Cape Washington lighthouse and mission, *Tothill* 128. Vatu Lele: occasional, no. 150. Mbatiki: only one plant seen during tour of island, no. 236. Koro: only two specimens seen on E. side between Matana and lighthouse, no. 85. Lakemba: no. 345. Kambara: no. 366. Totoya: no. 189. Matuku: not uncommon, no. 307.

C. echinatus Linn. *Sp. Pl.* 1050.

Viti Levu: Lautoka, Dec. 1925, *Greenwood* s.n.; Suva, April 1926, *Tothill* 52. Vatu Lele: only an occasional patch near the three villages, no. 142. Mbatiki: abundant, no. 237. Ngau: no. 396. Vanua Mbalavu: no. 183. Mango: no. 269. Kambara: no. 367. Fulanga: near the Buli's town, nos. 159, 159a. Totoya: no. 208. Matuku: no. 282.

30. THUAREA Pers.

T. involuta Kunth, *Enum.* i. 174.

Viti Levu: Suva, the Point, abundant, April 1926, *Tothill* 51. Vatu Lele: common, no. 140. Leleuvia: no. 18. Mbatiki: common, no. 228. Ngau: nos. 384, 386. Nairai: no. 380a. Koro: abundant, no. 93. Wailangi Lala: very abundant all over the island, no. 176. Kanathea: no. 255. Thikombia-i-Lau: no. 311. Mango: no. 263. Nayau: no. 321. Lakemba: no. 341. Kambara: no. 356. Fulanga: no. 153. Totoya: no. 200a. Matuku: common, no. 302.

Only recorded from or very near the sea-shore.

31. ISACHNE R. Br.

I. vitiensis Rendle in Journ. Linn. Soc. Bot. xxxix. 181.

Viti Levu: Nandarivatu, Feb. 1927, *Tothill* 64.

35. SPOROBOLUS R. Br.

S. indicus R. Br. *Prodr.* 170.

Viti Levu: Drasa, near Lautoka, April 1925, *Greenwood* 560 b; Suva, common on roadsides, April 1926, *Tothill* 26.

S. diander Beauv. Agrost. 26.

Viti Levu : Suva, April 1925, *Greenwood*, s.n. ; common on roadsides, April 1926, *Tothill* 28. Ngau : no. 398. Koro : no. 102. Vanua Mbalavu : no. 179. Mango : no. 270. Matuku : found only near the Buli's town of Murimuri, no. 283.

S. elongatus R. Br. Prodr. 170.

Differs from *S. indicus* in the long narrow more or less interrupted dense panicle with short branches, and in the acute unequal glumes, the longer one half the length of the spikelet.

Viti Levu : Rarawai, road from Nursery to Dumtas, June 1926, *Greenwood* 744 ; Suva, common on the Race Track, May 1926, *Tothill* 27. Lakemba : no. 339. Matuku : found only near the Buli's town of Murimuri, no. 284.

Indo-Malaya, Australia, Polynesia.

S. virginicus Kunth. Rev. Gram. i. 67.

Perennial. Culms erect or ascending from a long creeping rhizome, branched, up to 18 in. high, covered by the closely overlapping leaf sheaths. *Leaf-sheaths* bearded at the mouth ; blades narrow, rigid, inrolled, up to 6 in. long by $\frac{1}{8}$ in. wide, usually glabrous. *Panicle* much shorter and denser than in *S. indicus*, almost spikelike, $\frac{1}{2}$ –4 in. long, $\frac{1}{4}$ – $\frac{1}{3}$ in. wide. *Spikelets* as in *S. indicus*, $\frac{1}{12}$ – $\frac{1}{8}$ in. long ; lower glume $\frac{1}{2}$ – $\frac{2}{3}$ the length of the lemma.

Kambara : on or near the beach, *Tothill* 365. Fulanga : no. 154.

In most tropical, subtropical and warm temperate countries. A strand plant.

36. ERAGROSTIS Beauv.

E. tenella Roem. & Schult. Syst. ii. 576. *E. plumosa* Link, Enum. Hort. Berol. i. 192 ; Summerhayes and Hubbard in Kew Bull. 1927, 42.

Viti Levu : Suva, April 1926, *Tothill* 47. Vatu Lele : common on the sandy path between the villages on the east side, no. 149. Tomberua : no. 24. Mbatiki : well established in suitable places along paths and around villages, no. 223. Ngau : nos. 390, 410. Nairai : nos. 374, 375. Koro : fairly common around villages and along paths on east side of the island, no. 97. Naitamba : no. 210. Kanathea : no. 248. Vanua Mbalavu : no. 186. Lakemba : no. 348. Kambara : no. 358. Fulanga : no. 161. Totoya : no. 207. Matuku : uncommon, no. 306.

E. elongata Jacq. Eclog. Gram. 3, t. 3.

Differs from *E. pilosa* in the following :—A tufted *perennial*. Culms 4 in.–2 ft. high, slender. Mouth of *leaf-sheath* densely bearded. *Panicle* erect, rigid, open with short spreading branches or narrow and almost spike-like, 2–8 in. long. *Spikelets* almost sessile, 8–30 flowered, $\frac{1}{8}$ – $\frac{3}{8}$ in. long, $\frac{1}{12}$ in. wide ; lemmas $\frac{1}{12}$ in. long ; palea with hairy keels.

Nairai : *Tothill* 376. Koro : no. 80. Lakemba : no. 350. Kambara : not common, along sandy track on a coconut flat, no. 369. Fulanga : no. 156.

India, Malaya, Australia, Polynesia.

Considered an excellent feed for stock in Australia ; also suitable for making hay. All the specimens cited above agree very closely and are characterised by possessing a short very narrow panicle and greenish spikelets ; they might be held to constitute a definite variety of *E. elongata*.

37. CYNODON Pers.

C. Dactylon Pers. Syn. i. 85.

Viti Levu : Dec. 1925, *Greenwood* s.n. ; Nandarivatu, Feb. 1927, *Tothill* 74 ; Suva, from lawn, April 1926, no. 32. Vatu Lele : no. 151. Tomberua : no. 22a. Mbatiki : common, no. 222. Ngau : no. 385. Nairai : 372. Koro : abundant at towns and at lighthouse clearing, no. 94. Naitamba : *R. W. Paine in Herb. Tothill* 212. Kanathea : *Tothill* 247, 252. Thikombia-i-Lau : no. 316. Mango : abundant, no. 267. Nayau : no. 317. Lakemba : no. 331. Kambara : no. 362. Moala : no. 112. Totoya : no. 206. Matuku : no. 288.

Vern. name : " Australian Couch."

38. CHLORIS Swartz.

C. cynodontoides Bal. in Bull. Soc. Bot. Fr. xix. 318.

Viti Levu : Suva, near Casey's Baths, April 1926, *Tothill* 43. Moala : now well established, no. 120. Totoya : no. 201. Matuku : extremely abundant, no. 291.

39. ELEUSINE Gaertn.

E. indica Gaertn. Fruct. i. 8.

Viti Levu : Nandarivatu, Feb. 1927, *Tothill* 176 ; Suva, April 1926, no. 45. Vatu Lele : not common, but occasional about villages, no. 148. Tomberua : no. 23. Moturiki : no. 8. Leleuvia : no. 17. Mbatiki : fairly common, no. 220. Ngau : no. 383. Nairai : no. 371. Koro : no. 100. Kanathea : no. 245. Vanua Mbalavu : no. 169. Thikombia-i-Lau : no. 312. Nayau : no. 327. Lakemba : no. 347. Kambara : no. 357. Fulanga : no. 163. Moala : no. 116. Totoya : no. 203. Matuku : not common, no. 295.

40. CENTOTHECA Desv.

C. latifolia Trin. Fund. Agrost. 141.

Viti Levu : Mt. Evans, May 1919, *Greenwood* 42 ; Nandarivatu, Feb. 1927, *Tothill* 69 ; Suva, Nasinu, in fairly heavy shade, April 1926, no. 41. Leleuvia : no. 16. Mbatiki : not uncommon in shady places, no. 240. Ngau : nos. 397, 413, 416. Nairai : no. 370. Koro : common in shady places, nos. 84, 90. Vanua Mbalavu : nos. 166, 178. Nayau : no. 330. Lakemba : no. 343. Moala : no. 124. Totoya : no. 190. Matuku : no. 290.

Occurs in the bush throughout Viti Levu, from sea-level to 3000 ft. (Tothill).

40a. DACTYLIS Linn.

D. glomerata Linn. Sp. Pl. 71 (1753).

Tufted perennial. Culms moderately stout, erect or ascending, 6 in. to 3 ft. 6 in. high. Leaves mostly crowded at the base, glabrous; lower sheaths compressed and keeled; blades narrow, 4-12 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. wide, flat, rough. Spikelets alike, breaking up at maturity leaving the glumes, very shortly stalked, in dense clusters, forming a lobed, one-sided, more or less contracted panicle up to 6 in. long. Spikelets oblong, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, 3-7-flowered, greenish; lemmas awnless or shortly awned.

Viti Levu: Nandarivatu, naturalised, Jan. 1927, Tothill 60.

A native of the temperate regions of the Old World; introduced elsewhere.

Vern. names: "Cocksfoot," "Orchard Grass" (America).

41. LEPTURUS R. Br.

L. repens R. Br. Prodr. 207.

Viti Levu: Singatoka, beach, May 1921, Greenwood 224b. Vatu Lele: common just above high tide level, July 1927, Tothill 145. Tomberua: as in Vatu Lele, no. 25. Mbatiki: common on sandy beaches, no. 230. Koro: common along beach, no. 96. Kanathea: no. 250. Vanua Mbalavu: nos. 175, 175b. Mango: at mouths of creeks and along sea-shore, no. 265. Nayau: no. 320. Kambara: on or near the beach, no. 363. Fulanga: no. 157. Totoya: no. 209. Matuku: common, no. 303.

Schizostachyum glaucifolium Munro in Trans. Linn. Soc. xxvi. 137. (See K.B. 1927, p. 44).

Vanua Levu: Ndreketi, dwarf bamboo, Nov. 1928, Commander Burroughs in Herb. Tothill.

Description of New Species.

Ischaemum vitiense Summerhayes; affine *I. longisetum* Merrill a quo articulis racemorum crassioribus obtusangulis, spicula pedicellata basi fere glabra, glumis inferioribus apice breviter subacute bilobis, ima spiculae sessilis dimidio inferiore longe pilosa, superioribus acuminatis nec aristulatis differt.

Perennis. Culmi robusti, erecti, usque ad 45 cm. alti; innovationes intravaginales. Foliorum vaginae inferne laxae, superne angustiores involutae, glaberrimae, usque ad 17 cm. longae; ligulae lanceolato-triangles vel anguste ovatae, 3-7 mm. longae; laminae lineari-lanceolatae, acutissimae vel acuminatae, usque ad 30 cm. longae, 6-14 mm. latae, glabrae, omnino laeves, marginibus solum revolutis. Racemi bini, 8-13 cm. longi, circiter 5 mm. lati, fragiles; articuli spiculi vix dimidio breviores, 4 mm. longi, crassi, obtuse trigoni, intus leviter excavati tantum, angulis omnibus longiuscule albido-pilosis; pedicelli articulis breviores, basi et angulo exteriori

longe albido-pilosi, angulis interioribus glabris. Spiculae sessiles subfalcatis lanceolatae, 8-9 mm. longae, callo 1.5 mm. longo basi pilis albidis ipso duplo longioribus barbato, brunneae; gluma inferior 2 mm. lata, apice acute breviter bidentata, dorso longe pilosa, carinis latiuscule alata, alis ciliolatis breviter pubescentibus; gluma superior late lanceolata, valde concava, carinata, apice acuta, bidentulata, 7 mm. longa; anthoecium inferius ♂, lemmate lanceolato leviter obliquo 6 mm. longo membranaceo dorso pubescente, palea membranacea acuta carinis pubescentibus; anthoecium superius ♀, lemmate 5 mm. longo usque ad medium acute bifido firme membranaceo, arista leviter geniculata 2.2 cm. longa scaberula columna 8 mm. longa, palea oblongo-lanceolata 5 mm. longa sub-acuta. Spiculae pedicellatae oblique sed non falcatis lanceolatae, 7 mm. longae, brunneae; gluma inferior 2.7 mm. lata, apice inaequaliter acute bidentata, dorso basi longe pilosa, chartacea, carinis valde inaequaliter alata, alis ciliolatis; gluma superior lanceolata, acuta, 6.5 mm. longa, dorso pubescens; anthoecium inferius ut in spiculis sessilibus; anthoecium superius ♀, lemmate 4.5 mm. longo oblongo apice brevissime obtuseque bilobulato membranaceo, arista stricta 9 mm. longa scaberula, palea lemmati aequilonga.

Fiji Islands: Fulanga, only two clumps seen, July 30th 1927, J. D. Tothill 152.

XXX.—ADDITIONS TO THE INDEX KEWENSIS: XI.*

Kurz, Preliminary Report on the Forest and other Vegetation of Pegu, Appendices A, B, D.

Attention has been drawn by Professor W. G. Craib (in litt.) to the fact that numerous names of Burmese trees and shrubs proposed by Sulpice Kurz, the author of the "Forest Flora of British Burma," first appeared in his "Preliminary Report on the Forest and other Vegetation of Pegu" (1875). Their publication in this "Report," however, was for the most part overlooked at the time of preparation of the "Index Kewensis," and many of these names were consequently cited from later publications, thirteen of them being omitted.

For the convenience of botanists, especially those engaged in the study of the Burmese flora, a list of the names concerned is now supplied. New combinations (or names) are followed by the names on which they were based, while new species are accompanied by an indication of their geographical distribution. Names omitted from the Index Kewensis are denoted by an asterisk. M.I.S.

Agrostistachys longifolia, App. A. p. cxi. & App. B. 79: A. indica var. longifolia Muell. Arg.

*Albizzia angulata, App. B. 47.—Burma.

heterophylla, App. A. p. lvi.: Mimosa heterophylla Roxb. jiringa, App. A. p. lvi. & App. B. 47: Mimosa jiringa.

*Continued from Kew Bull. 1930, p. 41.

Artocarpus calophylla, App. A. p. cxxiv. & App. B. 82.—Burma.
Barringtonia asiatica, App. A. p. lxxv. & App. B. 52 : *Mammea asiatica*.
macrostachya, App. A. p. lxxvi. & App. B. 52 : *Careya macrostachya*.
Beilschmiedia globularia, App. A. p. c. & App. B. 73.—Burma.
Carumbium, App. A. p. cxiv. & App. B. 81 (*Euphorbiaceae*).
baccatum, App. A. p. cxiv. & App. B. 81 : *Excoecaria baccata*.
insigne, App. A. p. cxiv. & App. B. 81 : *Excoecaria insignis*.
sebiferum, App. A. p. cxiv. & App. B. 81 : *Excoecaria sebifera*.
Castanea lanceaefolia, App. A. p. cxxvii. & App. B. 88 : *Quercus lanceaefolia*.
rhamnifolia, App. A. p. cxxvii. & App. B. 88 : *Castanopsis rhamnifolia*.
Cephalostachyum Griffithii, App. A. p. cxxxviii. & App. B. 94 : *Teinostachyum Griffithii*.
schizostachyoides, App. A. p. cxxxviii. & App. B. 94.—Burma.
virgatum, App. A. p. cxxxviii. & App. B. 94 : *Melocanna virgata*.
Cicca Emblica, App. A. p. cvi. & App. B. 77 : *Phyllanthus Emblica*.
reticulata, App. B. 77.—Burma.
Cleistanthus myrianthus, App. A. p. cx. & App. B. 79 : *Nanopetalum myrianthum*.
**Cordia brunnea*, App. A. p. xcii. & App. B. 68.—Burma.
fragrantissima, App. A. p. xcii. & App. B. 68.—Burma.
Dendrocalamus Brandisii, App. B. 94 : *Bambusa Brandisii*.
calostachyus, App. B. 94 : *Bambusa calostachya*.
criticus, App. B. 94 : *Bambusa critica*.
Griffithianus, App. B. 94 : *Bambusa Griffithiana*.
longispathus, App. B. 94 : *Bambusa longispatha*.
Ellipanthus Helferii, App. B. 43.—Burma.
Endiandra Candolleana, App. A. p. ci. & App. B. 73 : *Dictyodaphne Candolleana*.
Eriobotrya bengalensis, App. A. p. lvii. : *Mespilus bengalensis*.
**Notoniana*, App. A. p. lvii. & App. B. 48 : *Photinia Notoniana Wight & Arn.*
**tinctoria*, App. B. 48.—Burma.
Eugenia acuminatissima, App. A. p. lxxiii. & App. B. 51 : *Myrtus acuminatissima*.
Ficus macropoda, App. A. p. cxxiii. & App. B. 86.—Burma.
Galearia Wallichii, App. A. p. cxiii. & App. B. 80 : *Bennettia Wallichii*.
Garcinia Roxburghii, App. A. p. xiii. & App. B. 27 : *Xanthochymus pictorius*.
Gigantochloa albo-ciliata, App. A. p. cxxxvi. & App. B. 93 : *Oxytenanthera albo-ciliata*.
andamanica, App. A. p. cxxxvii. & App. B. 93 : *Bambusa andamanica*.
auriculata, App. A. p. cxxxvii. & App. B. 94 : *Bambusa auriculata*.
Gironniera cuspidata, App. B. 87.—Burma.
lucida, App. A. p. cxvi.—Burma.
Glochidion Daltoni, App. A. p. cv. & App. B. 77 : *Phyllanthus Daltoni*.
nepalense, App. B. 77.—Burma.
sphaerogynum, App. A. p. cv. & App. B. 77 : *Phyllanthus sphaerogynus*.
Gluta elegans, App. A. p. xli. & App. B. 41 : *Syndesmis elegans*.
Hypobathrum racemosum, App. B. 59.—Burma.
strictum, App. B. 59.—Burma.
Isonandra caloneura, App. A. p. lxxxiii. & App. B. 63.—Burma.
polyantha, App. A. p. lxxxiii. & App. B. 63.—Burma.
Ixora naucleiflora, App. B. 57.—Burma.
Lindera assamica, App. A. p. ciii. & App. B. 74 : *Asperula assamica*.
Neesiana, App. A. p. ciii. & App. B. 74 : *Asperula Neesiana*.
nervosa, App. A. p. ciii. & App. B. 74 : *Tetranthera chartacea* var. *nervosa Meissn.*

Litsea angustifolia, App. A. p. cii. & App. B. 74 : *Actinodaphne angustifolia Nees*.
concolor, App. A. p. cii. & App. B. 74 : *Actinodaphne concolor Nees*.
Machilus indica, App. A. p. c. & App. B. 73 : *M. odoratissima*.
Mayodendron, App. A. p. xciv. ; App. B. 69 ; App. D. tt. 1, 2 (*Bignoniaceae*).
igneum, App. A. p. xciv. ; App. B. 69 ; App. D. tt. 1, 2 : *Spathodea ignea*.
**Melocanna baccifera*, App. B. 94.—Burma.
Melochia indica, App. A. p. xxiii. & App. B. 32 : *Visenia indica*.
Memecylon celastrinum, App. A. p. lxxvii. & App. B. 53.—Burma.
plebejum, App. A. p. lxxvii. & App. B. 53.—Burma.
Mimusops parvifolia, App. A. p. lxxxiv.—Burma.
Olea terniflora, App. A. p. lxxxviii. & App. B. 66 : *Linociera terniflora*.
Oreocnida acuminata, App. A. p. cxvii. & App. B. 82 : *Urtica acuminata*.
Payena Griffithii, App. B. 63.—Burma.
**Platea crassipes*, App. A. p. xxxiv. : *Stemonurus crassipes*.
**Polyalthia membranacea*, App. B. 24.—Burma.
Pongamia mitis, App. A. p. xlix. & App. B. 45 : *Robinia mitis Linn.*
**Ratonia adenophylla*, App. A. p. xxxviii. & App. B. 40 : *Sapindus adenophylla*.
**Sapindus verticillatus*, App. A. p. xxxviii. & App. B. 40 : *Scytalia verticillata*.
Sarcocephalus cadamba, App. A. p. lxxviii. & App. B. 60 : *Anthocephalus cadamba*.
Shorea nervosa, App. A. p. xviii.—Burma.
**Stephegyne rotundifolia*, App. B. 60.—Burma.
**Stereospermum crenulatum*, App. B. 69.—Burma.
Streblus microphylla, App. A. p. cxviii. & App. B. 86.—Burma.
taxoides, App. A. p. cxviii. & App. B. 86 : *Trophis taxoides*.
zeylanica, App. A. p. cxviii. & App. B. 86 : *Epicarpurus zeylanica*.
Terminalia pyrifolia, App. A. p. lix. & App. B. 49 : *Pentaptera pyrifolia Presl*.
**Tristania acuminata*, App. B. 50.—Burma.
**Walsura quinquejuga*, App. A. p. xxxiii. & App. B. 37 : *Heynea quinquejuga Roxb.*

XXXI.—ON THE GENERA MORICANDIA AND ORYCHOPHRAGMUS. H. K. AIRY-SHAW.

Attention has recently been drawn to the Chinese Crucifer often known as *Moricandia sonchifolia*, by an illustrated note in The Gardeners' Chronicle for April 5th of this year. Under current classification, and by the rules of priority, this name must be replaced by *Orychophragmus violaceus*.

A. P. de Candolle founded the genus *Moricandia* in his *Systema Naturale* ii. 626 (1821), with three species : (1) *M. arvensis* (the standard species of the genus), based upon the *Brassica arvensis* of Linné ; (2) *M. hesperidiflora*, based upon Forskål's *Hesperis acris*, = *Diplotaxis acris* (Forsk.) Boissier ; (3) *M. teretifolia*, based upon Desfontaine's *Brassica teretifolia*, = *Pseuderucaria teretifolia* (Desf.) O. E. Schulz.

At the present day six species are recognised in addition to the original *M. arvensis* (L.) DC., all of them natives of the Mediterranean region (one species, *M. sinaica* Boiss., extending eastwards as far as Baluchistan).

The genus *Orychophragmus* was established by A. Bunge in the Mém. Acad. Sci. St. Pétersb. ii. 81 (1835) (reprint, p. 7), in his enumeration of the plants collected by him when attached to the Russian mission to Pekin in 1831. The one species, *O. sonchifolius*, which he described at that time, together with *O. Winkleri* (Regel sub *Moricandia*) O. E. Schulz, are the only known members of the genus. The former is distributed over the greater part of China; the latter appears to be unknown outside Buchara.

Bunge's plant had, however, unknown to him, been discovered nearly a century earlier. In the year 1916, O. E. Schulz, the present distinguished monographer of the Cruciferae for "Das Pflanzenreich," established the identity of Bunge's species with Linné's *Brassica violacea* [Sp. Pl. ii. 667 (1753)]. Linné had already described the plant in his Hortus Upsaliensis 191 (1748), as *Brassica foliis lanceolato-ovatis glabris indivisis dentatis*, where he also states: "Habitat in China, misit Cel. Gmelinus. Hospitatur in apricario, biennis. Flores violacei magni."

It is to be noted that Linné received the seeds of the plants grown in the University Botanic Garden at Uppsala from Gmelin. The latter subsequently, in his Flora Sibirica iii. 265 (1768), described an *Eruca foliis subtriangularibus ex sinuato-dentatis*, adding: "E semine sinico in horto academico [sc. Petropolitano] enata est. An est *Brassica violacea*, LINNAEI?" This surmise was correct, for doubtless the "semen sinicum" had been collected by Gmelin himself, and the plants grown at St. Petersburg and Uppsala therefore came from the same source. Gmelin's description of the plant is an excellent one, though his figure (tom. iii., tab. lxi.) is not so good. The third volume of the Flora Sibirica was edited by Samuel Gottlieb Gmelin, nephew of Johann Georg, the author, and appeared in 1768, its publication having been delayed by the death of the latter in 1755. The materials for the work had, however, been accumulated by the author in the course of his travels in Siberia and Northern China during the years 1743 to 1753. His "*Eruca*" was actually collected near Pekin, according to a note by Linné in Willdenow's Herbarium (no. 12212), so we are told by O. E. Schulz.

Such is the not uninteresting history of the discovery and introduction into cultivation of the plant now frequently known as *Moricandia sonchifolia* Hook. fil. The credit—if such it be—of transferring this species of *Orychophragmus* to *Moricandia* should not, however, be ascribed to Sir J. D. Hooker [Bot. Mag. cii. t. 6243 (1876)], since the transference had already been effected by Ledebour in the year 1841, when he published his "Commentarius in J. G. Gmelini Floram Sibiricam" in the Baier. bot. Ges. Denkschr. iii. 43-138 (Regensburg). The name will be found at the top of p. 108 of that work.

For several reasons, however, this transference can hardly be justified, and Bunge's genus should be upheld. Though the diagnostic character (seeds 1-seriate), upon which Bunge relied for

establishing *Orychophragmus* as distinct from *Moricandia*, is now known to be invalid (for both 1- and 2-seriate seeds occur in the latter genus), there are other points of distinction which appear to be constant. These may be summarised as follows.

	<i>Orychophragmus</i>	<i>Moricandia</i> (and <i>Douepia</i>)
Habit:	Herbaceous	Suffrutescent
Leaves:	Membranous, sometimes hairy	Fleshy, or at least succulent, always glabrous.
Anthers:	Mucronate	Acute
Seeds:	Not winged	Narrowly winged

The geographical areas of the two genera are also quite separate, as indicated at the commencement of this note, a fact which lends support to the case in favour of their distinctness.

In conclusion, an enumeration of the nomenclatural vicissitudes through which *Orychophragmus violaceus* (L.) O. E. Schulz has passed, may not be out of place.

[1743-1748. Discovered by J. G. Gmelin in Northern China.]

1748. *Brassica fol. lanc.-ov. glabr. indiv. dent.*, Linné, Hort. Upsal. 191.

1753. *Brassica violacea* Linné, Sp. Pl. ii. 667.

1768. *Eruca fol. subtriang. ex sin.-dent.*, J. G. Gmelin, Fl. Sib. iii. 265.

1769. *Raphanus violaceus* Crantz, Class. Cruciform. emend. 112.

1835. *Orychophragmus sonchifolius* Bunge, in Mém. Acad. Sci. St. Pétersb. ii. 81.

1841. *Moricandia sonchifolia* Ledebour, in Baier. bot. Ges. Denkschr. iii. 108; Hooker fil. (quasi de novo), in Bot. Mag. cii. t. 6243 (1876); E. Regel (Hook. fil. auctore citato), in Gartenfl. xxviii. 24, cum fig. (1879).

1916. *Orychophragmus violaceus* O. E. Schulz, in Engl. bot. Jahrb. liv. Beibl. n. 119, 56; et in Engl. Pflanzenr. Abt. iv. 105: Hft. 84, 74 (1923).

XXXII.—*BEGONIA PLAGIONEURA*. E. MILNE-REDHEAD.

The determination of *Begonias* is frequently difficult even when the country of origin is known, owing to the great wealth of species in almost all areas in the tropics. When the native country is in doubt it is necessary to compare the whole material of the genus, as there is no monographic account of it more recent than 1864. The keys in floras utilize characters drawn from both the male and female flowers, and the absence of either is a bar to determination by this method. Hence it is not surprising that the *Begonia* described below, which has been in cultivation for at least thirty-five years, should not hitherto have been identified satisfactorily, since it has apparently never produced female flowers and its origin is unknown.

A specimen of this *Begonia*, which was in cultivation at Kew under the name of *Begonia debilis*—a very different plant from Malaya—was identified at the Herbarium, in 1895, as *Begonia*

Schottiana Alph. DC., a Brazilian species to which it bears considerable superficial resemblance. Subsequently, in 1925, it was found to differ in certain not very obvious but nevertheless significant characters, but it proved impossible to match it with any material in the Herbarium, and it was considered inadvisable to describe it as a new species in the absence of female flowers. As it is a valuable decorative plant, however, it seems desirable to give it a binary name, although the possibility that it may be a horticultural hybrid cannot entirely be excluded.

Begonia plagioneura Milne-Redhead; affinis, ut videtur, *B. Schottianae* Alph. DC., a qua foliis longipetiolatis supra glabris, nervis lateralibus paucioribus obliquis, sepalis glabris facile distinguitur.

Frutex erectus, vix 1 m. altus, ramis elongatis, caule basi circiter 0.6 cm. diametro glabrato, basibus persistentibus pilorum delapsorum notato, cortice brunneo plus minusve longitudinaliter findente, internodiis 4.5–6 cm. longis; rami ascendentes, 30–40 cm. longi, flexuoso-anfractuosi, internodiis 1–3 cm. longis, densiuscule breviuscule villosopilosi, pilis basi incrassatis debilibus ascendentibus vel plerumque appressis; ramuli inferne pallide brunnei, superne subherbacei. *Folia* valde obliqua, sublanceolata, latere altero inferne valde gibboso, altero leviter curvato tantum, 3.5–7 cm. longa, 1.5–3.5 cm. lata, acuminata, basi inconspicue inaequaliter subcordata, margine conspicue undulato irregulariter repandodentato, tenuiter carnosa, supra glabra, subnitidula, impresses foveolato-punctata, nervo medio lateralibusque impressis, subtus nitidula, multiareolata, areolis albis, nervis satis prominentibus breviter appresse crispule villosis, mesophyllo glabro; nervi laterales latere uno 3–4 altero 4–5, obliqui, 1 vel 2 inferiores utrinque breves, secundus vel tertius supra basin utrinque valde obliquus, nervo medio subparallelus, in dentem marginalem $\frac{2}{3}$ supra basin excurrens; petioli 1–2.5 cm. longi, villosopilosi; stipulae ovato-oblongae, 4–5 mm. longae, longiuscule mucronatae, membranaceae. *Pedunculi* 2–4 cm. longi, rubelli, sparse pilosi. *Cymae* semel furcatae, ramis circiter 0.5 cm. longis 4–5-floris; pedicelli glabri, supra basin constricto-articulati; bractae stipulis satis conformes, membranaceae, albidae. *Flores masculi* tantum noti; torus parvus, hemisphaericus; sepala 2, suborbicularia (in alabastro subreniformia), circiter 1.5 cm. diametro, glabra, extus scintillanti-punctata; petala 2 (vel 3–4) anguste obovata, 1 cm. longa, 0.5 cm. lata. *Stamina* circiter 19; filamenta 0.5–0.75 mm. longa; antherae oblanceolato-oblongae, circiter 3 mm. longae connectivo thecas 0.7 mm. superante 0.8 mm. lato incluso, fere 1 mm. latae.

Shrub, erect, up to 1 m. high. *Stem* glabrous with brown bark splitting longitudinally, and long branches. *Leaves* very obliquely sublanceolate, acuminate, inconspicuously subcordate at the base, 3.5–7 cm. long, 1.5–3.5 cm. broad, slightly fleshy, glabrous except for curly villous hairs on the veins beneath; margin wavy, irregularly toothed; petioles 1–2.5 cm. long, villous-hairy. *Flowers* in

axillary once-forked cymes at the ends of the shoots. *Male flowers* white, 3 cm. in diameter. *Sepals* 2, suborbicular, about 1.5 cm. in diameter. *Petals* 2, or more rarely 3–4, narrowly obovate, 1 cm. long, 0.5 cm. broad. *Stamens* about 19; filaments short; anthers oblanceolate-oblong, about 3 mm. long including the connective, which overtops the loculi.

Begonia plagioneura thrives best in a light loamy soil, and delights in a warm moist atmosphere where the temperature of the house does not fall below 55° Fahr. It is propagated by cuttings which root readily at any time of the year. It is very useful as a pot plant for decoration in the Conservatory.

XXXIII.—MISCELLANEOUS NOTES.

Exhibition of Drawings made by Professor Daniel Oliver.—Professor Daniel Oliver, F.R.S., F.L.S., LL.D., botanist and artist, occupied the position of Keeper of the Herbarium at Kew from 1864 to 1890. (*K.B.* 1893, p. 188; 1894, p. 78; and 1917, pp. 31–36). To celebrate the centenary of his birth an exhibition of his drawings and paintings has been arranged in a room in Museum No. 4 in the Royal Botanic Gardens, Kew. Professor Oliver's eminence as a botanist during the latter half of last century is well known: his ability as an artist, however, has not been so generally recognised. He was connected with the Herbarium from 1858, and during a considerable part of that time he was also Professor of Botany at University College, London. He took a prominent part in the work of the Royal Society, Linnean Society, and other learned institutions, and was able, therefore, only to indulge in his hobby, "art," during his limited leisure. However, by early rising and by taking full advantage of his annual leave, he cultivated his talent and kept alive his interest in drawing and painting until he was able to exercise it more fully during the 27 years of his retirement.

In his younger days he appears to have concentrated upon plant drawings, which he found a great aid to his scientific work, but later in life most of his leisure time was spent in sketching scenery and architecture. In the catalogue describing the 60 pictures shown, it is stated, "After he had reached the age of forty, his holidays became entirely given over to sketching. During the seventies these were largely spent in Jersey and France, as his parents had migrated to Jersey for their health. In France his chief interest was with the fine cathedrals and churches and especially in the medieval sculpture; and later on he had a number of his studies of these reproduced in a series of 'Decades' entitled *Plant and Animal Forms by Workmen of the Middle Ages*, examples of which are here exhibited (Nos. 47 and 48)."

The pictures exhibited are chiefly water-colour and sepia studies of landscapes and architecture, which include drawings made in Northumberland, Westmorland, Jersey, France and other places.

The exhibition is termed "The By-products of a Botanist," and a foreword by Mr. Noel Rooke describes the peculiar characteristics of Professor Oliver's work.

"The present Exhibition has a twofold interest. The second is of much the greater importance; but the first, which may seem to concern the student only, should be noted by others as well.

Professor Oliver may be looked on as one of the last, perhaps the very last, of the English amateurs who was entirely free from the influence of photographic vision. He is, therefore, two generations distant from the present reaction against it, and is, of course, using a language which is entirely foreign to that which expresses the thoughts of to-day."

The exhibition is made by Professor F. W. Oliver, F.R.S., and the Misses Oliver, son and daughters of Professor Oliver, and in the preparation of the catalogue they have given brief descriptions of their father's life and work, and of the pictures exhibited. W.D.

Spartina Townsendii* in New Zealand.—The value of *Spartina Townsendii* H. & J. Groves in the consolidation of tidal mud-flats has been recognised in this country for a number of years. It is therefore of interest to read of the results obtained in New Zealand by planting this grass in an area very similar to those coastal zones in Great Britain upon which *Spartina* has proved so successful.

In 1913 a number of plants obtained from Southampton Water were planted in clumps on the mud-flats at Foxton in the tidal estuary of the Manawatu River, North Island. To-day the grass has spread considerably, the largest patch measuring 57 feet by 33 feet, a rate of spread quite comparable with that observed along our own coasts.

Dr. H. H. Allan's observations show that the grass behaves in New Zealand just as it does at Poole Harbour and other similar situations along our British Coasts. He notes that the grass rarely increases by seedlings but mainly by vegetative extensions of the clumps, and its inability to compete successfully with *Juncus* and other plants of the more consolidated mud confirms what has already been observed in this country.

In view of the suspected hybrid origin of *Spartina Townsendii* with *S. stricta* L. and *S. alterniflora* Lois. as possible parents, the discovery by Dr. Allan of a few tufts of a *stricta*-like plant in the main patch at Foxton is of interest. The suggestion is made that this plant is a segregate from such a hybrid, though this possibility is somewhat weakened by the fact that a few plants of *S. stricta* may have been originally planted in 1913.

These experiments in New Zealand serve once again to demonstrate the extreme usefulness of *Spartina Townsendii* in the reclamation of tidal mud-flats. The results of the dual action of this grass in binding the mud and in preventing sea erosion can be effectively produced in no other way.

F.B.

*H. H. Allan in New Zealand Journal of Agriculture, XL, 189 (1930).

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XXXIV.—ON THE FLORA OF THE NEARER EAST: VI.*

A CONTRIBUTION TO OUR KNOWLEDGE OF THE FLORA OF AZERBAIDJAN, N. PERSIA. B. GILLIAT-SMITH AND W. B. TURRILL.

THE PERSIAN PROVINCE OF AZERBAIDJAN.

Topography.—Azerbaijan (often spelt Azerbaijan or Azerbijan) is the most north-westerly province of Persia. It is divided from Soviet territory to the north by the river Aras (Araks or Araxes), has Turkish territory on the west, and is separated from the Caspian Sea on the east by the narrow province of Talysch. The province is the most fertile and the most healthy in Persia. The capital town of Tabriz is situated to the east of the large Lake Urmia at an altitude of 1340 m. (4400 ft.) and is just north of the centre of the province. The town itself is built in the valley of the Aji Chai ("Bitter River") which runs into the east of Lake Urmia. Its population is said to be over 200,000. Other spellings of the name, still sometimes used, are Toris and Tauris (the latter being especially used by the French and also by the Indo-European Telegraph Company).

The large salt water lake of Urmia is named with the town, which lies a short distance from its present western shores. The name is variously written Urmi, Urumia, Urumea, Urumiyeh, Ooroomieyal and Urumiyah. Since the advent of the present régime the name of the town, and presumably of the lake, has been changed to Rizaieh. The following particulars are mostly taken from a paper by R. T. Günther published in the Geogr. Journ. xiv. 505 (1899).

The Urmia Lake-basin is situated upon a plateau of over 4000 feet above sea-level and forming the water-parting between the rivers flowing into the Caspian Sea and into the Persian Gulf, or between the Arctic and Indian Oceans, since geologically and faunistically the Caspian is regarded as belonging to the Arctic system. On the plateau is a depression of which 1795 square miles are at present occupied by the Lake of Urmia and its islands at low water. The level of the Lake is about 4100 ft. above sea-level, about 4184 ft. above the level of the Caspian, and about 1114 ft. lower than Lake Van (5214 ft.). Its depth probably does not exceed 50 ft. and its average depth is probably less than 20 ft.

The size of the Lake is continually changing with the season of the year and with less regular but longer fluctuations. It is about

*Continued from K.B. 1930, p. 126.

80 miles from north to south and 24 from east to west. The shores are for the most part of a very gentle gradient; but at certain places hills of Miocene limestone or of volcanic origin rise up abruptly from the usually flat shores. The waters of the lake are very salt. Günther and Manely [Proc. Roy. Soc. lxx. 316 (1899)] give the total salts in two samples of 100 grams of water as 14.814 and 14.893 respectively. In the Encyclopaedia Britannica, ed. xi. vol. xvi. 87 (1911), the total salts in 1000 grams of water are said to be 222.7730 grams, which is more than is given for the waters of the Dead Sea. It is certainly too salt to permit of the existence of fish life and apart from a species of *Artemisia*, the larva of a dipterous insect, bacteria, and diatoms the waters are lifeless.

To the north of the Lake lies the range of the Mishou (Mesho) Dag, on which a considerable number of the plants enumerated below were collected.

To the south of Tabriz are low hills constituting the forelands of the now extinct volcano of Sahand (or Sahend), which reaches to an altitude of 3650 m. (12,000 ft.).

The central districts of Azerbaidjan are frequently subjected to great earthquakes, of which a recent one did great damage in and near Salmas and Khoi (see "The Times," 12 May, 1930, and "The Near East and India," 19 June, 1930, p. 687).

Geology. Tabriz itself is on recent alluvial and Pleistocene rocks. To the south one quickly reaches volcanic tuffs and the andesite, trachyte, basalt and so on of the extinct volcano of Sahand. Miocene and Pliocene beds outcrop to the north of Tabriz and more volcanic tuffs appear. A. F. Stahl deals in outline with the geology of Persia in the Handb. der Regionalen Geologie, 8 Heft, Bd. V. 6 (1911) and the same author orographically and geologically describes the Kara Dag in a paper in Peterm. Geogr. Mitt. 1. 227 (1904) and records geological observations in N. W. Persia in a later paper in op. cit. lv. 1 (1909). In the map accompanying the last paper, a narrow strip of country is geologically mapped across Azerbaidjan, including the area immediately around Tabriz itself. Instead, however, of quoting from Stahl's paper we prefer to publish a translation of an unpublished account of the geology around Tabriz prepared by Mons. H. Rieben, a Swiss geologist resident in Tabriz, and whom we thank for his valuable contribution to our paper.

Geological description of the district around Tabriz.

By Mons. H. Rieben.

(Translated by W. B. Turrill.)

The immediate environs of Tabriz, within a radius of 20 to 30 km., include only Tertiary or Quaternary alluvial strata, or their remains.

The oldest beds date from the Upper Miocene and may be Tortonian. Similar gypsum- and salt-bearing layers are widely

spread from Asia Minor to Afghanistan, but are without fossils. It is possible, in places to the east of the town, to observe the continuous profile of these beds which pass upwards into the Pliocene; the only striking unconformity is that which separates the Tertiary beds from the horizontal conglomerates forming sometimes the cornice of the Quaternary terraces.

The main part of the Miocene is characterized by the abundance of red sandstones, alternating at first with some conglomerates, then higher with red, then with grey, and then with yellowish marls. Once past the cliffs of the chain of Ainali, which dominate the town to the north and the north-east, these beds give usually an aspect of "bad-lands" to the country. Intrusions of trachytes occur, as in the dome of Bahlul Dag, some 20 km. to the north, which is a laccolith piercing the red sandstones. These red sandstones are without fossils, apart from a few rare traces of plant remains, and have extremely eroded surfaces, often with salt. The marls in certain places are rich in gypsum and equally in salt; their outcrops are always recognised by their sterility. To the south of Tabriz, a sector symmetrical to the preceding, more homogeneous still, includes the accretions furnished from before the end of the Miocene and during the Pliocene by the massif of Sahand, formerly a considerable volcano. Its most northerly deposits are some twenty or twenty-five kilometres from Tabriz and form the extreme north of the massif. The latter is separated from the plain of Tabriz to the north, from Lake Urmia to the west, and from the Tertiary chain with red sandstones mentioned above to the north-east, by vast masses of deposits attaining a mean altitude of 400 m. above that of the town and stopping at a level of a striking regularity; that of the high terrace. The end of this ancient delta is now cut by numerous valleys of unequal length, the most important extending even up to the Sahand; three only possess a nearly permanent stream of water; they are separated one from the others on the fringe of the plateau, by the small chains of rounded hills which project towards the plain. The sandy watersheds are strewn with large pebbles, trachytes, andesites, pumice-stones, etc., which a long exposure to the elements has often rendered very friable. Sometimes a high proportion of this sand comes from beds of rather thick cinders, more or less horizontal and alternating with conglomerates of the same volcanic elements or with sandstones or with banks of sand hardly cemented. All these deposits have a great porosity and allow the water to penetrate, this being retained by the lacustrine clays which occur at the base of the hills and of the last promontories which project into the plain of Tabriz. These white clays with small fishes (*Brachylabrus persicus* Priem) alternate equally with the beds of volcanic cinders and some banks of conglomerate of slight thickness where one already meets the trachytes of Sahand; they pass suddenly but without apparent discordance into the Miocene of which we have spoken above.

To the East of Tabriz, following the axis (WWN-EES) of the Iranian chains is a zone of transition that often covers the deposits again and where are clearly visible, as everywhere else, two, three, or four stages of terraces, marking the stages of retreat of Lake Urmia. This zone extends from the cliffs of red sandstone of Ainali to the N.E. of the town, at the base of the alluvial or Pliocene deposits coming from Sahand to the east. Here the sandstones and the red marls have given place to clear marls or clays, with interbedded bands of limestone, carbonaceous shale, and lignite; lagune facies with abundant plant impressions and small molluscs (*Planorbis* and *Limnaea*), and veins and beds of gypsum are also frequent. To the south of Sari Dagħ or yellow hill of the suburb of Bagħ-Meche the beds become more and more horizontal passing into the clays with small fishes and cinders of the Pliocene.

The town of Tabriz is constructed in the eastern angle of a vast lacustrine plain marking the last retreat of that inland Pleistocene sea of which Lake Urmia is the actual vestige. Adji-Tchai flows into the lake near the town. This stream after having cut through in one place or another all the beds of red sandstone and marls of the Upper Miocene whose salt springs it drains, stretches its branches and meanders to the centre of the plain which becomes more and more a desert of salt as one approaches Lake Urmia. Towns and villages occur along the edge of this plain and the alluvial beds actually spread in large cones overlapping one another and having slight slopes.

Around Yam, between Marand and Sofian, are found the same Upper Tertiary strata. The red salt-bearing marls there form the bottom of some rather swampy valleys. Sandstones and conglomerates are much more volcanic than those to the north of Tabriz; of a grey colour, they are sometimes cut through by very thin dykes; these apparently belong to the Upper Miocene or perhaps to the Pliocene.

That which makes Yam a peculiar place is the imposing presence of Mishou Dagħ, whose chain, commanding the northern end of Lake Urmia, terminates suddenly at Yam, where it immediately passes under the above-mentioned Tertiary rocks. The mountain which dominates Yam to the south is formed by a crystalline mass of red porphyritic granites, gabbros, and others which in many places result from (? in) the metamorphism of the sedimentary rocks. The eastern summits of Mishou, in particular that of Yam, are formed by a cap of generally greyish or pale limestones, which some clayey fossiliferous beds indicate are of Permian or Carboniferous age. Whilst at the base of Mishou, at least near Yam, there appear some thin beds of greyish black limestones with numerous fossils of *Orbitolina*; all the evidence indicates a Cretaceous age for these.

The pass of Yam is at an elevation of about 400 m. above the plains of Tabriz and Marand. Of a length of about 3 km., it is formed of a line of alluvial cones of different dates and of materials from

different sources, as proved by their relation to the vestiges of primitive cones corresponding to the base of the upper terraces of the Pleistocene. The arable ground is of unusual thickness which facilitates the cultivation of cereals. In spite of their altitude, these alluvial beds have not been weathered away because of the chain of volcanic grits, immediately to the north of the entrance, thus facing Mishou Dagħ, and like it orientated along the axis of the Iranian foldings. All these alluvial beds have come from Mishou Dagħ; some such cones show only crystalline debris, others blocks of limestones, and others mixtures of these materials, according to the orientation of the ravines and their collecting basins.

Memorial School, Tabriz, Nov. 1929.

Hubert Rieben.

Climate.—Some general notes on the climate of central Azerbaidjan are given in the account of botanizing during 1925-29 published below. Dr. C. E. P. Brooks informs us that practically no information on the climate of the Tabriz district is available at the Meteorological Office. Supan [in Peterm. Geogr. Mitt. Ergänzungsband xxvi. Heft 124, 64 (1898)] gives the following rainfall for Urmia (Urmiah), apparently based on one year's records:

	mm.		mm.
January ...	43	July ...	—
February ...	72	August ...	12
March ...	103	September ...	16
April ...	133	October ...	38
May ...	62	November ...	24
June ...	11	December ...	33
Year 547.			

PREVIOUS BOTANICAL EXPLORATION OF AZERBAIDJAN.

Previous to the collection enumerated in this paper the only material from Azerbaidjan to be found in the large European herbaria has been obtained by travellers who have remained in the country for relatively short periods and usually only for the spring or summer season. The following list is as complete as it has been possible to make it but probably some small collections have been overlooked and there may be some of which no accounts have been published.

Olivier and Bruguère made a collection in 1796-97 in Iraq, north and west Persia. According to De Candolle [La Phytographie 438 (1880)] 720 species are represented in the main collection which is at the Muséum d'hist. nat. de Paris, with duplicates in Herb. de Candolle. It has not been possible to ascertain how many of these are from Azerbaidjan.

Bélanger at the beginning of his "Voyage aux Indes-Orientales pendant les années 1825-1829" visited Persia and passed through Tabriz. His specimens are at Geneva (Herb. Delessert). Some of the Persian Spermatophyta he collected were figured in his

" Voyage-Planches " but no descriptions were published by him. *Cirsium spectabile* (Pl. ii), for example, was first described in DC. Prodr. vi. 641 (1837) and *Cousinia aggregata* in l.c. 553. Exact localities for Bélanger's specimens are not known.

The Russian naturalist **Szowits** made a rich collection of plants in 1828 in Azerbaidjan, especially in the neighbourhood of Tabriz, Khoi, and Urmia. His main collection is at Leningrad but less complete sets are to be found in many European herbaria, and Kew possesses a considerable number of sheets collected by him. New species, first found by Szowits, were described mainly by Fischer and Meyer (Ind. Sem. Hort. Petrop), de Candolle (Prodromus), and Boissier (Flor. Or.).

In 1837, **Aucher-Eloy**, on his second expedition into Persia, entered the country from the north and botanized around Khoi, Salmas, and Tabriz. An account of his route is given in his Relations de Voyages en Orient ii. 399-403 (1843). His plants were described largely by Boissier (in Ann. Sci. Nat., Diagnoses, and Flor. Or.) and by Jaubert and Spach (Illustr. Flor. Or.).

Buhse in 1847-49 travelled widely in Armenia and North Persia. He spent a considerable part of June and all or most of July 1847 in Azerbaidjan. An account of his route and an enumeration of his specimens are given in the work by Boissier and himself Aufzählung der auf einer Reise durch Transkaukasien und Persien gesammelten Pflanzen (Moskau, 1860).

Seidlitz travelled round Lake Urmia in Sept.-Oct., 1856, having previously twice visited the Sahand Range. An account by him of his journey round the Lake is published in Peterm. Geogr. Mitt. 1858, 227. Boissier named several plants after him, including *Inula Seidlitzii* in Flor. Or. iii. 189 (1875), and the Chenopodiaceous genus *Seidlitzia* Bunge ex Boiss. Flor. Or. iv. 950 (1879) also commemorates him. Bunge, dealing with Persian *Labiatae* in Mem. l'Acad. Imp. Sci. St. Petersburg. Ser. vii. tom. xxi. No. 1 (1873), also refers to specimens collected in Azerbaidjan by Seidlitz.

Bunge left the Russian expedition to Persia and Afghanistan, 1859, and returned to Russia with his assistant Bienert via N. Persia and Tiflis. It was presumably on his return journey that he collected those plants from Azerbaidjan which are quoted with his name in his numerous monographs and papers on Near Eastern plants, and by Boissier.

Knapp in 1884 made a considerable collection in Azerbaidjan. The *Labiatae*, *Chenopodiaceae*, *Amarantaceae*, *Polygonaceae*, *Ranunculaceae*, *Berberidaceae*, *Papaveraceae*, and *Fumariaceae* were worked out by Braun and Reehinger and published in the Verh. Zool. Bot. Ges. Wien xxxix. 214 (1889), l.c. 240, op. cit. xlv. 88 (1894). The complete list of Knapp's plants, however, was published by Bornmüller in the Verh. Zool. Bot. Ges. Wien lx. 61 (1910). This is a very valuable list in spite of the fact that it is based on material which often left much to be desired.

The account by **Grossheim** of his collection made in June 1924, published in Beih. Bot. Centrbl. xlv. 199 (1927), is the last published list of plants from Azerbaidjan.

Cowan and Darlington visited the province in May and June, 1929, and made a collection which has not yet been critically determined. An account of their journey is given in the *Kew Bulletin* 1930, 49.

BOTANIZING IN THE TABRIZ DISTRICT, 1925-1929.

B. Gilliat-Smith.

To one newly arrived from Europe, even from South Eastern Europe, the immediate vicinity of Tabriz, roughly typical of the greater part of the northern Iranian Tableland, presents a most desolate aspect, at a first glance not unlike, one would imagine, the surface of the moon. There is a complete absence of trees or even of bushes, save where planted by man, or at rare intervals in deep crevasses where a small brook trickles more or less permanently. The air is clear and bracing, the climate good, but treacherous to uninitiated Europeans, owing to the sudden changes in temperature. Sunshine is more or less permanent, with few exceptions in spring and autumn, or during the winter snow-storms. The soil is fertile, but produces little where not watered by artificial irrigation. Winter is long and dreary, in spite of the sunshine. Snow covers the higher peaks of the Sahand Range from the end of October or the beginning of November until the end of May, and it is not uncommon for some snow to remain on the northern slopes all the year round. Snow lies on the hills surrounding Tabriz for the greater part of the winter, and intermittently in the town itself. Details as to the geographical situation of Tabriz are given above. The town lies in a vast plain, narrow at its eastern end and cut up into gulleys; tilted westward and broadening out towards Lake Urmia, and having on the south side the offshoots of the Sahand Range and on the north side the red hills of Einal Zeinal.

The first beginning of spring is noted about the 21st March, the Persian New Year, on which date, or slightly later, on the hills to the north and south of Tabriz are to be found here and there patches of *Iris persica* and, to the north only, the varieties *Krelagii* (claret) and *cyanea* of *Iris reticulata*. The var. *typica* of the species is not found wild. Spring is slow in coming. Garden flowers, mostly annuals, are sown generally at the end of March, or the beginning of April, and gardens are at their best in August. A night or two of severe frost in mid-November will generally destroy everything.

Orchards are a great feature of the country. Riding out in the desert hills one may suddenly come upon an enclosure surrounded by a mud-brick wall, the haunt of hoopoes and the little owl. The trees planted are mostly Almond, Apricot, Peach, Plum, *Elaeagnus angustifolius* var. *orientalis*, and, along the water channels, willows and *Populus euphratica*, with, in the richer orchards, splendid specimens of the small leaved elm, *Ulmus glabra* Mill. (not of all authors),

around the water reservoirs. Under the fruit trees are sown crops of wheat, barley, rye, cotton, or more frequently the whole space is sown with sainfoin (a north Persian variety, see the conspectus), with here and there a few plants of hemp, grown for the seed, to be strewn on bread, some castor oil plants of which the oil is used in primitive lamps and medicinally, and a little *Sesamum indicum*, likewise for the seed used as a condiment. The orchards are artificially irrigated and, being rarely if ever weeded, constitute veritable living museums in which may be found representatives of most of the flora of the countryside at a corresponding altitude within a radius of many miles. The spreading of seeds is doubtless greatly helped by violent wind and sand storms which occur in spring and autumn and which completely veil the sun.

Of the 1370 specimens collected by me between August 1925 and November 1929, and now mounted in the Kew Herbarium, a considerable number were found in gardens and orchards and in the desert hills to the south of Tabriz.

These hills are cut up into winding ravines running down in a north westerly direction from the outposts of the Sahand Range, and, with few exceptions, dry at all times of the year. They are probably the result of floods in past ages. Disastrous floods still occur from time to time. Two in the year 1928, on the 8th July and the 11th August, destroyed many thousands of the poorer homes, and damage was done to the irrigation system in orchards and in the town itself which it will take years to repair. The crops under the orchard trees were covered with a layer of sands and stones several feet deep and the bark of the trees themselves was cut off almost in a circle by the sharp stones brought down by the rushing water. The water rushed down the principal thoroughfares, bringing with it dead bodies of animals and in some cases of men and the debris of houses, including several mill stones and huge boulders. On both dates the centre of the cloud burst was somewhere up in the Sahand Range and the water came from the larger ravines which debouch in the neighbourhood of the Teheran Gate. Several villages situated along the lower reaches of the Zindjanab ravine, which is a permanent waterway and displays an exceedingly luxuriant vegetation, were completely wiped out. On the second occasion the actual rainfall in Tabriz was scarcely enough to freshen up the parched gardens and orchards. An elaborate system of dykes has since been planned and the work partially carried out.

Except in times of cloud bursts and consequent floods the ravine beds are dry and sun-baked. About the middle of the month of June it is not uncommon at a turn in a ravine to come across a stretch about a quarter of a mile long or slightly more, in which, for no immediately discernible reason—the soil is as dry here as in the rest of the desert hills—the monotony of the treeless and bushless and largely grassless landscape is broken by colonies of Mullein (*Verbascum speciosum*),

enormous clumps of golden yellow *Phlomis armeniaca* var. *subcordata*, of bright yellow *Onosma microspermum* Stev. or of the paler *Onosma bilabiatum* Boiss. et Buhse, and of white *Salvia sahendica*; large cushion-like masses of the white or pink *Acanthophyllum squarrosum*, interspersed with brilliant tufts of *Thymus Kotschyanus* and of the dark blue *Moltkia caerulea*, carpets of bright yellow *Scutellaria pinnatifida*, long stalked rosettes of ruby coloured *Helichrysum Eichwaldii* and still taller rosettes of the violet *Teucrium orientale*, and large colonies of the pink-purple *Stachys inflata* with silvery grey foliage, to mention a few only of the more showy plants in prime at about this season. Closer examination will generally reveal the existence of a small cornfield at either end of the stretch. Sheep have been refused access to this part of the ravine in order that the corn may not be disturbed, hence the profusion of flowering plants and of colours which would compete with those of any artificially prepared rockery. A few weeks later the corn will be cut, the sheep will do their worst, and little or nothing will remain of all this splendour.

While sheltered patches in the ravines are thus strewn with flowers the wind-swept ridges separating them are naturally planted out here and there with little clumps, knarled at their woody bases, of *Allochrysa persica*, whose white, cream-coloured or pink flowers, massed together on slender pedicels, appear to be for ever shivering, and are consequently difficult to photograph.

In July large purple thistles (*Onopordon heteracanthum*) provide a little colour—and also scent—in the hills to the south of Tabriz, after which all is grey-brown and sunbaked until autumn and late autumn, when various species of the *Chenopodium* family break the monotony with their crimson, ruby-coloured or orange infructescences, and a few plants of bright violet *Orobanche aegyptiaca* appear on the edge of ploughed patches. But little corn of any kind is grown on these hills. There is no system of surface irrigation up here; water is to be found, if at all, in subterranean passages often several hundred feet below the surface. These passages are called kanats. They all run in the direction of Tabriz, and access to them is had at regular intervals, for purposes of repair, by wells which, however, are continually silting up. The temperature in the kanats is frequently greater than at the surface and steam may be seen issuing from the crater-like mouths of the wells, around which delicate plants of *Aethionema arabicum* are often found to be clinging. The chief crop on the hills to the south of Tabriz is provided by the water melon which is planted over large tracts on the hill sides. It never attains any size, doubtless owing to the lack of water, but its fruit is very succulent.

The garden of the British Consulate at Tabriz resembles, in many respects, the orchards described above. During the four years which I spent at Tabriz I forbade any weeding to be done before 16th June, and in the case of the first two years, before mid-July.

I was thus able to observe the life cycle of most of the annuals and to note the date of commencement of flowering from year to year. In spite of climatic differences as between the different years, with few exceptions the dates of first flowering coincided very nearly, in some cases exactly, from year to year, and differences in early spring tended to disappear as that season drew to its close. Among my garden weeds Crucifers took a prominent place. In the systematic conspectus which figures below, prepared by Dr. W. B. Turrill, plants located as "near Tabriz" all grew, except where otherwise stated, in the Consulate Gardens.

A very small proportion of the collection comes from the Red Hills to the north of Tabriz, the flora of which I have scarcely touched. It differs considerably from that of the southern hills.

The flora around the Yam Pass, on the Tabriz-Djulfa road, and on the mountain known in Persian as Kuh-i-Mishou, and in Turki as Mishou Dag, differs in many respects from that of the vicinity of Tabriz. Yam station is at 1786 metres above sea level, Tabriz at 1348 metres. The difference is therefore 438 metres higher in the case of Yam. The distance from Tabriz station to Yam station is about 50 kilometres. The rise occurs for the most part after Sofian (1381 metres above sea level), rather more than half way from Tabriz to Yam. After Sofian the landscape changes rapidly. Green meadows appear, and interspersed with the more typically Persian flora are to be found plants common in Europe, such as *Lythrum Salicaria* and *Orchis latifolia*, or cosmopolitans unknown around Tabriz such as *Prunella vulgaris*, until at Yam itself and the mountain meadows and damp grassy places on Mishou Dag the British grass of Parnassus occurs in abundance, while *Juniperus communis* is abundant in the higher reaches of the mountain. Water is by no means scarce, and is of excellent quality. This area is not very extensive. From Yam station the Djulfa road drops in 8 kilometres to the town of Marand at 1299 metres above sea-level, at a lower level than Tabriz, very hot in summer, and famed for its excellent fruit, including apples and pears.

The more typically Persian flora in the Yam and Mishou area likewise differs from that of the neighbourhood of Tabriz. Here we have *Aethionema pulchellum*, instead of *Aethionema arabicum* and *A. cristatum* of Tabriz, *Jurinea pulchella* instead of *J. leptoloba*, *Onobrychis cornuta*, *Astragalus mishouensis* Turrill and colonies of the remarkable and ungainly *Michauxia laevigata*, all typical of the higher mountain regions. For further notes on this interesting region I must refer to the body of the Systematic Conspectus. Owing to their distance from Tabriz I have not been able to collect nearly so thoroughly in the Yam and Mishou areas as nearer home. It was, however, my custom to pitch my camp under Mount Mishou during the months of July, August, and part of September and to repair there for several days and nights every week. I have probably missed a good deal of the spring flora, including some bulbous plants. The typical bulb in late summer and early autumn on

Mishou Dag and at Yam is the white, cream-white, and often faintly pink tinged *Colchicum Kotschyi*.

For notes concerning the plants collected in the Urmia district and in general west and south of Lake Urmia I must also refer to the body of the Conspectus. I was able to visit this district twice only, in each case during the latter half of May, in 1926 and 1928. The collection from this area is therefore necessarily meagre.

Seeds of nearly all the plants collected in the Tabriz area, and of many of those obtained in the Yam and Mishou area were likewise sent to Kew during the summers and autumns of 1927, 1928, and 1929.

GEOGRAPHICAL DISTRIBUTION AND PHYTOGEOGRAPHICAL PROBLEMS. W. B. Turrill.

The herbarium collection numbers 1370 specimens and the total list consists of 699 species and 31 additional varieties. While the collection is not complete for all the species of central Azerbaidjan it must be considered as more representative than any other single collection made in the province because of the residence of the collector for several years and in all seasons. For this reason a phytogeographical analysis of the collection is likely to yield valuable facts concerning the distribution and origin of the Near Eastern flora.

The position of the province of Azerbaidjan is of special interest to the student of the Mediterranean flora. It is situated near the junction of the Central European (Caucasian Province), the Mediterranean (Armenian-Iranian Mediterranean Province), and the Central Asian (Turanian or Aralo-Caspian Province), floral Regions in the sense of Engler and Gilg [Syllabus der Pflanzenfamilien Aufl. 9 u. 10, 377-379 (1924)]. The flora is predominantly Mediterranean as proved by the general distribution of the chief genera and of many of the species but its detailed affinities are more diverse than those of the flora of a more centrally placed area of the Mediterranean Floral Region.

Stoyanoff [Journ. Ecol. xiv. 138 (1926)] develops the interesting theme that "during all the stages of the development of the European steppe flora direct immigration from the Mediterranean and its neighbouring countries may be more easily imagined than the often supposed migration in large numbers from the foot of the Altai, along a kind of relatively narrow corridor in Western Siberia." The migration of plants from and across Asia Minor into Europe has also been considered by many authors and the subject has been studied in detail by the present writer (The Plant Life of the Balkan Peninsula, Oxford, 1929, especially pp. 373-388, 481-482). Azerbaidjan is at the parting of the ways for "migrating" or extending species. To the south-west lie the more desert regions of Iraq, and Arabia, to the south-east the dissected Iranian plateau, to the north the high mountains of Armenia and the Caucasus, and to the west the diversified area of Asia Minor which in Tertiary and even early

Quaternary times led across Aegean land into Europe. Species extending westwards south of the Caspian from Afghanistan, Turkestan, or Persia, or eastwards into these countries, must for the most part include Azerbaidjan in their route under the existing climatic conditions of the countries immediately to the south. That there has been a considerable local development of the flora is indicated by the endemism of a relatively large number of species.

The largest family in the collection is that of the *Compositae* with 115 species and 4 additional varieties. *Labiatae* with 58 species and two additional varieties, *Leguminosae* with 57 species and one additional variety, *Cruciferae*, with 55 species and four additional varieties, *Caryophyllaceae*, with 38 species and one additional variety, *Gramineae* with 28 species and one additional variety, and *Umbelliferae* with 28 species are, in the order named, the families with the next most numerous species. The largest genus is *Astragalus* with 36 species. Some of the new species were described in an earlier paper published in Kew Bull. 1929, pp. 223-235, and one, *Fritillaria karadaghensis*, in the Gard. Chron. 3rd ser. lxxxv. 242, 221 (1929). Including these the collection has 23 species and 17 varieties which are described as new.

In analyzing the geographical distribution of the species in the collection those having smaller areas of distribution have been classified into a number of categories. A wide experience has shown that it is often the species with more limited distribution which indicate phytogeographical affinities most clearly.

Widely distributed species. Many of these are weeds of cultivation and have no doubt been partly distributed with crop plants. It is, however, of interest to note that the following wild species are placed under this category. *Silene vulgaris* Garcke, *Myricaria germanica* Desv., *Lotus corniculatus* L., *Vicia tenuifolia* Roth, *Potentilla reptans* L., *Poterium Sanguisorba* L., *Parnassia palustris* L., *Sedum album* L., *Lythrum Salicaria* L., *Epilobium hirsutum* L., *Falcaria Rivinii* Bernh., *Galium tricornis* Stokes, *G. verum* L., *Rubia tinctorum* L., *Campanula glomerata* L., *Glaux maritima* L., *Prunella vulgaris* L., *Salsola Kali* L., *Rumex Acetosella* L., *Juniperus communis* L., and *Cystopteris fragilis* Bernh. The majority of these even occur in the British flora.

Species extending into Europe. No less than 312 of the species extend their distribution into Europe. This number, of course, includes many widely distributed, and even practically cosmopolitan species. However, bearing in mind the important Oriental (in the sense of Boissier) contribution to the European flora, the fact that the following species extend from Azerbaidjan into Europe, even if only into the Balkan Peninsula, is of considerable significance: *Delphinium orientale* Gay, *Ranunculus constaninopolitanus* D'Urv., *R. oxyspermus* M. Bieb., *Fumaria Schrammii* Vel., *Roemeria hybrida* DC., *Aethionema arabicum* Andr., *Alyssum linifolium* Steph., *Brassica*

elongata Ehrh., *Ruta Buxbaumii* Poir., *Sophora alopecuriodes* L., *Galium coronatum* S. et S., *Echinops viscosus* DC., *Centaureum turcicum* Ronn., *Gentiana ciliata* L., *Lycium ruthenicum* Murr., *Phlomis pungens* Willd., and *Orchis iberica* M. Bieb. The distribution of the above, and of a considerable number of other species, undoubtedly represents, for the most part, a migration (extension) westwards, though the possibility that some have extended eastwards must not be forgotten. It may be recalled that the writer has clearly shown that the extension of species eastwards in the Mediterranean Region, at least in South Europe, has been much less important than extension westwards. For example, the floristic affinities of the Balkan Peninsula are much closer, on the whole, with Asia Minor than with the Italian and Iberian Peninsulas (see Turrill, The Plant Life of the Balkan Peninsula, pp. 373 seq.). Moreover, many important genera, or sections of genera of the Mediterranean flora, have their chief centre of development in the Orient but extend westwards, as, for example, *Astragalus*, while those with their most important development in the west do not extend far to the east, as *Ulex*, or have only a few species in the Eastern Mediterranean Basin and these not extending into the east of the Region, as, for example, *Cistus*. It seems established that many species, or their immediate ancestors, reached Europe by extending through Asia Minor and across the Aegean and thence through the Balkan Peninsula into Central Europe or the Mediterranean Basin. Further, that a connection between the Central Asiatic and European floras may be traced through Asia Minor adds to the phytogeographical importance of the flora of Azerbaidjan.

Species common to the Orient and to Central Asia but not recorded for Europe. It is not inconsistent with the conclusions just drawn that a considerable number of species occur in Azerbaidjan and also in Central Asia but have not extended to Europe. It would require much detailed study of each species individually to be able to suggest what were the limiting factors to further extension. Physiological, climatic, or edaphic barriers, causing a wide extent of unfavourable habitat conditions, and insufficient age of the species to have spread so far are probably the most important. Distribution of pollinating insects and unsuccessful competition with other species and in closed plant communities are others.

It will be noted, in the detailed distributions given in the Systematic List, that Azerbaidjan is sometimes in the centre, sometimes on the western edge of the area occupied by the species in this category. We are here concerned with 34 species, of which the distributions of the following are typical: *Anemone biflora* DC., *Roemeria refracta* DC., *Euclidium tataricum* DC., *Goldbachia torulosa* DC., *Sisymbrium nudum* Boiss., *Viola occulta* Lehm., *Lepyrodiclis holosteoides* Fenzl., *Biebersteinia multifida* DC., *Astragalus commixtus* Bunge, *Lactuca orientalis* Boiss., *Campanula simplex* Stev., *Ziziphora clinopodioides* M. Bieb., *Z. tenuior* L., and *Eremurus anisopterus* Regel.

In addition to the above attention should also be called to the *Chenopodiaceae* inhabiting saline habitats in Azerbaidjan. Not only is Lake Urmia salt but salt areas of greater or less extent are common. It is probable that many of the members of the flora of saline terrain extended to Azerbaidjan, and sometimes beyond, from Central Asia. Thus *Petrosimonia glauca* Bunge came from the east around the southern part of the Caspian Sea; *Anabasis aphylla* L., *Salsola brachiata* Pall. and *S. spissa* M. Bieb. have extended to S. Russia; *Halocnemum strobilaceum* M. Bieb. is distributed from Central Asia to the Mediterranean Region; and several species have differentiated from Asiatic affinities within the area of the Armenian-N. Persian flora.

Species with wide or fairly wide distribution in the Orient but not reaching Europe or Central Asia. 146 species are included in this category. They represent the typical Oriental element in the Flora of Azerbaidjan and therefore support the statement that the flora is essentially Mediterranean. The majority are species of genera limited to or with a chief centre of development in the Mediterranean Region. The following species are characteristic of those placed under this heading: *Delphinium cappadocicum* Boiss., *Fumaria asepala* Boiss., *Papaver macrostomum* Boiss. et Huet, *Clypeola lappacea* Boiss., *Conringia clavata* Boiss., *Isatis glauca* Auch.-Eloy, *Acanthophyllum squarrosum* Boiss., *Dianthus crinitus* Smith, *Linum mucronatum* Bertol., *Astragalus odoratus* Lam., *Scabiosa rotata* M. Bieb., *Cirsium apiculatum* DC., *Echinops persicus* Stev., *Acantholimon venustum* Boiss., *Nonnea melanocarpa* Boiss., *Globularia trichosantha* Fisch. et Mey., *Nepeta micrantha* Bunge, *Phlomis armeniaca* Willd., *Thymus Kotschyanus* Boiss. et Hohen., and *Paronychia kurdica* Boiss.

A number of other species most of which should strictly have been counted with the above have been kept separate since their distributions give special indications of their places of origin:

Hesperis persica Boiss. Armenia, Kurdistan, Persia.

Acanthophyllum mucronatum C. A. Mey. Caucasus, Armenia, N. Persia, Transcaspi.

Reaumuria hypericoides Willd. Caucasus, Persia, Caspian district.

Hypericum asperulum Jaub. et Spach. Iraq, Persia.

Astragalus Caraganae Fisch. et Mey. Iraq, Armenia, N. and W. Persia, Talysch.

Ferula ovina Boiss. Persia, Baluchistan.

Lisaea heterocarpa Boiss. Iraq, N. and Cent. Persia.

Malabaila Aucheri Boiss. Iraq, N. and Cent. Persia.

Prangos uloptera DC. Iraq, Persia, Armenia.

Galium leiophyllum Boiss. Armenia, Kurdistan, N. Persia.

Pteroccephalus canus Coult. Persia, Kurdistan.

Echinops descendens Hand.-Mazz. Military zone between Iraq and Syria.

Campanula sclerotricha Boiss. N. and W. Persia, Kurdistan.

Primula auriculata Lam. Bithynian Olympus through Asia Minor and the Caucasus thence N.W. and S. to Persia.

Veronica intercedens Bornm. Kurdistan.

Salvia Hydrangea Benth. N. Persia, Kurdistan.

Stachys inflata Benth. Caucasus, Iraq, Persia.

Petrosimonia glauca Bunge. N. Persia and shores of the Caspian Sea.

Polygonum luzuloides Jaub. et Spach. N. Asia Minor, Armenia, N. and W. Persia.

Euphorbia orientalis L. Armenia, Kurdistan, Persia.

Bellevalia ciliata Nees. Caucasus, Persia, Afghanistan.

It will be noted that the above species indicate floristic relationships with the Caucasus and Armenia, with Iraq, with eastern Asia Minor, and with Baluchistan.

Species known only from the Caucasus (sensu lato), Armenia, and N. Persia. This group is important because the majority of those species with more limited distributions belong to it. Indeed, judging from the present collection, the narrower affinities of the flora of Azerbaidjan are predominantly with the floras immediately to the north and north-west, and not with the flora of Central and South Persia. There must, indeed, be either a sudden or a gradual transition somewhere in western Persia between the Armenian-Transcaucasian-Azerbaidjan flora and that of the warmer parts of Persia. The details of this transition have still to be investigated. The phyto-geographical position of the Caucasian flora cannot be further commented upon here except to say that Boissier's inclusion of it in his *Flora Orientalis* is extraordinarily convenient.

In the present category 83 species of the collection have been placed and these include: *Aquilegia olympica* Boiss., *Delphinium speciosum* M. Bieb., *Papaver desertorum* Grossh., *P. orientale* L., *Aethionema trinervium* Boiss., *Alyssum Muellieri* Boiss. et Buhse, *Chorispora iberica* DC., *Crambe juncea* M. Bieb., *Fibigia suffruticosa* Sweet, *Lepidium persicum* Boiss., *L. vesicarium* L., *Polygala Hohenackeriana* Fisch. et Mey., *Silene commelinaefolia* Boiss., *Ruta villosa* M. Bieb., *Rhamnus Pallasii* Fisch. et Mey., *Astragalus macrourus* Fisch. et Mey., *A. podocarpus* C. A. Mey., *Vicia persica* Boiss., *Chaerophyllum macrospermum* Fisch. et Mey., *Hippomarathrum crispum* Koch, *Reutera aurea* Boiss., *Asperula trichodes* Gay, *Crucianella chlorostachys* Fisch. et Mey., *Carduus onopordioides* Fisch., *Centaurea Glehnii* Trautv., *Cirsium Szovitsii* Boiss., *Microlonchus oligochaetus* Boiss., *Phaeopappus leuzeoides* Boiss., *Michauxia laevigata* Vent., *Syringa persica* L. *Veronica microcarpa* Boiss., *Eremostachys Tournefortii* Jaub. et Spach, *Salvia limbata* C. A. Mey., *Stachys fruticulosa* M. Bieb., *Salsola glauca* M. Bieb., *Iris reticulata* M. Bieb., and *Allium akaka* Gmel.

Species found only in Persia. The species placed here number 45 and many of them do not extend far over the southern borders of

the province. With the 44 endemics of Azerbaidjan they form a group of 89 Persian species which give a local facies to the flora. The following may be mentioned by name as examples: *Corydalis Boissieri* Prain, *Alyssum lanigerum* DC., *Astragalus chrysotrichus* Boiss., *Asperula bracteata* Grossh., *Celsia persica* C. A. Mey., *Linaria lineolata* Boiss., and *Nepeta longiflora* Vent.

It may be pointed out here that the flora of Central Azerbaidjan is markedly different from that of Talysch and of the Elburs range, in spite of its geographical proximity to the former. Judging from Grossheim's account of the vegetation of Talysch [Flora Talysh, Tiflis 1926, and in Beih. Bot. Centrbl. xliii. ii. 1 (1926)] the plant communities are also essentially different.

Endemics. 44 of the species in the collection are at present known only from the province of Azerbaidjan and 23 of these have been described as new. The majority of the endemics are morphologically very closely allied to species already known from Azerbaidjan or at least from Persia, Armenia, or Transcaucasia. Presumably, therefore, the majority are relatively novitate species rather than relicts. The majority of the varieties have a decidedly smaller area of distribution than the whole species and the endemism of some of them suggests a preliminary to the segregation of the species into two or more.

Summary. The phytogeographical analysis has indicated that the flora of Azerbaidjan is Mediterranean-Oriental and that its closest affinities are with Armenia and Transcaucasia to the north and north-west and not with Central and South Persia.

Cultivated plants and weeds. In the systematic list below a number of cultivated plants and weeds of cultivated ground are included. In addition the following cereals and legumes have been cultivated at Kew from seeds received from the Tabriz district through Gilliat-Smith.

Secale cereale L. Coudar (Caudar). Generally sown in the autumn.

Triticum vulgare Host var. **turcicum** Körn. or var. **pseudoturcicum** Hakob. Qizilqin Boghda of Hashdari (Hasht-Rud).

Triticum vulgare Host var. **Hostianum** Körn. Qirmizi Boghda = Red wheat. Sown in the spring. The same variety is also said to be sown in the autumn.

Triticum vulgare Host var. **graecum** Körn. Agh Boghda = White wheat. Sown in the autumn.

Hordeum distichon L. Arpa in Turki, Džou in Persian. Džov in all gypsy dialects, but in some it has come to mean oats.

Lens esculenta Moench, var. **nummularia** Alef. Landwirthschaftliche Flora 57 (1866).

Cicer arietinum L. var. **fuscum** Alef. l.c. Known as Qirmizi Nohut, i.e. Red Chickpea or as Gara Nohut, i.e. Black Chickpea.

We have to thank Prof. J. Percival of Reading for determining the cereals in the above list.

The importance of the study of weeds when considering the origin of cultivated plants has been emphasized by many writers, notably by Vavilov in his *Studies on the Origin of Cultivated Plants*, Leningrad 1926. Not only have important crops been obtained from weeds growing with other crops, but a study of the weed flora may indicate the immediate place of origin of the seed used for sowing a given field [see Stapledon in Journ. Board Agric. xxiii. 105 (1916)], and an exhaustive research of weeds constantly accompanying a given crop may at least suggest the area whence the crop was first distributed to other lands. It is therefore probable that the weeds included below have more than a local interest, because, as is stated for so many, they occur not only in cultivated ground, fields, or gardens, but also on the hill-slopes or in other natural habitats. In such an area as Azerbaidjan it is possible to see the persistence of certain weeds under conditions of cultivation, and the introduction of others into cultivated land from the natural plant communities. That, for example, many species of the family *Cruciferae* but not of the genus *Astragalus* survive and flourish as garden and field weeds shows the selective action of cultivation.

SYSTEMATIC LIST.

W. B. Turrill, with field notes and vernacular names by B. Gilliat-Smith.

The determinations of the plants enumerated below have been made at Kew by comparison with original or well authenticated descriptions and, wherever possible, with type or authentic herbarium material. Sometimes comparison with the original description alone has had to suffice for identification; rarely the original description has not been available and a reference is then given to any other publication which has been used. Apart from such species, synonyms and additional references are only given where they aid in clarifying taxonomic ambiguities. The works of Boissier, Bornmüller, and Grossheim have been constantly used.

The assistance of specialists is acknowledged under certain species and in addition our thanks are due to Prof. Babcock for checking the determinations of *Crepis* and *Pterotheca*, to Mr. Pugsley for checking those of *Fumaria* and *Euphrasia*, and Prof. Širjaev those of *Trigonella*.

Question marks indicate either that the material is faulty or that the genus, or section of a genus, needs detailed taxonomic revision.

The appended field notes on colour of flowers, scent, and other data are all made from living material. Vernacular names and notes on uses can only be trustworthily obtained by a resident with a knowledge of the language: for that reason those Turki and Persian names and uses given below must be considered exceptionally valuable.

RANUNCULACEAE.

Adonis aestivalis L. Sp. Pl. ed. 2.771 (1792).

Near Tabriz, garden and cornfield weed, flowers red, 26.4.26, No. 1414; 24.4.27, No. 1925. Flowers during the latter end of April and in May.

Distrib. S. and Cent. Eur., N. Afr., Orient east to Persia.

Anemone biflora DC. Syst. i. 201 (1818).

Mou Deh, May 1929, No. 2495.

Distrib. Persia, Baluchistan, Afghanistan, Turkestan, Cent. Asia.

Aquilegia olympica Boiss. in Ann. Sci. Nat. Ser. II. xvi. 360 (1841).

Brook side under Mishou Dag, 25.7.29, No. 2582.

Distrib. Armenia, Caucasus, N. Persia.

Ceratocephalus falcatus Pers. Syn. i. 341 (1805).

Tabriz, garden weed, 31.3.26, flowers yellow, No. 1331; common everywhere, 9.4.26, No. 1357; 26.4.26, No. 1419: hills to the south, 27.3.27, No. 1921. Flowers March to May.

Distrib. S. and Centr. Eur., Orient east to N. India.

It is doubtful if the varieties given by Boissier [Flor. Or. i. 58 (1867)] are more than habitat forms. The last specimen quoted above, No. 1921, answers to Boissier's description of his var. *exscapus*, since it consists of very small tomentose plants with the flowers practically sessile. Several of the specimens are so young as to make exact determination not quite certain.

Delphinium acutilobum Turritt in Kew. Bull. 1929, 223.

Near Yam, 21.8.27, No. 2086; Yam, 7.28, No. 2365; 7.28, No. 2388. Flowers pale violet, in late July and throughout August. Cultivated at Kew, as K. 675, 1928.

Endemic.

D. cappadocicum Boiss. in Ann. Sci. Nat. Ser. II. xvi. 367 (1841); Flor. Or. i. 81 (1867).

Near Tabriz, garden weed, 20.6.27, flowers violet-mauve, No. 1916. Cultivated at Kew as K. 685, 686, 31.7.28. Flowers June, July, and August.

Distrib. Cappadocia, N. Syria, Iraq, Armenia, N. Persia.

One other specimen, No. 1734, Tabriz, 6.26, is either this species or one very closely related to it and not yet described. It consists of one drawn-out shoot with about half-a-dozen well spaced, long pedicelled flowers.

D. divaricatum Ledeb. in Eichw. Casp. 16, t. 16 (1831-33), var. **Gilliatii** Turritt var. nov.; a planta vulgare caule inferne breviter patule pubescente, floribus leviter minoribus fere concoloribus (in siccitate) distinguitur.

Near Tabriz, garden weed, 15.6.27, flowers violet-blue, No. 1917. Flowers from the middle of June to the middle of November when the weather permits.

Distrib. (of var.) endemic.

Distrib. (of sp.) S.E. Eur., Russia, Caucasus, Armenia, Turcomania, N. Persia.

This species is the eastern representative of the European and N. Asian *D. Consolida* L. which extends as far east as Asia Minor (Lycia and Phrygia). It is best distinguished by the adpressed hairs on the follicles. It is at present uncertain if the characters of the variety described above are constant, but the dried specimen with its smaller, darker, and almost uniformly coloured flowers has a different appearance from any others at Kew.

D. halophilum Huth in Engl. Bot. Jahrb. xx. 487 (1895). *D. Freynii* Huth l.c. 372 non Conrath. *D. laxiflorum* Freyn ex Stapf in Denkschr. Math.—Naturwiss. Cl. K. Akad. Wiss. Wien li. 25 (1886).

Near Tabriz, 6.7.26, flowers pale mauve, creamy, sometimes purplish, Nos. 1724, 1763; hills to the south of Tabriz, 19.6.27, No. 1914. Flowers end of June, July, and part of August.

Distrib. Persia.

The group to which this species belongs is a very critical one and it is unfortunate that the key provided by Huth is useless for distinguishing the species. The nearest affinity of our plants is to *D. persicum* Boiss. in Ann. Sci. Nat. Ser. II. xvi. 362 (1841). The type of this is *Aucher-Eloy* 78 from near Amadan. It is accurately described as having the stem covered "indumento brevi patulo sparso viscidulo." Unfortunately in the Flor. Or. i. 76 (1867) this description is altered to "adpressiuscule glanduloso-pubescent." *D. halophilum* has a grey adpressed not viscid indumentum. This as well as the longer pedicels also distinguishes it from *D. rugulosum* Boiss. which was based on *Aucher-Eloy* 4028, from near Lake Urmia.

In addition to *Aucher-Eloy*'s and *Freyn*'s types and *Gilliat-Smith*'s plants there is at Kew a rather poor specimen from *Bunge*, "pr. Sser-tschah Persiae mediae orientalis. Mart. 1859," and one specimen, without locality, ex herb. *Trautvetter* leg. *Radde*, mounted with a specimen of *D. persicum*, which I place under *D. halophilum*.

The amount of branching is a character of no taxonomic importance, since *Gilliat-Smith*'s specimens range from simple to much branched plants.

D. orientale Gay in Desm. Catal. Dord. 12 (1840).

In gardens near Tabriz, 5.26, faintly scented, flowers violet-purple, No. 1575; 19.5.27, No. 1915; cultivated at Kew as K. 414 from Tabriz seed, and in fruit 14.8.28. It flowers from the middle of May to July. In the fields there were some plants with pink flowers instead of the more usual violet-purple flowers. Under cultivation at Kew it increases very much in size and is very floriferous.

Distrib. Hungary, Balk. Penins., N. Afr., Orient east to Afghanistan.

D. speciosum M. Bieb. Flor. Taur.-Cauc. ii. 12 (1808).

Above Zindjanab, Sahand Range, 25-27.6.29, flowers large, blue with slight violet tinge, No. 2514.

Distrib. Caucasus, Armenia, N. Persia.

Nigella arvensis L. Sp. Pl. 534 (1753).
Cultivated in garden, Tabriz, 8.28, flowers green-white or blue-white, No. 2466. Known locally as "Gara tschörek oti," i.e. "Black bread weed." The seeds are used sprinkled on bread and the plant is cultivated for this purpose.

Distrib. Cent. Eur. and Medit. Region.

The specimen is too young to determine the variety.

N. damascena L. Sp. Pl. 534 (1753) var. *floribus semiplenis*.
Near Tabriz, cultivated as a garden plant, 6.7.26, flowers sky blue, No. 1660.

Distrib. S. Eur., N. Afr., Asia Minor, Cyprus.

Ranunculus arvensis L. Sp. Pl. 555 (1753).
Near Tabriz, 25.4.26, No. 1402; weed in garden, 2.5.26, No. 1467; Mishou Dagħ, 22.5.27, No. 1794; near Tabriz, 1.5.27, No. 1922.

Distrib. S. and Cent. Eur., N. Afr., Orient east to India.

R. constantinopolitanus D'Urv. in Mém. Soc. Linn. Par. i. 317 (1822).

Mishou Dagħ, in rich fields, 22.5.27, No. 1923.

Distrib. E. Balk. Penins., Asia Minor, Armenia, Persia, and (as var. *palaestinus* Boiss.) south to Syria and Palestine.

R. oxyspermus M. Bieb. in Willd. Sp. Pl. ii. 1328 (1800).

South of Tabriz, a garden weed, 29.4.26, No. 1448; near Tabriz 5.27, No. 1920. Flowers from mid-April to end of May.

Distrib. Balk. Penins., Caucasus, Armenia to Persia.

Ranunculus sp. Rich fields near Mishou Dagħ, 22.5.27, No. 1924.

Ranunculus sp. Stream under Mishou Dagħ, 8.29, No. 2612.

The specimen belongs to the *R. acris* group but is too poor to determine.

Thalictrum elatum Jacq. Hort. Vindob. iii. 49 (1776).

At Seivan near Yam, 24.6.28, No. 2344.

Distrib. E.N. Tempt. Region.

Some of the leaves have stipels.

BERDERIDACEAE.

Berberis densiflora Boiss. et Buhse Aufz. 9, t. iii. f. 2. (1860).

N.E. of Tabriz, cultivated as a tree, in young fruit, 6.28, No. 2393; Zindjanab torrent, hills south of Tabriz, 27.6.29, No. 2573. Also cultivated and the berries sold in the bazaars.

Distrib. Armenia, N. Persia, Turkestan, Baluchistan.

Leontice minor Boiss. Flor. Or. i. 100 (1867).

West of Zandjan, 3.5.28, flowers bright yellow, No. 2247.

PAPAVERACEAE.

Corydalis Boissieri Prain in Bull. Herb. Boiss. vii. 172 (1899).

Kara Dagħ, north of Tabriz, coll. Egger, spring 1927, No. 2175.

Distrib. Persia.

Fumaria asepala Boiss. Flor. Or. i. 135 (1867).

Valley of Livan, 9.25, No. 1290 (?); hills south of Tabriz, 5.5.26, white flowers, No. 1475; near Tabriz, garden weed, 5.26, flowers white, No. 1497 pro parte; 12.5.27, flowers white, No. 2077.

Distrib. Asia Minor, Syria, Iraq, Persia.

F. Schrammii Vel. Flor. Bulg. 22 (1891).

Near Tabriz, garden weed, 5.26, pink flowers, No. 1497 pro parte.

Distrib. S. and Cent. Eur., Asia Minor, Armenia, Transcaucasia, Persia, Turkestan, Cent. Asia, N. India.

F. Vaillantii Lois. in Desv. Journ. Bot. ii. 358 (1809).

Near Tabriz, garden weed, 26.4.26, flowers pink, No. 1413.

Distrib. Cent. and S. Eur. east to Baluchistan, Afghanistan, Cent. Asia, and N. India.

Glaucium corniculatum Curt. Flor. Lond. vi. 6, t. 32 (1817) var. *phoeniceum* DC. Syst. ii. 96 (1821).

Near Tabriz, 5.26, flowers red with blue-black blotches at base of petals, No. 1512; east of Lake Urmia, 5.26, No. 1600; near Tabriz, 5.26, No. 1601; garden near Tabriz, 5.6.29, No. 2538.

Distrib. (of var. and species) Medit. Region; often an escape in Cent. Eur.

G. grandiflorum Boiss. et Huet in Boiss. Diagn. Ser. II. v. 15 (1856).

Garden near Tabriz, 5.29, flowers deep red sometimes verging to brick red with blue-black blotches at base of petals, No. 2539; Shor Dara (Dere), 11.5.28, No. 2298.

Distrib. E. Medit. Region.

Hypocoum pendulum L. Sp. Pl. 124 (1753).

Tabriz, garden weed, 9.4.26, flowers yellow, No. 1358; 5.26, No. 1389; 26.4.26, No. 1416; 2.5.26, Nos. 1471, 1472; hills south of Tabriz, 13.4.27, No. 2057. Flowers from mid-April to June and July.

Distrib. S. Eur. and Orient east to N. India.

Papaver Argemone L. Sp. Pl. 506 (1753).

Near Tabriz, garden weed, 11.5.27, flowers red, No. 2055.

Distrib. Cent. and S. Eur., N. Afr., Orient east to Persia.

P. caucasicum M. Bieb. Flor. Taur.-Cauc. ii. 5 (1808) var. *stenocarpum* Boiss. Flor. Or. i. 110 (1867).

Mishou Dagħ, 12.7.28, flowers pale brick red, No. 2387.

Distrib. (of species) E. Asia Minor, Caucasus, Persia.
(of var.) Armenia, Persia.

P. desertorum Grossheim Plantae orientales exsiccatae, No. 85 (1924).

Tabriz, garden weed, 24.5.26, flowers red, No. 1452.

Distrib. Armenia, N. Persia.

This species is in some respects intermediate between *P. Argemone* L. and *P. hybridum* L. Grossheim's type is from near Erivan, dist. Nachitshevan, in mont. Darry-Dagh.

P. dubium L. Sp. Pl. 1196 (1753).

This species [sensu Fedde in Pflanzenr. iv. 104. 315 (1909)] is a very puzzling one and until wide field studies have been made and correlated with the results of breeding experiments and cytological examination it is doubtful if any taxonomic scheme will have much value. In the main I have followed Fedde's nomenclature.

Near Tabriz, garden weed, 29.4.26, flowers red, No. 1455. So far as can be judged from the solitary specimen this is not to be distinguished from European plants accepted as *P. dubium* L.

Near Tabriz, 5.26, No. 1508; 13.5.27, No. 2056; garden near Tabriz, 5.29, No. 2540; cultivated at Kew from Tabriz seed as K. 445. These plants are the var. *laevigatum* Elkan (*P. laevigatum* M. Bieb.) subvar. *setulosum* Fedde et Bornm. in Pflanzenr. iv. 104, 318 (1909).

Hills to the south of Tabriz, 5.27, No. 2054. This is considered a new subvariety (or form). It is provisionally termed *P. dubium* L. var. *laevigatum* Elkan subvar. *nanum* Turrill foliis omnibus basilariis vel fere basilariis, pedunculis unifloris 11 cm. longis vel minus. From the data available it appears to be an ecad, its habit being correlated with its dry environment on hill-slopes. Whether it is a mere habitat form or a genetical ecotype is quite uncertain. The dwarf specimens with leaves aggregated at the base of the one-flowered peduncles have a peculiar general habit. The leaves have distinct bristle-hairs, the peduncles are densely adpressly setose, and the buds spreadingly so.

Distrib. (of species s. l). East N. Temp. Region.

P. macrostomum Boiss. et Huet in Boiss. Diagn. Ser. II. v. 15 (1856).

Near Tabriz, 5.26, flowers dark red with black blotches at base of petals, No. 1510; hills south of Tabriz, 9.6.28, Nos. 2276, 2297, the latter a var. or forma *albomarginatum*; hills south of Tabriz, 6.29, No. 2536; cultivated at Kew from Tabriz seeds as K. 451 and as 38/1927, in flower 23.7.28. Flowers in nature from latter half of May to end of June.

Distrib. Cent. Asia Minor, Iraq, W. and N.W. Persia.

P. orientale L. Sp. Pl. 508 (1753).

Mishou Dagh, high up, 19.7.28, bright scarlet with black blotch at base, No. 2362 (ad *P. bracteatum* Lindl. vergens); Zindjanab, end of June 1929, No. 2537.

Distrib. Armenia, Caucasus, N. Persia.

The specimens, under No. 2362 and apparently all from one plant, are exceedingly interesting. One peduncle immediately under the young fruit is crowned with bracts, the remainder (three) have no bracts. One fruit has 18 stigmatic rays, another has only 12. It would appear that the distinction between *P. orientale* L. and *P. bracteatum* Lindl. breaks down taxonomically. Both "species" are distributed from the Caucasus to N. Persia.

P. Rhoëas L. Sp. Pl. 507 (1753) var. **caudatifolium** Fedde in Pflanzenr. iv. 104, 297 (1909).

In the garden of the old British Consulate, Tabriz, 6.7.26, Nos. 1648, 1681 (perhaps introduced). The petals of No. 1648 have, in the dried specimens, pale blotches at the bases.

Distrib. (of species and var.) E. N. Temp. Region.

P. somniferum L. Sp. Pl. 508 (1753).

Near Tabriz, 6.7.26, No. 1676. The plant has spreading bristles on the flower stalk and 9 to 12 rays to each ovary.

Distrib. (of species) S. Eur. east to China and N. India, often an escape from cultivation.

P. somniferum L. var. **leptocaulotum** Fedde in Pflanzenr. iv. 104, 342 (1909).

Near Tabriz, 18.7.27, No. 1994.

Distrib. (of var.) Asia Minor, Armenia.

Papaver somniferum L. var. **collinum** Turrill var. nov.; a var. *leptocauloto* Fedde pedunculis setulosis setis numerosis valde adpressis, capsulis breviter stipitatis distinctissima videtur.

Planta herbacea, caulibus ad 2.4 dm. altis a basi valde ramosis. *Folia* ambitu oblonga, pinnati-lobata, amplexicaulia, distinctissime glauca, glabra. *Pedunculi* setis numerosis valde adpressis dense obtecti. *Sepala* glabra. *Petala* purpurea exteriora usque ad 5.5 cm. longa et 8.5 cm. lata haud vel vix nigro-maculata, interiora minora circiter 4.5 cm. longa et 4.7 cm. lata nigro-maculata intus albo-glaucescentia. *Capsulae* immaturae lobis stigmaticis 11 instructae, 1.5 cm. longae, 6-7 diametro, glabrae, breviter stipitatae.

Hills south of Tabriz, 6.29, flowers bright red, No. 2535.

It is with some hesitation that a new variety of the polymorphic *P. somniferum* is described. The specimen has, however, flowers and young fruits, and apparently was collected growing wild. The number of stigmatic rays agrees with the number usually found in *P. somniferum* and serves to distinguish our plant from varieties of *P. setigerum*.

Papaver sp. nov. ?

North-west of Lake Urmia, 5.26, flowers brick red, No. 1550.

It is unfortunate that the material under this number is insufficient to form the basis of a proper description of what appears to be a new species. The alliance is certainly with *P. persicum* Lindl. but

the adpressed white hairs to the capsules and the much more depressed stigmata prevent it being included under this species. Fedde, Pflanzenr. iv. 104, 347 (1909), describes a species from the Erzingham district, Armenia, as *P. Bartuschianum*, which must also be near our plant but, e descriptione, differs in having quite glabrous stems and pedicels.

Roemeria hybrida DC. Syst. ii. 92 (1821).

Near Tabriz, 26.4.26, flowers, blue-purple or purple-violet, No. 1409 (typica); garden weed, 29.4.26, No. 1451 [var. *eriocarpa* DC. Syst. ii. 93 (1821)] Flowers from the end of April and during May.
Distrib. Medit. Region.

R. refracta DC. Syst. ii. 93 (1821). *R. rhoeadiflora* Boiss. Diagn. Ser. I. vi. 7 (1855) et Flor. Or. i. 119 (1867).

Near Tabriz, garden weed, 29.4.26, Nos. 1453, 1454; 5.26, Nos. 1509, 1611. One specimen under No. 1454 and No. 1611 are the var. *albomarginata* Fedde. Cultivated at Kew from Tabriz seed, as K. 400. Two of the specimens have setose fruits. K. 400 seed was also grown by the late L. A. M. Riley at North Warnborough, Hants, and three distinct types of plants were raised by him.

- a. blue-purple flowers, stiff hairs on capsules.
- b. scarlet-black blotches on petals, smooth capsules.
- c. late flowering, scarlet flowers, leaves finely dissected.

Flowers, at Tabriz, from the first week in May to mid-June, always red.

Distrib. Caucasus, Armenia, Persia, Afghanistan, Baluchistan, Turkestan, Cent. Asia.

CRUCIFERAE.

Aethionema arabicum Andr. ex DC. Syst. ii. 560 (1821).

Hills south of Tabriz, 2.5.26, No. 1460; near Tabriz, 6.27, No. 1806. Normally in flower during April and May, flowers pink. Cultivated at Kew from Tabriz seed, 29.6.28.

Distrib. Thrace, Asia Minor, Syria, Armenia, Transcaucasia, N. Persia.

A. carneum B. Fedtschenko in Acta Hort. Petrop. xxiii. 428 (1904), *Thlaspi carneum* Soland. in Russell Nat. Hist. of Aleppo ii. 257 (1794). *Aethionema cristatum* DC. Syst. ii. 560 (1821).

Urmia district, 5.26, No. 1566; near Tabriz, 6.27, flowers pink, No. 1805.

Distrib. Syria and Palestine east to Persia, Afghanistan and Turcomania.

A. fimbriatum Boiss. in Ann. Sci. Nat. Ser. II. xvii. 193 (1842).

Urmia district, 5.26, No. 1540. The flowers are a very beautiful pink.

Distrib. N. Persia.

A. pulchellum Boiss. et Huet in Boiss. Diagn. Ser. II. v. 43 (1856).

Urmia district, 20.5.26, Nos. 1544 (small flowers), 1551 (medium sized flowers). Also common in the higher districts of Sir, Yam, etc. Flowers of various shades of pink and very showy.

Distrib. Armenia, E. Asia Minor, Persia.

There is a considerable range in the size of the flowers and since no ripe fruits are present on these specimens the identifications remain a little doubtful.

A. trinervium Boiss. Flor. Or. i. 342 (1867).

Mishou Dag, flowers white, 22.5.27, No. 1793.

Distrib. Armenia, Transcaucasia, Persia.

Aethionema sp.

Near Tabriz, 5.27, No. 2130.

Alyssum bracteatum Boiss. et Buhse Aufz. 18 (1860).

Hills south of Tabriz, 2.5.26, flowers yellow, No. 1465; 5.26, No. 1504; 5.26, No. 1627; 5.26, No. 1689.

Distrib. Armenia, Persia.

No. 2588, from Mushou Dag, 5.8.29, is probably a variety or form of this species but the material is too imperfect to be certain.

A. campestre L. Syst. ed. x. 1130 (1759).

Near Tabriz, garden weed, 9.4.26, flowers yellow, No. 1355; 26.4.26, No. 1410; hills to the south of Tabriz, 2.5.26, No. 1464; near Lake Urmia, 5.26, No. 1605; garden weed, 5.27, Nos. 1784, 1785, 1789; hills south of Tabriz, July 1929, No. 2529 [a mixture of var. *genuinum* Boiss. (C), var. *micranthum* Boiss. (A. and B.), and intermediates between them (D. to G.)]. Cultivated at Kew as K. 405 and on 21.6.28 (styles somewhat shorter and stouter than usual).

Distrib. Cent. and S. Eur., Medit. Region.

A. campestre L. var. *compactum* Turrill var. nov.; a var. *micropetalo* (Fisch.) Boiss. inflorescentiis (infructescentiis) compactionibus, siliculis vix maturis ovatis haud orbiculatis differt.

Plantae annuae, haud ramosae, 7-12 cm. longae. *Folia* var. *micropetali* illis similia. *Inflorescentia* compactae, post anthesin 3-4.5 cm. longae; pedicelli 3.5 mm. longi, fastigiati haud horizontaliter patentes, floribus luteis. *Siliculae* immaturae ovatae, 3.25 mm. longae, 2.75 mm. latae; stylus 0.75 mm. longus.

Yam, May 1927, No. 1781. Mostly fruiting at this time.

It is well-known that *Alyssum campestre* L., as usually accepted, is a polymorphic species extending over a wide geographical area. Even in the collection enumerated here the vars. *genuinum* and *micranthum* as understood by Boissier are represented in addition to the new variety *compactum*. This last is undoubtedly related to the var. *micropetalum* which was described as a species by Fischer and reduced to a var. of *campestre* by Boissier [Flor. Or. i. 284 (1867)]. Thus it has the filaments with most often 2 teeth. The number of ovules in each loculus fluctuates between 1 and 2.

A. dasycarpum Steph. in Willd. Sp. Pl. iii. 469 (1801).

Hills to the south of Tabriz, 9.4.26, flowers yellow, No. 1356; 4.26, No. 1381; Tabriz, weed in garden, 5.26, No. 1773; 5.27, No. 1782; hills to the south of Tabriz, 12.5.27, No. 1783.

Distrib. S.E. Russia, Asia Minor east to Afghanistan.

Nos. 1356 and 1381 are very young and probably represent merely the dwarf form typical of the hills south of Tabriz but they may be the var. *minus* Bornm. Iter Persico-turcicum 1892-93, Nos. 2174, 2175 in Herb. Kew.

A. desertorum Stapf in Denkschr. Akad. Wien li. 302 (1886).

Near Tabriz, garden weed, 1.4.26, flowers yellow, No. 1337; 9.4.26, Nos. 1353, 1354; 12.3.26, No. 1423; 10.4.27, No. 1777; 5.27, No. 1787; cultivated at Kew from Tabriz seed as K. 419 and 21.6.28. Naturally flowers from March to May.

Distrib. East-Cent. Eur., Balkan Penins., Orient, Cent. Asia.

A. lanigerum DC. Syst. ii. 308 (1821).

Yam, 20.7.28, No. 2447.

Distrib. N. and W. Persia.

A. linifolium Steph. in Willd. Sp. Pl. iii. 467 (1801).

Hills to the south of Tabriz, 1.4.26, flowers yellow, No. 1336; garden weed, 1.4.26, No. 1338; 9.4.26, No. 1351; hills to the south of Tabriz, 9.4.26, No. 1352; near Tabriz 5.27, No. 1786.

Distrib. Medit. Region to Cent. Asia.

A. Muelleri Boiss et Buhse in Nouv. Mém. Soc. Nat. Mosc. xii. 16 (1860).

Red hills to the north of Tabriz, 17.5.27, rather large bright yellow flowers, No. 1788; 1.5.28, No. 2250.

Distrib. Armenia, Persia.

No. 2249, from the top of Mt. Sir, Urmia, 27.5.28, may be a variety of this species with narrower leaves and paler slightly larger flowers.

A. Szovitsianum Fisch. et Mey. Ind. Sem. Hort. Petrop. iv. 31 (1837).

Near Tabriz, 15.5.27, flowers yellow, No. 1780; Urmia district, Band, 25.5.28, No. 2248. Flowers in April and May.

Distrib. Asia Minor, Syria, Iraq, Transcaucasia, W. and N. Persia.

Alyssum sp. nov. aff. *A. lanigero* DC. sed planta nana pedicellis crassioribus differt.

Mishou Dag, 19.7.28, Nos. 2368, 2437.

These two specimens probably represent a new species. Their morphological affinity is with *A. lanigerum* DC. but the habit is so different that I hesitate to make them a variety of this. Only one seed appears to be ripened in each silicle. No. 2437 has longer styles than No. 2368. In the absence of flowers in both specimens no new name is proposed.

Barbarea plantaginea DC. Syst. ii. 208 (1821); Near Tabriz, cultivated at Kew as 58/28, in flower and young fruit, 10. 6.30.

Distrib. Asia Minor, Armenia, Syria, Persia.

Brassica elongata Ehrh. Beitr. vii. 159 (1792).

Weed in garden, near Tabriz, 5.6.27, flowers yellow, No. 1813; hills south of Tabriz, 5.29, No. 2552.

Distrib. S.E. Eur., Asia Minor, Caucasus, Armenia, Iraq, N. Persia.

Camelina silvestris Wallr. Sched. 347 (1822) var. **albiflora** Boiss. Flor. Or. i. 311 (1867).

Near Tabriz, garden weed and on the hills to the south, 29.4.26, No. 1434; 5.26, No. 1526; 22.4.27, No. 1808; cultivated at Kew from Tabriz seed as K.436 and 19.6.28. Flowers from Mid-April and throughout May; fruits in May and June, and ripe seeds gathered in July. The flowers are pale yellow when they first open and then become gradually white.

Distrib. (of species) Cent. Eur. and Medit. Region.

(of var.) Cilicia, Persia.

Capsella Bursa-Pastoris Medic. Pflanzeng. 85 (1792).

Tabriz, garden weed, 1.4.26, Nos. 1347, 1348, 1349. The last is a very dwarf variety or form.

Distrib. Now practically cosmopolitan as a weed and ruderal.

Chorispora iberica DC. Syst. ii. 437 (1821).

Tabriz, garden weed, 14.3.26, flowers pale yellow, No. 1320; 27.3.26, No. 1335; 3.26, No. 1368. The first plant to flower each spring in the Tabriz district.

Distrib. Armenia, Transcaucasia, N. Persia.

C. tenella DC. Syst. ii. 435 (1821).

Near Tabriz, garden weed, 1.4.26, No. 1342; 11.4.26, No. 1366; 25.4.26, No. 1398; 24.4.26, No. 1404; cultivated at Kew from Tabriz seed 20.6.28. Flowers naturally in April and May, a rather deep pink.

Distrib. S. Russia, Crimea, E. Asia Minor, Caucasus, N. Persia, Turkestan, Afghanistan, Baluchistan, Cent. Asia.

Clypeola lappacea Boiss. in Ann. Sci. Nat. Ser. II, xvii. 174 (1842);

Near Salmas, Urmia district, 5.26, No. 1565. Also occurs on Mishou Dag.

Distrib. Syria, Iraq, Persia, Turkish Armenia.

Cochlearia Snowitzii Boiss. Flor. Or. i. 248 (1867).

Mishou Dag, rocky places, 2.9.29. No. 2630.

Distrib. Azerbaidjan.

Conringia clavata Boiss. in Ann. Sci. Nat. Ser. II, xvii. 84 (1842).

Hills to the south of Tabriz, 2.5.26, No. 1461. Flowers yellow.

Distrib. Asia Minor to Syria and N. Persia.

C. orientalis Andr. apud DC. Syst. ii. 508 (1821).

Near Tabriz, garden weed, 11.3.26, No. 1319; 24.4.26, No. 1403; 5.5.26, No. 1473; cultivated at Kew from Tabriz seed, 18.6.28. Flowers normally in second half of April and in May, cream-white.

Distrib. Cent. Eur. and Medit. Region.

Crambe juncea M. Bieb. Flor. Taur.-Cauc. iii. 421 (1819). var. **aculeolata** N. Busch in Flor. Cauc. Crit. iii. 4, 229 (1908).

Near Tabriz, 5.26, flowers white, No. 1583; above Zindjanab, Sahand Range, 25-27.6.29, No. 2511. This plant is widely scattered on mountain sides and in cornfields, not abundant but growing as isolated plants here and there. All leaves are basal with a prickly midrib. The roots and stems are loose so that the whole plant rocks in the wind.

Distrib. (of species) Caucasus, Armenia, N. Persia.
(of var.) Russian Armenia and N. Persia.

Eruca cappadocica Reut. ex Boiss. Diagn. Ser. II. vi. 13 (1859).

Weed in garden near Tabriz, 5.26, flowers pale yellow and brown veined, Nos. 1483, 1621, 1707.

Distrib. Asia Minor to Armenia and Persia.

Erysimum persicum Boiss. in Ann. Sci. Nat. Ser. II. xvii. 79 (1842).

Near Tabriz, 5.26, flowers yellow, No. 1729; 6.27, Nos. 1817, 1821, 1822.

Distrib. Azerbaidjan.

E. repandum L. Amoen. Acad. iii. 415 (1756).

Near Tabriz, garden weed, 26.4.26, flowers yellow, No. 1420.

Distrib. Eur. and Orient.

Euclidium syriacum R. Br. in Ait. Hort. Kew. ed. 2 iv. 74 (1812).

Near Tabriz, garden weed, 4.26, flowers minute and white, Nos. 1375, 1426; 5.26, Nos. 1501, 1502, 1700. Flowers April to May, fruits May to August.

Distrib. E. Eur. to N.W. India.

E. tataricum DC. Syst. ii. 422 (1821).

Tabriz, garden weed, flowers white, 26.4.26, No. 1406; 4.26, No. 1446; in a garden on the hills, 29.4.26, No. 1457; 6.27 (in fruit), No. 1807; cultivated at Kew from Tabriz seed, 29.6.28, and in fruit, 3.6.29.

Distrib. N. Persia, Turkestan, Afghanistan, Cent. Asia.

Fibigia suffruticosa Sweet Hort. Brit. ed. 1, 467 (1827).

Near Sir, Urmia district, 6.26, flowers deep purplish-pink, Nos. 1552, 1587; hills south of Tabriz, 6.26, No. 1738; 5.6.28, No. 2246; hills south of Tabriz, and Sir, 6.28, No. 2335; Flowers in May and June, purple. The last specimens have a less dense indumentum of

smaller stellate hairs and slightly narrower fruits than the majority of our sheets.

Distrib. Armenia, Persia.

Goldbachia torulosa DC. Syst. ii. 577 (1821). *G. laevigata* DC. var. *ascendens* Boiss. Flor. Or. i. 243 (1867).

Tabriz, garden weed, 1.4.26, No. 1343; 11.4.26, No. 1367; 25.4.26, No. 1396; in garden among hills to south of Tabriz, 29.4.26, No. 1427; 5.26 (fruit), No. 1576; cultivated at Kew from Tabriz seed, 3.6.29. Flowers mauve, or palish blue or pale pink, April and a little in May.

Distrib. Orient and Cent. Asia.

Hesperis persica Boiss. in Ann. Sci. Nat. Ser. II. xvii. 64 (1842) var. **leiocarpa** Boiss ex Grossh. in Beih. Bot. Centrbl. xlv. 216 (1927) siliquis glabris.

Sir, Urmia district, 21.5.26, flowers purple, No. 1519; Band, Urmia district, 25.5.28, No. 2244.

Distrib. (of species) Armenia, Kurdistan, and S. Persia.
(of var.) N. Persia, Kurdistan.

Isatis glauca Auch.-Eloy ex Boiss. in Ann. Sci. Nat. Ser. II. xvii. 201 (1842) et Flor. Or. i. 378 (1867).

Weed in gardens east of Tabriz, 5.27, flowers yellow, Nos. 1862, 1890.

Distrib. Asia Minor, Armenia, Persia.

I. latisiliqua Stev. in Mem. Soc. Nat. Mosc. iii. 267 (1812) ex Busch in Flor. cauc. crit. iii. 4, 243 (1808).

Distrib. Asia Minor, Armenia, Persia.

Urmia district, 5.26, flowers yellow, No. 1520 (leaves and stems hairy, young silicles hairy); near Tabriz, 5.26, No. 1582 (leaves and stems sparsely hairy, mature silicles glabrous); Urmia district, Band, 25.5.28 and Sir, 27.5.28, No. 2243 (stems and leaves strongly hairy, young silicles densely hairy).

Distrib. Transcaucasia, Armenia, Persia.

In spite of the published work of Busch, l.c., the intra-specific classification of *I. latisiliqua* is not in a satisfactory state. It is evidently very polymorphic, especially in indumentum, and breeding experiments will probably be necessary to clear up its taxonomy.

Lepidium Draba L. Sp. Pl. 645 (1753).

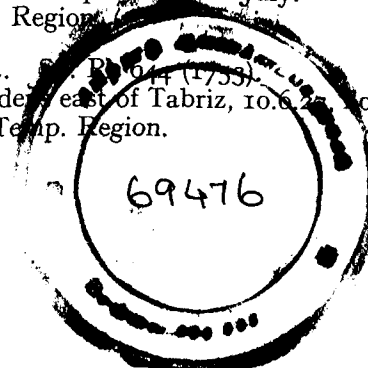
Waste places in garden, near Tabriz, very abundant, flowers white, 6.27, No. 1812, young shoots used as a salad under the name "Khili-wili." Flowers mid-April, May to July.

Distrib. Medit. Region.

L. latifolium L. Sp. Pl. 644 (1753).

Weed in garden east of Tabriz, 10.6.27, flowers white, No. 1863.

Distrib. E.N. Temp. Region.



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N 20.

L. perfoliatum L. Sp. Pl. 643 (1753).

Near Tabriz, garden and cornfield weed, 14.4.26, No. 1377. Cultivated at Kew from Tabriz seed as K. 402, 19.5.27. Flowers yellow, mid-April to July.

Distrib. E.N. Temp. Region.

L. persicum Boiss. in Ann. Sci. Nat. Ser. II. xvii. 196 (1842).

Hills to the north of Tabriz, 7.28, flowers white, No. 2448.

Distrib. Persia, Armenia, Afghanistan.

L. sativum L. Sp. Pl. 644 (1753).

In garden, Tabriz, 5.26, flowers white, No. 1496. Called "Taratun teck." Cultivated at Kew from Tabriz seed as K. 398, 21.7.27.

Distrib. Now practically cosmopolitan as an escape from cultivation.

L. vesicarium L. Sp. Pl. 643 (1753).

Very common in and around Tabriz, still in flower in the valley of Livan, 9.25, flowers white, No. 1286; near Tabriz, 5.26, No. 1486; cultivated at Kew from Tabriz seed as K. 401 and 14/27, 10.7.28.

Distrib. Caucasus, Armenia, Persia.

Malcolmia africana R. Br. in Ait. Hort. Kew. ed. 2, iv. 121 (1812).

Near Tabriz, garden weed, 4.26, No. 1364; 25.4.26, No. 1397; 26.4.26, No. 1408; 4.26, in fruit, No. 1709; 4.27, No. 1814; cultivated at Kew from Tabriz seeds as K. 437 and on 18.6.28. The degree or spreading of the hairs on the siliques varies considerably. The flowers are pink, pink with deeper blotches, or wholly of a deeper pink colour.

Distrib. E.N. Temp. Region.

M. africana R. Br. var. *laxa* Boiss. Flor. Or. i. 223 (1867).

Near Tabriz, 11.4.26, flowers pink, No. 1365; 26.4.26, No. 1407.

Distrib. (of var.) Turkestan, Persia.

M. africana R. Br. var. *stenopetala* Boiss. Flor. Or. i. 224 (1867).

Near Tabriz, 5.26, flowers pink, No. 1498.

Distrib. (of var.) Turkestan, Persia.

M. africana R. Br. var. *intermedia* Boiss. Flor. Or. i. 223 (1867).

Near Tabriz, 6.27, No. 1815. Glabrous or subglabrous fruits and generally pinker flowers.

Distrib. (of var.) Turkestan, Caucasus, Persia.

M. torulosa Boiss. Flor. Or. i. 225 (1867).

Weed in cultivated ground near Tabriz, 5.26, No. 1503 (mixed with varieties of *M. africana*), 2.5.26, No. 1466; 6.27, No. 1816. Flowers white.

Distrib. N. Africa and Orient eastwards to Afghanistan.

Matthiola ovatifolia Boiss. Diagn. Ser. i. vi. 9 (1845).

Hills north of Tabriz, 1.5.28, flowers dirty cream and sweetly scented, No. 2245.

Distrib. Persia.

Myagrum perfoliatum L. Sp. Pl. 640 (1753).

Weed in garden near Tabriz, 5.26, flowers white, No. 1609.

Distrib. Cent. Eur. and Medit. Region.

Rapistrum rugosum All. Flor. Pedem. i. 257 (1785).

Weed in garden near Tabriz, 5.26, flowers rather pale pink, No. 1571; 5.26, No. 1690; cultivated at Kew from Tabriz seed as K. 434 and 10.7.28.

Distrib. Cent. and S. Eur. and east to Caucasus and Persia.

Sameraria armena Desv. Journ. Bot. iii. 161 (1813).

Isatis armena L. Sp. Pl. 670 (1753).

Hills south of Tabriz, 5.6.27, flowers bright yellow, No. 1823.

Distrib. Armenia, Persia, Turkestan.

Sinapis arvensis L. Sp. Pl. 668 (1753).

Near Tabriz, 5.26, No. 1573 (a small plant, with narrow leaves and young fruits slightly retrorse-hispid); 5.26, Nos. 1622, 1623; 5.26, No. 1708.

Distrib. Now nearly cosmopolitan as a weed of cultivation.

A specimen from near Yam, 7.8.27, No. 2028, is probably this species, with the flowers abnormal. The floral parts are replaced by more or less bract-like structures.

Sisymbrium altissimum L. Sp. Pl. 659 (1753).

Near Tabriz, ruderal and garden weed, 11.4.26, flowers pale yellow, No. 1363; 26.4.26, No. 1421; 5.26, Nos. 1516, 1727; cultivated at Kew from Tabriz seed as K. 421.

Distrib. E.N. Temp. Region.

Sisymbrium Loeselii L. Cent. pl. i. 18. n. 49 (1755).

Near Tabriz, garden weed, 11.25, flowers a deeper yellow than those of *S. altissimum*, No. 1318; 5.5.26, No. 1474; 5.26, Nos. 1705, 1706; 6.27, No. 1810; cultivated at Kew from Tabriz seed as K. 422 and K. 423.

Distrib. Cent. and S. Eur., Orient, N. Asia, N. India.

The specimens show very varying degrees of hairiness of the leaves and stems. Some of the specimens quoted are quite glabrous and others have long distinct hairs on the stems or leaves or both. The exact value of this character is at present doubtful since plants differing in this respect have been obtained from the same packets of wild seed. Several "forms" are named by O. E. Schulz in Engler's Pflanzenr. iv. 105. 97 (1924).

S. nudum Boiss. Flor. Or. i. 214 (1867).

Hills to the south of Tabriz, 16.4.26, flowers yellow No. 1379; garden weed, 29.4.26, No. 1431.

Distrib. Syria, Armenia, east to Cent. Asia and N. India.

S. pumilum Steph. ex. Willd. Sp. Pl. iii. 507 (1801). *Arabidopsis pumila* Busch, vide Engler's Pflanzenr. iv. 105. 277 (1924).

Near Tabriz, garden weed, 4.26, No. 1376; 26.4.26, No. 1412; 10.4.27, No. 1811. Flowers yellow, April and May.

Distrib. Cilicia, Syria, Iraq, Arabia, Caucasus, Persia, Turkestan, Afghanistan, Baluchistan, Cent. Asia, W. Himalayas.

S. Sophia L. Sp. Pl. 659 (1753).

Tabriz, garden weed, 20.3.26, flowers yellow, No. 1323; 1.4.26, No. 1344. Used as a medicinal herb. Persian "Khāk-shir." Turki "Shuvaran."

Distrib. E.N. Temp. Region.

Sterigmostemum tomentosum M. Bieb. Flor. Taur.-Cauc. iii. 444 (1819); N. Busch in Flor. Cauc. Crit. iii. 684 (1910); var. **subintegrum** Turritt var. (vel forma) nov. caulibus altioribus ramosioribus foliis inferioribus plus minusve pinnatifidis superioribus integris a planta biebersteiniana recedit.

Near Tabriz, 20.5.27, flowers yellow, Nos. 1818, 1819, 1820.

Distrib. (of species) around the Caspian Sea, Armenia, Songaria, Turcomania, and N. Persia.

Aucher-Eloy 4108, from "Azerbidjan," without date or exact locality is to be included under the variety here described.

Thlaspi arvense L. Sp. Pl. 646 (1753).

Near Tabriz, 5.26, No. 1500; cultivated at Kew from Tabriz seed as K. 408, 19.5.27.

Distrib. N. Temp. Region.

Vogelia apiculata Vierh. Oesterr. Bot. Zeitschr. lxx. 168 (1921).

Weed in garden near Tabriz, flowers yellow, 5.26, No. 1514; cultivated at Kew as K. 407, 21.7.27. Flowers April and May.

Distrib. Medit. Region from Spain to N. India.

CAPPARIDACEAE.

Capparis sicula Duh. Traité des Arbres ed. 2. i. 159 (1801).

Sir, west of Lake Urmia, 5.26, No. 1524. Also at Marand and Yam. Flowers end of May to August. The plant is common in cemeteries and mountainous rocky places. The fruit is eaten and is known locally as "mountain melon."

Distrib. S. Eur. east to Persia.

Cleome ornithopodioides L. Sp. Pl. 672 (1753) var. **stipitata** Boiss. Flor. Or. i. 411 (1867).

Near Tabriz, 6.27, No. 1809; valley of Livan, 9.27, No. 1292. Flowers normally in June and July, flowers white or pinkish and whole plant very glandular and strongly scented.

Distrib. (of species and var.) Asia Minor east to Afghanistan.

RESEDACEAE.

Reseda lutea L. Sp. Pl. 449 (1753).

Weed in garden, near Tabriz, 6.5.26, No. 1547. A very common weed and ruderal in flower from May to the end of the season.

Distrib. Cent. Eur. and Medit. Region.

VIOLACEAE.

Viola occulta Lehm. Ind. Sem. Hamb. 1829 sec. Boiss. Flor. Or. i. 467 (1867).

South of Tabriz, garden weed, 29.4.26, No. 1436.

Distrib. Asia Minor to Persia and Cent. Asia.

POLYGALACEAE.

Polygala anatolica Boiss. et Heldr. in Boiss. Diagn. Ser. II. i. 57 (1853)?

Yam. 22.5.27, flowers pink, No. 2065.

Distrib. Asia Minor, Syria, Caucasus, Armenia.

The material is poor and young and the identification is uncertain.

P. Hohenackeriana Fisch. et Mey. Ind. Sem. Hort. Petrop. iv. 42 (1838).

Near Tabriz, 15.5.27, flowers predominantly white, creamy, or often pinkish, No. 1800.

Distrib. Caucasus, Armenia, N. Persia.

FRANKENIACEAE.

• **Frankenia hirsuta** L. Sp. Pl. 331 (1753) var. **erecta** Boiss. Flor. Or. i. 780 (1867).

Roadside in Shor Dara (Dere), between Yam and Tabriz, flowers a beautiful pink, 28.7.28, No. 2364.

Distrib. (of species) E.N. Temp. Region.

(of var.) N. Persia, Armenia.

CARYOPHYLLACEAE.

Acanthophyllum mucronatum C. A. Mey. Verz. Pfl. Cauc. 210 (1831).

Dik Dash, Yam, 28.8.27, flowers white, No. 2092.

Distrib. Caucasus, Armenia, N. Persia, Transcaspia.

A. squarrosum Boiss. Diagn. Ser. II. i. 81 (1853).

Hills south of Tabriz, 7.26, flowers white or pink, No. 1686; 7.6.27, No. 2019. Flowers in June and July.

Distrib. Persia, Afghanistan, Baluchistan.

Allochrysa persica Boiss. Flor. Or. i. 560 (1867).

Hills south of Tabriz, 6.26, No. 1743; 7.6.27, No. 2016. Has an apparently short flowering period in June, flowers white, creamy, or pink, very showy and delicate and never still in the slightest breeze.

Distrib. Azerbaidjan.

Arenaria gypsophiloides L. Mant. i. 71 (1767) "f." **glaberrima** Bornm. in Bull. Herb. Boiss. Ser. 2, V. 125 (1905).

Mishou Dag, 19.7.28, flowers white, No. 2373; above Zindjanab Sahand Range, 25-27.6.29, No. 2515.

Distrib. (of species) Armenia, N. Persia.

A. serpyllifolia L. Sp. Pl. 423 (1753) sensu lato. Near Tabriz, 8.5.27, flowers white, No. 1856; cultivated at Kew from Tabriz seeds, 29.6.28 and 14.8.28.

Distrib. E.N. Temp. Region.

In some respects the specimens approach the var. *leptoclados* Reichb. (*A. leptoclados* Guss.), but the pedicels and sepals are longer.

A. Szowitsii Boiss. Flor. Or. i. 695 (1867).

Sir, Urmia district, 20.5.26, flowers white, No. 1533; near Tabriz, 22.5.27, No. 1849a. Also found on the Mishou Dag.

Distrib. Azerbaidjan.

Buffonia macrocarpa Ser. in DC. Prodr. i. 388 (1824) var. **elata** Boiss. Flor. Or. i. 667 (1867) subvar. **velutina** Bornm. Verh. Zool.-Bot. Ges. Wien lx. 85 (1910).

Mishou Dag, 12.7.28, flowers white, No. 2385.

Distrib. (of species) Persia, Afghanistan.

(of var. and subvar.) Persia.

Cerastium dichotomum L. Sp. Pl. 438 (1753).

Near Tabriz, 5.26, flowers white, No. 1490; 5.26, No. 1626; cultivated at Kew from Tabriz seeds as K. 417 and 18.6.28.

Distrib. Medit. Region.

C. vulgatum L. Flor. Suecc. ed. 2, 158 (1755).

Yam, 21.8.27, flowers white, No. 2083; under Mishou Dag, 10.9.28, No. 2468. Plants not quite typical, especially in leaf shape.

Distrib. E.N. Temp. Region.

Dianthus crinitus Smith in Trans. Linn. Soc. ii. 300 (1794).

Dik Dash, Yam, 2.8.28, flowers pink or white, No. 2363; near Tabriz, 2.8.29, No. 2649.

Distrib. Asia Minor, Cyprus, Armenia, Transcaucasus, Persia, Turkestan, Baluchistan.

D. crossopetalus Fenzl. ex Boiss. Flor. Or. i. 496 (1867). *D. crinitus* Smith var. *crossopetalus* Boiss. l.c.

Hills to the south of Tabriz, 6.7.26, flowers white, No. 1677; 6.26, No. 1693; 7.6.27, No. 1843.

Distrib. N. and W. Persia.

D. Libanotis Labill. Dec. i. 14, t. 5 (1791).

Hills south of Tabriz, 6.26, flowers pink veined, No. 1762; hills south of Tabriz, 6.7.27, No. 2017; cultivated at Kew from Tabriz seed, 13.10.28. Flowers normally from the end of June to August.

Distrib. Syria, Sinai, Iraq, Armenia, N. and W. Persia.

D. orientalis Sims in Bot. Mag. t. 1069 (1808) var. **obtusisquameus** (Boiss.) Flor. Or. i. 495 (1867).

Mishou Dag, 12.7.28 and 19.7.28, flowers a beautiful pink, No. 2384; above Zindjanab, Sahand Range, 25-27.6.29, No. 2524; Mishou Dag, 5.8.29, No. 2598.

Distrib. (of species) Persia, Afghanistan.

(of var.) Caucasus and Persia east to N. India.

D. tabrisianus Bienert in Bunge pl. Pers. exs. 1859 ex Boiss. Fl. Or. i. 496 (1867).

Near Tabriz, 6.26, flowers white or pink, No. 1694, 10.6.27, No. 1842; Mishou Dag, 5.8.29, No. 2583.

Distrib. N. Persia, Afghanistan.

Gypsophila paniculata L. Sp. Pl. 407 (1753).

Near Tabriz, 6.26, flowers white, No. 1721; 10.6.27, No. 1841. Flowers from June onwards.

Distrib. Cent. Eur., Caucasus, N. Persia, Cent. Asia.

G. porrigens Boiss. Flor. Or. i. 557 (1867).

Near Tabriz, 5.26, flowers white or pinkish, No. 1615; 6.7.26, No. 1651; in fruit, 27.7.26, No. 1766; garden weed, 1.6.27, No. 2018; cultivated at Kew from Tabriz seed as K. 412 and 14.8.28. Flowers normally in June and July and fruits in July and August.

Distrib. Asia Minor, Syria, Palestine, Iraq, Armenia, Persia, Afghanistan.

G. ruscifolia Boiss. Diagn. Ser. I. 1.12 (1842).

Yam pass, below Dik Dash, 8.27, flowers white, No. 2015. Flowers from mid-June to August.

Distrib. Syria, Iraq, Armenia, Persia.

Holosteum glutinosum Fisch. et Mey. Ind. Sem. Hort. Petrop. vi. 52 (1839).

Near Tabriz, garden weed, 1.4.26, flowers white or pink, No. 1346, a rather large form; hills to the south, 4.26, No. 1374, dwarf plants; near Tabriz, 4.26, No. 1380; plants branched from base; garden in hills south of Tabriz, 29.4.26, No. 1433; garden weed, 4.27, No. 1778, partly pink flowered plants, hills south of Tabriz, 24.4.27, No. 1857, dwarf plants; hills south of Tabriz, 5.27, No. 1858, a much branched plant; cultivated at Kew from Tabriz seed, 19.6.28 and 3.6.29.

Distrib. E. Medit. Region.

The plants of this genus show a wide range of characters in various combinations and the species are difficult to characterize. Of the published descriptions the Tabriz plants agree best with that quoted above, but I have seen no type specimen of *H. glutinosum*. Gay in Ann. Sci. Nat. Ser. 3. iv. 23 (1845) has a monograph of the genus. According to this *H. glutinosum* is a variety of *H. umbellatum* and the petals are "utrinque supra basim ciliolata." The petals of the Tabriz specimens are, however, so far as I have dissected them, quite glabrous.

Exactly what *H. liniflorum* Stev. may be I am not sure. The name was published in Ind. Sem. Hort. Petrop. iii. 39 (1837) and reduced by Gay (l.c.) to *H. umbellatum* β *glutinosum*, i.e. *H. glutinosum* Fisch. et Mey. The stamen number and the petal shape do not agree with those of the Tabriz plants. In Ind. Sem. Hort. Petrop. vi. 52 (1839) a different description is attached to the name *H. liniflorum* Stev. which is here used for a species with long petals.

Lepyrodiclis holosteoides Fenzl. in Ledeb. Flor. Ross. i. 359 (1842).

Near Tabriz, 11.5.26, flowers invariably white, No. 1511; Zindjanab, end of June 1929, No. 2637; cultivated at Kew from Tabriz seeds as K. 399, 21.7.27, and 18.6.28.

Distrib. E. Asia Minor, Armenia, N. Persia, Turkestan, Baluchistan, N. India, Cent. Asia.

Melandryum ericalycinum Boiss. Diagn. Ser. II. i. 78 (1853).

Tabriz, garden weed, flowers white, 30.4.26, Nos. 1438 (♀), 1439 (♂); 19.4.27, No. 1852 (♂), 1853 (♀), 1854 (♂); cultivated at Kew from Tabriz seed as K. 453, 20.5.28.

Distrib. Asia Minor to Afghanistan.

The degree of development of the calyx indumentum varies very greatly and with the data available at present it appears to be inadvisable to attempt a division of the species. It is probable that many botanists would refer our specimens, wholly or in part, to the var. *persicum* Boiss.

Minuartia acuminata Turill in Kew. Bull. 1929, 225.

Mishou Dag, 19.7.28, flowers white, No. 2374.
Endemic.

Saponaria orientalis L. Sp. Pl. 409 (1753).

Valley of Livan, on rocky stones near torrent, mostly fruiting, 9.25, flowers white or pink, No. 1301; near Tabriz, 5.6.27, No. 1850; ploughed field near Yam, 28.8.27, No. 2091.

Distrib. Greece, Asia Minor, Armenia, N. Persia,

The specimens are not quite typical of the species and vary even amongst themselves. No. 1301 is very floriferous and glandular hairy and has capsules equal in length to the calyx. No. 850 is younger but its older calyces are glabrescent. No. 2091 is a luxuriant, much branched, very floriferous, densely glandular hairy plant, with the pedicels rather short and the capsules exceeding the calyces in length.

Silene Aucheriana Boiss. Diagn. Ser. I. i. 27 (1842).

Above Zindjanab, Sahand Range, 25-27.6.29, flowers pinkish, No. 2521.

Distrib. Armenia, Kurdistan, N. Persia, Baluchistan.

There is a wide range of variation within this species. The specimens under No. 2521 combine the narrow-leaved character of the "f" *stenophylla* Bornm. with the character of having a glandular

calyx such as is found in var. *viscosa* Freyn et Sint. The polymorphism of the species is indicated by Bornmüller in Beih. Bot. Centrbl. xix. ii. 216 (1906).

S. commelinaefolia Boiss. Diagn. Ser. I. i. 35 (1842).

Mishou Dag, 12.7.28, No. 2386.

Distrib. Armenia, N. Persia.

S. conoidea L. Sp. Pl. 418 (1753).

Near Tabriz, 29.4.26, flowers pink or red, also white flowered forms occur, No. 1447; hills south of Tabriz, 2.5.26, No. 1459; near Tabriz, 5.26, No. 1625; cultivated at Kew from Tabriz seeds as K. 397, and 16.8.28.

Distrib. Medit. Region.

S. delectabilis Turill in Kew. Bull. 1929, 225.

Near the top of Mishou Dag, in cracks in the rocks, with very showy deep pink-purple flowers, 19.7.28, No. 2359.

Endemic.

S. Marschallii C. A. Mey. Verz. Pfl. Cauc. 214 (1831).

Above Zindjanab, Sahand Range, 25-27.6.29, flowers white verging on pink, No. 2505.

Distrib. Asia Minor, Armenia, Caucasus, N. Persia.

S. noctiflora L. Sp. Pl. 419 (1753).

Garden weed, Tabriz, flowers white, 23.5.27, No. 1855; Urmia plain, 28.5.28, No. 2323.

Distrib. E.N. Temp. Region.

S. peduncularis Boiss. Diagn. Ser. I. i. 30 (1842).

Hills south of Tabriz, flowers white, 27.6.27, No. 2021.

Distrib. Transcaucasus and Persia.

S. pruinosa Boiss. Diagn. Ser. I. i. 23 (1842) et viii. 85 (1849).

Hills to the south of Tabriz, 5-6.26, flowers white, No. 1630; 21.5.27, Nos. 1845, 1846, 1847, 1848, 1849; 22.6.27, No. 2020 (?)

Distrib. Asia Minor, Syria.

S. pruinosa Boiss. var. *rubra* Gilliat-Smith a planta vulgare petalis rubris differt.

Hills south of Tabriz, 5.6.28, No. 2320.

S. leyseroides Boiss. Diagn. Ser. I. i. 41 (1842). *S. arenosa* C. Koch in Linnaea xv. 711 (1851).

Hills south of Tabriz, 5.6.28, No. 2321.

Distrib. Iraq, Armenia, Persia, Afghanistan.

S. pungens Boiss. Diagn. Ser. I. i. 32 (1842).

Mishou Dag, 5.8.29, No. 2590.

Distrib. Armenia, N. Persia.

S. racemosa Otth. in DC. Prodr. i. 384 (1824) var. *Sibthorpiana* Boiss. Flor. Or. i. 589 (1867).

Near Tabriz, 16.5.26, flowers white, No. 1495 ; cultivated at Kew from Tabriz seeds, 14.8.28 and 13.10.28. Flowers from the second half of May till August.

Distrib. (of species sensu Boiss.) Southern and eastern parts of the Balkan Peninsula, Asia Minor, Cyprus, Syria, Iraq, N. Persia, Caucasus.

(of var.) from species area except Caucasus.

S. spergulifolia *M. Bieb.* Flor. Taur.-Cauc. iii. 305 (1819).

Yam, 24.6.28, No. 2347.

Distrib. E. Asia Minor, Syria, Armenia, Transcaucasus, Persia.

The varieties of this species as accepted by Boissier do not seem to be very well differentiated.

S. swertifolia *Boiss.* Diagn. Ser. I. i. 32 (1842).

Valley of Livan, rocky hillsides, 9.25, flowers white, No. 1280 ; near Tabriz, 6.26, Nos. 1715, 1761 ; near Tabriz, 5.6.27, No. 1844.

Distrib. Asia Minor, Syria, Persia.

S. viscosa *Pers.* Syn. i. 497 (1805).

Above Zindjanab, Sahand Range, 25-27.6.29, flowers white, No. 2510.

Distrib. Cent. Eur., S. Russia, Asia Minor, Armenia, N. Persia, Cent. Asia.

S. vulgaris *Garcke* Flor. Deutschl. ed. ix. 64 (1869).

Mishou Dag, wet ravine, end of August, 1929, flowers white, No. 2606.

Distrib. E.N. Temp. Region.

Vaccaria pyramidata *Med.* Phil. bot. i. 96 (1789) var. **grandiflora** *Hayek* Prodr. Flor. Penins. Balc. i. 218 (1924).

Near Tabriz, 6.26, flowers pink or red, No. 1647 ; Yam, 8.27, No. 2029 ; cultivated at Kew from Tabriz seed as K. 396, 29.6.28 and 23.7.28.

Distrib. (of species and var.) E. N. Temp. Region.

TAMARICACEAE.

Myricaria germanica *Desv.* in Ann. Sci. Nat. Ser. I. iv. 349 (1825).

Mishou Dag, along water in a field, 22.5.27, flowers white or pink, No. 1930.

Distrib. Cent. Eur. and Medit. Region to Cent. Asia.

Reaumuria hypericoides *Willd.* Sp. Pl. ii. 1250 (1800).

Hills to the north of Tabriz, 22.6.27, flowers white or pink, often with cream tinge, Nos. 1926, 1927 ; 7.27, No. 2148. Flowers end of June to end of August.

Distrib. Caucasus, Persia, Caspian district.

R. persica *Boiss.* Flor. Or. i. 761 (1867).

Hills to the north of Tabriz, 22.6.27, flowers white or pink, Nos. 1928, 1929 ; 7.27, No. 2149. Flowers end of June to end of August.

Distrib. Persia, "Armenia."

HYPERICACEAE.

Hypericum asperulum *Jaub. et Spach* Illustr. i. 60 (1842-43).

Urmia district, 5.26, flowers yellow, No. 1560.

Distrib. Iraq, Persia.

H. hyssopifolium *Vill.* Hist. Pl. Dauph. iii. 505, t. 44 (1789).

Yam, 8.27, No. 1968 ; near Tabriz, 8.27, flowers yellow, No. 2120.

Distrib. Medit. Region and Cent. Asia.

H. scabrum *L.* Cent. i. 25 (1755) ; *Amoen.* Acad. iv. 287 (1759).

Yam, 8.27, flowers yellow, No. 1969 ; Mt. Sir, 27.5.28, No. 2336.

Distrib. Asia Minor to Persia and Cent. Asia.

MALVACEAE.

Abutilon Avicennae *Gaertn.* Fruct. ii. 251, t. 135 (1791).

Tabriz, in garden, 8.27, flowers orange, No. 2153.

Distrib. N. Temp. Region.

Althaea (Alcea) ficifolia *Cav.* Diss. ii. 92, t. 28, f. 2 (1786) var. **glabrata** *Boiss.* Flor. Or. i. 834 (1867).

Yam, 8.27, flowers pale yellow or cream, No. 2118 ; near Tabriz, 21.8.27, No. 2119 ; 9.27, No. 1303.

Distrib. (of species) S. Russia, Armenia, Caucasus, N. Persia.

(of var.) N. Persia.

Gossypium herbaceum *L.* Sp. Pl. 693 (1753) s.l.

Garden, south-east of Tabriz, 8.28, No. 2467.

The common cultivated cotton of the district.

Distrib. Cultivated in many of the warmer parts of the world.

Hibiscus trionum *L.* Sp. Pl. 697 (1753).

Near Tabriz, 7.8.27, flowers white or pink, No. 2013 ; 8.27, No. 2080.

Distrib. Cent. Eur. and Medit. Region.

Malva rotundifolia *L.* Sp. Pl. 688 (1753).

Near Tabriz, garden weed, 4.5.27, flowers white or mauve, No. 2076 ; 5.27, No. 2123.

Distrib. E.N. Temp. Region.

M. silvestris *L.* Sp. Pl. 689 (1753) var. **mauritiana** *Boiss.* Flor. Or. i. 819 (1867).

Near Tabriz, 9.25, No. 1309. Flowers from the second half of May throughout the season, deep pink.

Distrib. (of species) E.N. Temp. Region.

(of var.) locally in the area of the species.

LINACEAE.

Linum austriacum *L.* Sp. Pl. 278 (1753).

Near Tabriz, 5.26, flowers sky blue, No. 1723 ; Yam, 22.5.27, No. 2063.

Distrib. Cent. and S. Eur. east to Caucasus and N. Persia.

L. mucronatum Bertol. Misc. bot. I, 18 (1842) var. **eglandulosum** Turrill in Kew Bull. 1929, 226.

Near Tabriz, 5.26, flowers yellow, No. 1586.

Distrib. (of species) E. Asia Minor, Armenia, Iraq, Palestine, Syria.
(of var.) Endemic.

L. usitatissimum L. Sp. Pl. 277 (1753).

In garden near Tabriz, 4.7.26, flowers blue, No. 1765.

Distrib. Often occurring as an escape from cultivation.

GERANIACEAE.

Biebersteinia multifida DC. Prodr. i. 708 (1824).

Hills to the north-east of Tabriz, 15.5.27, flowers yellow, No. 1932.

Flowers in March, fruits in May.

Distrib. Syria, Persia, Iraq, Turkestan, Afghanistan, Cent. Asia.

Erodium ciconium Ait. Hort. Kew. ed. 1, ii. 415 (1789).

Weed in garden near Tabriz, 5.26, flowers white or mauve to pinkish, No. 1488. Flowers in May, fruits in June and July.

Distrib. Medit. Region.

E. cicutarium L'Hér. ex Ait. Hort. Kew. ed. 1, ii. 414 (1789).

Near Tabriz, garden weed, 26.4.26, flowers pink, No. 1417; 24.4.27, No. 1829. Flowers April to June.

Distrib. Now nearly cosmopolitan.

E. oxyrhynchum M. Bieb. Flor. Taur.-Cauc. ii. 133 (1808).

Hills south of Tabriz, 4.6.27, No. 1831. Flowers in May, pale pink, fruits in June.

Distrib. Armenia, Transcaucasus, N. Persia, Transcaspia, Songaria.

Geranium collinum Steph. ex Willd. Spec. Pl. iii. 705 (1800) var. **eglandulosum** Ledeb. Flor. Ross. i. 468 (1842).

Yam, 7.8.27, flowers pink, No. 2004; Yam, 6-8.28, No. 2409.

Distrib. (of species and var.) S.E. Russia to Baikal and N.W. Himalayas.

G. tuberosum L. Sp. Pl. 680 (1753).

Hills south of Tabriz, 29.4.26, flowers pink, No. 1441.

Distrib. Medit. Region and Cent. Asia.

G. tuberosum L. var. **linearifolium** Boiss. Flor. Or. i. 873 (1867).

Yam, 22.5.27, flowers pink, No. 1830.

Distrib. (of var.) S.E. Russia, Caucasus, N. and W. Persia, Cent. Asia.

XXXV.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXVIII.

Melastoma acutisepalum Geddes [Melastomaceae-Osbeckieae]; a *M. polyantho* Blume cymis longioribus, receptaculo sparse adpresse setuloso, calycis segmentis multo longioribus recedit.

Frutex circa 2.5 m. altus (ex Kerr), ramis primo quadrangularibus adpresse hirsutis ad nodos setosis mox teretibus glabris. *Folia* oblongo-lanceolata, apice acuta, basi late cuneata, 4.4–8.2 cm. longa, 1.9–3.2 cm. lata, supra adpresse hirsuta, subtus pallidiora, ad nervos nervulosque pilis adpressis dense instructa, nervis 7 (duobus exterioribus tenuibus) pagina superiore impressis inferiore prominentibus, nervis transversis inter se parallelis supra subconspicuis subtus prominentibus, petiolo 8–11 mm. longo adpresse hirsuto supra canaliculato suffulta. *Panicula* laxa; axes quadrangulares, hirsuti; pedicelli 7–10 mm. longi. *Receptaculum* sparse adpresse setulosum. *Calycis* segmenta 5, lineari-lanceolata, apice acuta, 8 mm. longa, margine ciliata. *Petala* 5, purpurea (ex Kerr), obovata, apice obtusa, 2.5 cm. longa, 1.5 cm. lata, dorso fere glabra. *Stamina* 5 longiora, 5 breviora, longiorum connectivis ad 12 mm. infra loculos extensis basi bifurcatis, filamentis 10 mm. longis, antheris 7 mm. longis, breviorum connectivis apud antheras bifurcatis, filamentis 9 mm. longis, antheris 5 mm. longis. *Stylus* 2.8 cm. longus, glaber. *Fructus* ellipsoideus.

Kaw Chang, Klawng Kloi, 50 m., rocky ground, Kerr 9244.

Oxyspora caudata Geddes [Melastomaceae-Oxysporeae]; ab affini *O. hirta* Ridl. ramis petiolisque pilis brevioribus instructis, foliis latioribus caudatis, calycis segmentis deltoideis recedit.

Frutex ad 5 m. altus (ex Kerr); ramuli fistulosi, primo quadrangulares, dense breviter hirsuti, mox glabrescentes, pallide corticati. *Folia* opposita inter se subaequalia, subelliptica, ovato-oblonga, vel elliptico-rotundata, caudato-acuminata, basi late cuneata vel rotundata, cordatula, 11–16 cm. longa, 5.7–8.7 cm. lata, chartacea, sicco supra viridia vel fusciscentia, subtus viridia, supra sparse setulosa, mox plus minusve glabrescentia, subtus ad nervos hirsuto-tomentosa, ad nervulos longius setosa, 7–9-nervia, nervis supra conspicuis subtus prominentibus duobus exterioribus tenuibus, nervis transversis pagina utraque plus minusve conspicuis, margine ciliata, inferne integra, superne denticulata; petioli foliorum oppositorum inaequales, 3–10 cm. longi, hirsuto-tomentosi. *Panicula* terminalis, pedunculo communi 3–4.5 cm. longo incluso 9–15 cm. longa, basi ad 7.5 cm. diametro, pedunculo cum rhachi et ramulis densius breviter hirsuto; pedicelli ad 5 mm. longi, puberuli; bracteae lineares, circa 3 mm. longae, fugaces; alabastra subacuta, apice breviter pauci-setulosa. *Receptaculum* supra ovarium productum, circa 6 mm. longum, setulosum vel hirsutum. *Calycis* segmenta 4, deltoidea, apice seta longiuscula acuminata, dorso

* Continued from K.B., 1930, p. 174.

Nakawn Sritamarat, Kao Luang, 1300-1600 m., common in evergreen forest, flowers mauve, *Kerr* 15500.

Frutex ad 2 m. altus (ex *Kerr*) ; ramuli graciles, primo setulis brevibus subadpressis instructi, mox glabri, cortice cinereo-brunneo obtecti, nodis incrassati, glabri, lenticellis haud conspicuis. *Folia* opposita, paribus inter se inaequalibus, oblongo-lanceolata vel ovato-lanceolata, apice longius obtuse acuminata, basi cuneata vel late cuneata, 5-12 cm. longa, 1.5-4.5 cm. lata, chartacea, sicco supra fusco-viridia, subtus pallide viridia, supra primo pulverulento-puberula, glabrescentia, subtus similiter iuventute puberula praeterea ad nervos setis brevibus subsquamiformibus hic et illic instructa, e basi trinervia, nervis lateralibus utrinque 1 paulo supra laminae basem ortis, nervis supra conspicuis subtus subprominentibus, nervis transversis rectis fere patulis inter se parallelis in foliis maioribus inter se 3-4 mm. distantibus saepissime supra conspicuis subtus prominulis, margine subintegra, petiolis oppositis inter se inaequilongis 1-4 cm. longis indumento ei ramulorum simili tectis. *Inflorescentia* terminalis, pedunculo communi 4-5 cm. longo sulcato scabrido suffulta, ex umbellis tribus constituta, umbellis duabus inferioribus oppositis subsessilibus vel pedunculo ad 1 cm. longo suffultis ad 4-floris rarius 1-2-floris, umbella terminali a lateralibus circa 2 cm. distante ad 6-flora ; pedicelli usque ad 1 cm. longi, scabridi, sicco saepe punicei, basi bracteis parvis deciduis instructi ; flores punicei (ex *Kerr*). *Receptaculum* circa 3 mm. longum, scabridulum. *Calycis* tubus fere 2 mm. longus, truncatus, ad lobos incrassatus. *Petala* 4, elliptica, breviter subacuminata, 6 mm. longa, 3.5 mm. lata, glabra. *Stamina* 8, inter se inaequalia ; maxima filamentis 9 mm. longis, antheris apice attenuatis filamentis aequilongis ; parvissima filamentis 5 mm. longis, antheris circa 3.5 mm. longis ; antherae omnes antice nudae, postice connectivo in appendicem brevem obtusam producto. *Stylus* staminibus intermediis subaequilongus.

Oxyspora setosa Craib [Melastomaceae-Oxysporeae]; *O. hirtae* Ridl. habitu similis sed foliis ovato-ellipticis vel subellipticis supra haud glabris, nervis transversis magis numerosis et magis approximatis recedens.

Trang, Kao Sung, 900 m., evergreen forest, *Kerr* 15236.

Frutex circa 50 cm. altus (ex Kerr); ramuli quadrangulares, angulis alatis, ad 5 mm. diametro, glabri, sicco brunnei. *Folia* subelliptica, apice subacuminata, circa 18 cm. longa et 8.5 cm. lata, chartacea, sicco supra fusco-brunnea, subtus viridi-brunnea, supra praesertim ad nervos plus minusve pulverulenta, subtus matura fere glabra, 5-nervia, nervis supra impressis subtus prominentibus, nervis transversis inter se parallelis et 4-6 mm. distantibus supra conspicuis subtus prominulis, margine obsolete denticulata, petiolo 3.5-4.5 cm. longo conspicue alato alis basi auriculatis suffulta. *Panicula* terminalis, pedunculo communi 3 cm. longo incluso 14 cm. longa, inferne 6 cm. diametro, iuventute pulverulenta, rhachi quadrangulanti angulis anguste alatis, ramulis plus minusve angulatis vix alatis; pedicelli 4 mm. longi, subteretes; bractae deciduae; flores purpurei (ex Kerr). *Receptaculum* supra ovarium ad 3 mm. tubuloso-productum, parte tubulosa post anthesin saepe decidua. *Fructus*

(vix maturus) saepissime subellipsoideus, 3-4 mm. longus, glaber, longitudinaliter 8-costatus.

Pattani, Bukit, 100 m., evergreen forest, *Kerr* 7874.

Allomorpha sylvorum *Geddes* [Melastomaceae-Oxysporeae]; ab affini *A. exigua* Blume, var. *capillari* Ridl. foliis longius acuminatis, inflorescentiae ramulis magis robustis, cymis haud umbelliformibus, capsulis maioribus breviter crassius stipitatis recedit.

Frutex ad 3 m. altus (ex *Kerr*); ramuli primo ferrugineo-furfuracei, angulati, mox glabri, teretes, fusciscentes. *Folia* opposita inter se similia sed paulo inaequalia, elliptico-oblonga, longius acuminata, summo apice primo costa excurrente apiculata, basi cuneata vel rotundato-cuneata, 6-13.5 cm. longa, 2.5-5.2 cm. lata, chartacea, sicco supra fusco-brunnea, subtus viridia, supra primo ferrugineo-furfuracea, matura glabra, subtus sparse ferrugineo-furfuracea, e basi trinervia, nervo intramarginali etiam e basi oreunte tenuiore addito, nervis supra conspicuis, subtus prominentibus, nervis transversis inter se parallelis et ad 5 mm. distantibus supra conspicuis subtus prominulis, reticulatione vix conspicua, margine integra vel subintegra, anguste recurva, petiolo 0.7-1.4 cm. longo iuventute ferrugineo-furfuraceo supra canaliculato suffulta. *Panicula* fructescens, pedunculo communi 1.2-2.5 cm. longo incluso, 7.8-8.5 cm. longa, rhachi et ramulis sparse ferrugineo-furfuraceis vel subglabris, ramulis inferioribus ad 2 cm. longis. *Capsula* subrotundata, ad 4 mm. longa, stipite crasso stramineo circa 1 mm. longo suffulta, calyce persistente coronata, prominenter 8-costata.

Nan, Doi Pu Ka, 1200-1600 m., common in evergreen, *Kerr* 4921.

Phaulanthus brevidens *Craib* [Melastomaceae-Oxysporeae]; a *P. Helferi* Ridl. indumento sparsiore e pilis brevioribus constituto et calycis lobis conspicue brevioribus recedit.

Frutex circa 2 m. altus (ex *Kerr*); ramuli iuventute pallidi, dense breviter adpresse hirsuti, mox brunneo-corticati, plus minusve glabrescentes, lenticellis haud conspicuis, ad 5 mm. diametro. *Folia* opposita, paribus inter se similibus aequalibus vel parum inaequalibus, elliptico-ovata vel rotundato-ovata, apice subacute acuminata, basi saepe parum inaequilaterialia, rotundata vel truncata et plus minusve leviter retusa, 10-15 cm. longa, 6.5-11 cm. lata, chartacea, sicco viridia, subtus pallidiora, supra ad nervos adpresse hirsuta, aliter matura scabridula, setis sparsis instructa, subtus ad nervos subadpresse hirsuta, aliter sparse hirsuta, e basi 7-nervia, nervis supra conspicuis subtus prominentibus exterioribus tenuioribus, nervis transversis inter se parallelis supra conspicuis vel subconspicuis subtus prominulis, margine ciliata, petiolo 3-7.5 cm. longo adpresse hirsuto suffulta. *Flores* fasciculati, et axillares et infra folia orti, punicea (ex *Kerr*), pedicellis usque ad 8 mm. longis sparse setulosis suffulti. *Receptaculum* ambitu oblongum, plus minusve obtuse angulatum, supra ovarium tubuloso-productum, paulo ultra 2 mm.

longum, circa 2 mm. diametro, setis rigidis albis adscendentibus subsparis et processibus carnosus brevibus sparsis instructum. *Calycis* tubus circa 0.5 mm. longus; lobi late deltoidei, obtusi, circa 0.5 mm. longi et 1 mm. lati, sat crassi, dorso apice brevius cornuti, intra glabri. *Petala* 4, suboblonga, apiculata, 3 mm. longa, 1.25 mm. lata, glabra, medio incrassata. *Stamina* 8, inter se aequalia, filamentis 2.5 mm. longis, antheris filamentis subaequilongis dorso basi breviter calcaratis. *Stylus* 6 mm. longus; ovarium circa 1 mm. longum, a receptaculo fere omnino liberum, apice concavum, 4-loculare.

Songkla, Klawng Yai, 50 m., open evergreen forest, *Kerr* 15888.

Phaulanthus nervosus *Craib* [Melastomaceae-Oxysporeae]; a *P. Helferi* Ridl. ramulorum indumento brevior, receptaculi setis paucioribus, calycis lobis brevioribus, a *P. brevidente* Craib nervis transversis subtus prominentibus, pedicellis brevioribus inter alia recedit.

Frutex ad 2 m. altus (ex *Kerr*); ramuli setis adpressis brevibus hirsuti, primo compressi, sicco bisulcati, mox teretes, saepissime cinnamomei, ad 7 mm. diametro. *Folia* saepissime oblongo-elliptica, apice acute acuminata vel subacuminata, basi late cuneata, emarginata, 8-23 cm. longa, 3-11.5 cm. lata, rigide chartacea, sicco supra plus minusve fusciscentia, subtus pallide viridia, supra matura scabrida, iuventute setis paucis brevibus adpressis saepissime mox deciduis instructa, subtus setis brevibus subadpressis ad nervos dense aliter sparsius instructa, e basi 5-nervia, nervis duobus aliis tenuibus prope marginem saepissime additis, nervis supra conspicuis subtus prominentibus, nervis transversis inter se parallelis supra magis minusve conspicuis subtus subprominentibus, nervulis paucis subtus prominulis, hirsuto-ciliolata, petiolo 1-10 cm. longo indumento ei ramulorum simili tecto suffulta. *Flores* fasciculati, et axillares et infra folia orti; pedicelli 2-3 mm. vel infrutescentes circa 4 mm. longi, setosi. *Receptaculum* ambitu oblongum, basi inaequaliter gibbosum, 2.5-3 mm. longum, setosum. *Calycis* lobi late deltoidei, medio apicem versus cornuti, circa 1 mm. longi, dorso sparse setosi. *Petala* quatuor, 2 mm. longa, 1.75 mm. lata, glabra, sat crassa. *Stamina* 8, inter se aequalia; filamenta 4 mm. longa; antherae 2.5 mm. longae, poro singulo apicali dehiscentes, basi antice nuda, postice breviter appendiculatae, loculis basi inter se breviter liberis. *Stylus* stamina paululo superans. *Semina* minuta, pallida, basi fusca, papillosa, cuneata, apice plana, horizontaliter acuminata.

Takuapa, Kapong, 100 m., evergreen forest, *Kerr* 17127.

Phaulanthus pedunculatus *Craib* [Melastomaceae-Oxysporeae]; a *P. brevidente* Craib et *P. nervoso* Craib foliis angustioribus, pedunculo communi evoluto recedit.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli iuventute graciles, teretes, cinnamomei, setulis adpressis hirsuti, demum parum fusciscentes, subglabri, ad 6 mm. diametro. *Folia* opposita, paribus inter

se similibus sed saepe parum inaequalibus, oblongo-lanceolata vel oblongo-elliptica, apice obtuse acuminata, basi late cuneata, rotundata, emarginata, 8-15 cm. longa, 3.3-5.8 cm. lata, chartacea, sicco supra plus minusve brunnescentia, subtus pallide viridia, supra scabridula et setulis paucis hic et illic instructa, subtus ad nervos pilis rigidis et setis brevibus subsparsis hirsuta, aliter similiter sed sparsius hirsuta, e basi 5-nervia, nervis supra conspicuis subtus prominulis, nervis transversis inter se parallelis supra conspicuis subtus prominulis, margine sparse setuloso-ciliata, petiolo 1.5-5 cm. longo indumento ramulorum recto suffulta. *Inflorescentia* racemiformis, infra folia orta, pauciflora, rhachi cum pedunculo communi brevi ad 5 mm. longa; pedicelli ad 7 mm. longi, primo rubro-tincti, sparse adpresse setulosi, basi parvi-bracteati. *Receptaculum* ambitu oblongum, circa 3 mm. longum, supra ovarium tubuloso-productum, iuventute sicco puniceum, dorso sparse breviter adpresse setulosum. *Calyx* 1 mm. longus, lobis quam tubo paululo brevioribus dorso medio apicem versus brevissime appendiculatis. *Ovarium* apice concavum, a receptaculo fere omnino liberum, 4-loculare.

Ranawng, La-un, 20 m., evergreen forest, *Kerr* 16491.

***Sonerila angulata* Craib** [Melastomaceae-Sonerileae]; a *S. ciliata* Ridl. caule inferne minus rigido angulato vix alato, a *S. flaccida* Stapf et King antheris multo longioribus recedit.

Caulis parce ramosus, circa 20 cm. altus, inferne radicans, sicco brunneus, angulatus, basi 3 mm. diametro, plus minusve glanduloso-subfurfuraceus. *Folia* opposita, paribus inter se similibus sed parum inaequalibus, suboblonga, apice acuminata vel subacuminata, obtusiuscula, basi parum inaequilateralia, cuneata vel late cuneata, 5-9.5 cm. longa, 2.5-4.3 cm. lata, submembranacea, sicco viridia vel parum brunnescentia vel supra albo-maculata, viva interdum rubro-tincta (ex *Kerr*), supra leprosula et parvi-pustulata macula quaque medio uni-setosa, subtus leprosula vel glabra, parvi-pustulata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 3 obliquis pagina utraque conspicuis vel inferiore prominulis, margine argute denticulata, interdum undulata, petiolo 0.5-2 cm. longo suffulta. *Cymae* secundae, et terminales et ramulos laterales terminantes, pedunculo communi infructescente circa 3 cm. longo suffultae, et pedunculo et rhachi conspicue angulatis sicco stramineis; bracteae deciduae; flores purpurei (ex *Kerr*); pedicelli demum ad 6 mm. longi, conspicue angulati, straminei, glabri vel subglabri. *Receptaculum* 5 mm. longum, supra ovarium ad 2 mm. tubuloso-productum, glabrum vel interdum pilis perpauca glanduloso-capitatis instructum. *Calycis* segmenta 3, deltoidea, acuta, 1.5 mm. longa. *Petala* 3, ovato-oblonga, 6 mm. longa, 2.5 mm. lata, dorso medio pilis sat longis glanduloso-capitatis instructa, aliter glabra. *Stamina* 3, filamentis fere 4 mm. longis, antheris 5.5 mm. longis superne angustatis, loculis basi inter se liberis. *Stylus* staminibus paulo brevior. *Capsula* circa 6 mm. longa, straminea.

Betong, 400 m., bank in scrub jungle, *Kerr* 7473 (type of fruit), 7473a (type of flower).

***Sonerila insularis* Craib** [Melastomaceae-Sonerileae]; herba rhizomate brevi tuberiforme, caule gracili erecto vel adscendente, nodis superioribus approximatis, staminibus tribus distincta.

Herba rhizomate circa 1 cm. longo tuberiforme, caule annuo erecto vel adscendente usque ad 5 cm. longo simplice vel superne parce ramoso gracili sicco rubro glabro vel apicem versus pauperius barbato, nodis inferioribus sat distantibus superioribus approximatis. *Folia* opposita, ovata, oblongo-ovata, vel rarius rotundato-ovata, apice obtusa, basi rotundata vel truncata, haud rarius cordatula, 2-8 cm. longa, 1.5-4.5 cm. lata, sicco subviridia, membranacea, glabra, rarius subglabra, e basi 5-7-nervia sed parum variabilia, nervis duobus superioribus e basi oreuntibus vel basi cum costa longius confluentibus vel interdum paulo supra basem oreuntibus, nervis pagina utraque conspicuis, nervis transversis paucis vix conspicuis, margine setoso-denticulata, petiolo 0.8-2.5 cm. longo glabro vel parce glanduloso-barbato suffulta. *Cyma* terminalis, pedunculo communi ad 4 cm. longo suffulta, glabra vel fere glabra, bracteis parvis setaceis, pedicellis biseriatis circa 3 mm. longis quadrangulis; alabastra apice angustata, acuta. *Receptaculum* 4.5 mm. longum, supra ovarium tubuloso-productum, glabrum. *Calycis* segmenta deltoidea, acuta, circa 1 mm. longa, paulo incrassata. *Petala* 3, oblongo-cuneata, apice cuspidato-acuminata, 7 mm. longa, 3 mm. lata, glabra, breviter unguiculata. *Stamina* 3, antheris apice attenuatis basi sagittatis, 5.5 mm. longis, filamentis 4 mm. longis. *Stylus* staminibus paulo brevior. *Fructus* stramineus, 5 mm. longus, apice 3-3.5 mm. diametro.

Kaw Pangan, *Put* 1166.

***Sonerila notata* Craib** [Melastomaceae-Sonerileae]; herba erecta, caule duriusculo, foliis sicco plus minusve purpurascentibus ad nervos pallide notatis cognoscenda.

Herba erecta, caule simplice usque ad 7 cm. alto vel haud rarius vix evoluto inferne radicante angulato vel superne subalato duriusculo. *Folia* opposita inter se similia, oblongo-elliptica, elliptica, vel obovata, apice obtusa vel rotundata, interdum breviter acuminata, basi cuneata vel late cuneata, 2.5-11 cm. longa, 1.5-5.5 cm. lata, sicco membranacea, plus minusve purpurascentia, ad nervos pallide notata, glabra, nervis lateralibus pinnatis utrinque 4-5 pagina utraque cum costa conspicuis, nervulis paucis conspicuis, margine irregulariter pauci-denticulata, petiolo 2-17 mm. longo suffulta. *Inflorescentia* terminalis, cymosa, pedunculo communi incluso 4-8 cm. longa, alabastris et capsulis tantum visis; flores trimeri. *Receptaculum* supra ovarium tubuloso-productum. *Calycis* segmenta late deltoidea, acuta, dorso medio superne incrassata, circa 1.5 mm. longa et lata. *Stamina* 3. *Capsula* glabra vel rarius setosa, 3-4 mm. longa, pedicello 2-3 mm. longo suffulta.

Kanburi, Sai Yok, *Put* 1844.

Sonerila sylvicola Craib [Melastomaceae-Sonerileae]; herba erecta, fere glabra, rhizomate brevi repente, foliis oppositis inter se similibus pinnatim nervosis, staminibus tribus distincta.

Herba erecta, ad 20 cm. alta, rhizomate repente, caulibus simplicibus solitariis sicco rubris ad nodos inferiores saepe radicantibus. *Folia* opposita inter se similia, ovato-lanceolata, subovata, vel rarius subelliptica, apice obtusa vel acuta, basi cuneata vel late cuneata, 3-7.5 cm. longa, 2-3.5 cm. lata, sicco membranacea, viridia vel ad nervorum partes basales rubra, glabra vel saepe pagina superiore marginem versus pauci-setosa, nervis lateralibus utrinque 3-4 saepissime obliquis pagina utraque conspicuis vel subconspicuis, nervulis obscuris, margine setoso-denticulata, petiolo 1-1.7 cm. longo glabro vel apice pauci-barbato suffulta. *Inflorescentia* terminalis, glabra, pedunculo communi 1-4 cm. longo suffulta, bracteis parvis subulatis, pedicellis circa 3 mm. longis; alabastra longius attenuata. *Receptaculum* circa 5 mm. longum, supra ovarium tubuloso-productum, glabrum. *Calyx* segmenta deltoidea, acuta, dorso medio incrassata, 1.75 mm. longa, 1.5 mm. lata, glabra. *Petala* 3, oblongo-oblancheolata, acuminata, acuta, ad 13 mm. longa et 5 mm. lata, glabra. *Stamina* 3, filamentis 7 mm. longis, antheris paulo arcuatis apice productis 9 mm. longis, loculis basi productis inter se liberis, postice paululo supra filamentorum insertionem minute tuberculatis. *Stylus* 13 mm. longus.

Surat, Kao Nawng, 1100-1200 m., on trees in evergreen forest, Kerr 13268.

Marumia dimorpha Craib [Melastomaceae-Medinilleae]; a speciebus aliis visis receptaculis et calyce pilis ferrugineis brevibus stellatis obtectis praetereaue setis sat longis rigidis primo pilos stellatos gerentibus instructis recedens.

Frutex volubilis (ex Kerr); ramuli primo parum angulati, pilis stellatis ferrugineis dense furfuraceo-tomentosi, ad nodos prominenter annulati. *Folia* opposita, paribus inter se aequalibus vel subaequalibus, oblongo-elliptica, ovato-oblonga, vel rarius elliptica, apice acuminata, basi rotundata vel cordatula, 6.5-9 cm. longa, 2.7-5.5 cm. lata, rigide chartacea, pagina superiore viridia, saepe nitida, subtus ferruginea, supra ad nervos primarios sed praesertim ad costam breviter pubescentia, aliter glabra, subtus pilis ferrugineis stellatis sat dense subhirsuta, e basi 5-nervia, nervis supra impressis subtus prominentibus, nervis transversis inter se parallelis et 3-5 mm. distantibus supra impressis subtus prominentibus, nervulis rete gracile supra vix conspicuum subtus prominulum efficientibus, margine integra, parum recurva, petiolo 5-7 mm. longo indumento ei ramulorum simili oblecto suffulta. *Cymae* axillares, 3-5-florae, pedunculo communi 2-2.8 cm. longo cum pedunculis partialibus ubi evolutis circa 1 cm. longis et pedicellis 0.5-1 cm. longis indumento ei ramulorum simili oblecto; bracteae deciduae, circa 1 cm. longae; bracteolae deciduae, 7 mm. longae; flores pallide punicei (ex Kerr). *Receptaculum* ambitu oblongum, supra ovarium ad 5 mm. tubuloso-

productum, circa 11 mm. longum et 7 mm. diametro, dorso pilis ferrugineis stellatis dense tectum praetereaue setis rectis primo pilos stellatos gerentibus superne gradatim longioribus et magis numerosis instructum, intra glabrum. *Calyx* dorso pilis stellatis ferrugineis oblectus; tubus 2 mm. longus, intra glaber; lobi oblongo-lanceolati, subacuti, 10 mm. longi, 5 mm. lati, intra stellato-tomentosi, medio intra incrassati, post anthesin reflexi, margine subregulariter denticulati. *Petala* 4, elliptica vel obovato-elliptica, circa 2.5 cm. longa et 1.5 cm. lata, glabra. *Stamina* 8, filamentis circa 12 mm. longis, glabris, loculis circa 1.5 cm. longis; 4 connectivo basi circa 7 mm. producto ima basi setis filamentosis 4 ad 9 mm. longis antice instructo postice calcarato, 4 connectivo vix producto setis similibus duabus instructo dorso calcarato. *Ovarium* apice liberum, pilosum, 4-loculare, placentis bilobatis; stylus 1.4 cm. longus, pilos paucos stellatos gerens.

Batang Sta, 50 m., edge of evergreen forest, Kerr 7283.

Marumia impressa Craib [Melastomaceae-Medinilleae]; a *M. nemorosa* Blume indumento diverso, foliorum nervis supra impressis inter alia differt.

Frutex scandens; ramuli teretes, pilis stellatis ferrugineis vel cinnamomeo-ferrugineis oblecti, ad nodos annulato-incrassati. *Folia* opposita, paribus inter se aequalibus, saepissime oblonga, oblongo-elliptica, vel iuniora late lanceolata, apice obtuse acuminata, basi rotundata vel cordatula, 6.5-12 cm. longa, 2-5 cm. lata, rigide chartacea, sicco supra viridia, subtus ferruginea vel cinnamomeo-ferruginea, pagina superiore primo pilis ferrugineis stellatis conspersa, mox nisi ad nervos primarios glabra, inferiore pilis stellatis ferrugineis vel cinnamomeo-ferrugineis persistenter subhirsuta, e basi 5-nervia, nervis supra impressis subtus prominentibus, nervis transversis numerosis inter se parallelis et 3-5 mm. distantibus supra impressis subtus prominentibus, nervulis rete supra gracile vix conspicuum subtus laxum subprominulum efficientibus, margine integra, parum recurva, petiolo circa 5 mm. longo indumento ei ramulorum simili oblecto suffulta. *Cymae* axillares, 3-florae, pedunculo communi 2-3.5 cm. longo suffultae, partibus omnibus pilis iis ramulorum similibus oblectae; bracteae deciduae; bracteolae duae, etiam deciduae, circa 5 mm. longae; pedicelli sub anthesin 3-5 mm. longi. *Receptaculum* ambitu oblongum, supra ovarium tubuloso-productum, circa 1 cm. longum et 6 mm. diametro, dorso pilis brevibus ferrugineis stellatis oblectum, intra glabrum. *Calyx* tubo intra glabro excepto utrinque similiter tectus; tubus circa 2 mm. longus; lobi reflexi, oblongo-lanceolati, obtusi, 12 mm. longi, 6 mm. lati, intra medio incrassati. *Petala* 4, punicea (ex Kerr), obovato-rotundata, 2.7 cm. longa, 2.5 cm. lata, glabra, breviter late unguiculata. *Stamina* 8, filamentis 1.3 cm. longis; antherae 4 ad 2 cm. longae, connectivo basi 6 mm. producto ima basi setis filamentosis duabus circa 6 mm. longis et 4 brevioribus instructo et dorso incrassato vel parum producto, 4 breviores, connectivo basi

vix producto ima basi setis duabus filamentosis 6 mm. longis instructo dorso haud producto. *Ovarium* apice liberum, pilosum, 4-loculare, placentis bilobatis; stylus 2.2 cm. longus, primo pilos paucos stellatos gerens.

Takuapa, Kapong, 100 m., edge of evergreen forest, *Kerr* 17110.

***Medinilla elliptica* Craib** [Melastomaceae-Medinilleae]; a speciebus aliis floribus pentameris e peninsula malayana foliis oppositis sessilibus vel subsessilibus, panícula terminali recedit.

Fruticulus epiphyticus (ex *Kerr*), ad innovationes ferrugineo-furfuraceus, aliter glaber; ramuli primo compressi vel angulati, stramineo-corticati, lenticellis haud conspicuis, annotini subteretes, lenticellis prominentibus tuberculati. *Folia* opposita, saepissime elliptica vel oblongo-elliptica, apice obtuse acuminata, basi rotundata, vel cordatula, 6-9.5 cm. longa, 2.5-4 cm. lata, subcoriacea, sicco subviridia, subtus pallidiora, triplinervia, nervis supra conspicuis subtus prominentibus, nervo intramarginali e basi oreunte multo tenuiore evoluta, nervulis fere omnino obscuris, margine integra, anguste cartilaginea, saepe parum recurva, sessilia vel subsessilia. *Panicula* terminalis, pedunculo communi 1-2 cm. longo incluso 4-5 cm. longa, ad 6 cm. lata, ad nodos ferrugineo-furfuracea, pedunculis et pedicellis primo pilis brevibus ferrugineis sparsissime instructis, pedunculis lateralibus ad 1 cm. longis; flores punicei (ex *Kerr*), pedicellis circa 7 mm. longis suffulti. *Receptaculum* circa 4 mm. longum, supra ovarium parum productum. *Calycis* tubus brevis, sub anthesin fere truncatus. *Petala* 5, suboblonga, paululo ultra 1 cm. longa, circa 8 mm. lata. *Stamina* 10, filamentis circa 8 mm. longis, antheris 6-8 mm. longis basi antice bituberculatis postice appendiculatis. *Stylus* circa 1.2 cm. longus.

Ranawng, Kao Pawta Chongdong, 900 m., evergreen forest, *Kerr* 16779.

***Medinilla emarginata* Craib** [Melastomaceae-Medinilleae]; ab affini *M. Scortechinii* King foliis et inflorescentiis brevioribus recedit.

Frutex epiphyticus; ramuli parum complanati, stramineo- vel pallide brunneo-stramineo-corticati, subsparse tuberculati, maturi glabri. *Folia* oblongo-oblancoolata, oblongo-lanceolata, vel suboblonga, apice obtuse acuminata, basi cuneata, 7-11 cm. longa, 2.7-3.5 cm. lata, sicco chartacea vel subcoriacea saepe viridia, triplinervia, nervis pagina utraque conspicuis, nervulis rarius subconspicuis, glabra, margine integra, parum recurva, sessilia vel petiolo circa 2 mm. longo suffulta. *Cymae* ex axillis foliorum delapsorum ortae, pedunculo communi ad 7 mm. longo incluso ad 2 cm. longae, floribus circa 5; bracteae deciduae; pedicelli ad 8 mm. longi; flores albi (ex *Kerr*). *Receptaculum* circa 3 mm. longum. *Calycis* lobi rotundati, circa 1 mm. longi et 2 mm. lati, apice emarginati. *Petala* 4, obovata, apice truncata, 12 mm. longa, 6.5 mm. lata. *Stamina* 8, inter se aequalia, filamentis 7.5 mm.

longis, antheris apice attenuatis 6 mm. longis basi antice bituberculatis postice breviter calcaratis. *Stylus* 1.4 cm. longus; ovarium 4-loculare.

Kao Kalakiri, 900 m., evergreen forest, *Kerr* 7773.

***Medinilla ferrata* Craib** [Melastomaceae-Medinilleae]; a *M. crassifolia* Blume ramulis magis tuberculatis distinguenda.

Frutex epiphyticus (ex *Kerr*), gemmis ferrugineo-pubescentibus exceptis glaber; ramuli cinerei vel stramineo-cinerei, prominenter tuberculati. *Folia* opposita, elliptica, vel oblongo-elliptica, apice subacute acuminata, basi cuneata, 8-18 cm. longa, 3.7-7.5 cm. lata, carnosae, sicco rigide chartacea, e basi vel fere e basi trinervia, nervo intramarginali multo tenuiore addito, nervis supra conspicuis subtus prominentibus, nervis transversis paucis hic et illic subconspicuis, margine integra, parum recurva, petiolo 0.8-1.8 cm. longo supra late canaliculato suffulta. *Cymae* ex axillis foliorum delapsorum ortae, saepissime 5-florae, pedunculo et pedicellis, gracilibus, pedunculo communi 1-2.3 cm. longo incluso ad 4.5 cm. longae, glabrae, pedicellis 8-10 mm. longis, bracteis et bracteolis deltoideis circa 1 mm. longis. *Receptaculum* 4 mm. longum. *Calycis* tubus truncatus, 1.5 mm. longus. *Petala* 5, alba (ex *Kerr*), oblongo-cuneata, apice breviter mucronulata, 14-19 mm. longa, 8-9 mm. lata. *Stamina* 10; filamenta 7-8 mm. longa; antherae arcuatae, apice productae, 9 mm. longae, basi antice bituberculatae, postice breviter calcaratae. *Stylus* 12 mm. longus.

Surat, Kao Nawng, 800 m., evergreen forest, *Kerr* 13253.

***Memecylon Brandisianum* Craib** [Melastomaceae-Memecyleae]; a *M. garcinioide* Blume ramulis pallidioribus, foliis sicco viridibus, pedunculo communi et pedicellis conspicue longioribus recedit.

Arbor circa 7 m. alta (ex *Kerr*), glabra; ramuli primo straminei, mox cinerei vel cinnamomeo-cinerei, teretes, lenticellis haud conspicuis. *Folia* oblongo-elliptica vel elliptica, apice obtuse acuminata, basi cuneata, acuminato-cuneata, vel rarius late cuneata, 10-12.5 cm. longa, 4.3-5.7 cm. vel rarissime usque ad 7 cm. lata, chartacea, sicco pagina utraque viridia, inferiore parum pallidiora, interdum lutescentia, costa subtus prominente, nervis lateralibus utrinque circa 10 pagina superiore subconspicuis inferiore conspicuis bene intra marginem anastomosantibus, nervis transversis obscuris, margine integra, parum recurva, petiolo 5-7 mm. longo supra late canaliculato suffulta. *Cymae* axillares, umbelliformes, petiolo paulo longiores, pedunculo communi saepissime solitario 5-10 mm. longo compresso sulcato suffultae; pedicelli ad 3 mm. longi, basi parvibracteati; alabastra cum pedicellis sicco atra, longius acuminata. *Receptaculum* circa 2 mm. longum, supra ovarium productum, basi rotundatum vel subrotundatum. *Calyx* ante anthesin subtruncatus, margine pallidus.

Terutao, under 5 m. evergreen forest, *Kerr* 14169.

Memecylon caudatum Craib [Melastomaceae-Memecyleae]; a *M. Griffithiano* Naud. et *M. corticoso* Ridl. foliis latioribus, nervis lateralibus pagina inferiore magis prominentibus distinguendum.

Arbor circa 5 m. alta (ex *Kerr*), glabra; ramuli iuventute straminei, 4-alati, mox teretes, 2-3 mm. diametro, cortice brunneo substriato obtecti, lenticellis haud conspicuis. *Folia* ovato-lanceolata, caudato-acuminata, summo apice obtusa, basi rotundata, 12-17 cm. longa, 3.5-5.7 cm. lata, rigide chartacea, sicco viridia, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 15 rectis supra impressis subtus subprominentibus conspicue anastomosantibus et 2-5 mm. intra marginem nervum intramarginalem undulatum supra impressum subtus subprominentem efficientibus, nervis paucis aliis tantum paulo minus conspicuis interiectis, nervulis paucis subtus conspicuis, margine integra, saepe parum recurva, subsessilia vel petiolo circa 2 mm. longo suffulta. *Inflorescentia* infra folia orta; pedunculus communis haud evolutus; flores ignoti. *Fructus* pedicello 3 mm. longo suffultus, subglobosus, calyce persistente coronatus, fere 1 cm. diametro, pericarpio primo purpureo maturo sicco pallide viridi plus minusve lenticellato crustaceo tenui; semen solitarium, nitidum, stramineo-brunneum.

Kanburi, Wangka, 700 m., by stream in evergreen forest, *Kerr* 10433.

Memecylon constrictum Craib [Melastomaceae-Memecyleae]; inter species foliis maioribus et nervis lateralibus conspicuis receptaculo supra ovarium conspicue constrictum distinctum.

Frutex circa 3 m. altus (ex *Haniff et Nur*), glaber; ramuli teretes, primo parum angulati, circa 3 mm. diametro, cortice cinereo-brunneo obtecti, lenticellis haud conspicuis. *Folia* saepissime ovato-elliptica, vel oblongo-elliptica, apice acuminata vel subacuminata, obtusa, basi cuneata, saepe parum inaequilaterialia, 7-13 cm. longa, 3.5-5.3 cm. lata, subcoriacea, sicco supra brunnea, subtus pallide viridia, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 12 rectis intra marginem anastomosantibus supra subconspicuis subtus prominulis, paucis aliis tantum paulo minus conspicuis interiectis, nervulis obscuris, margine integra, anguste cartilaginea, recurva, petiolo sat valido 2-4 mm. longo suffulta. *Cymae* et axillares et ex axillis foliorum delapsorum ortae, usque ad 1 cm. longae, pedunculo communi brevi; pedicelli circa 1 mm. longi; bracteae deciduae; alabastra obtusa vel brevissime obtuse acuminata. *Receptaculum* ad ovarium 1 mm. diametro, supra ovarium ad 0.5 mm. diametro constrictum, inde dilatatum, apice circa 2.5 mm. diametro, sicco pallidum, parum pustulatum, intra supra ovarium costatum. *Calycis* tubus brevis, incurvus, apice truncatus. *Petala* 4, pallide azurea (ex *Haniff et Nur*), subquadrata, apice breviter acuminata, circa 1.75 mm. longa et lata. *Stamina* 8, filamentis 1.5 mm. longis, antheris antice glandula concava conspicua parva instructis, loculis circa 0.75 mm. longis, connectivo ad

1 mm. producto. *Ovarium* circa 1.25 mm. longum; ovula 9, basalia.

Kopah, Bukit Tinggi, Ban Krap, 300 m., *Haniff et Nur* 2732.

Memecylon dissitum Craib [Melastomaceae-Memecyleae]; ab affini *M. garcinioide* Blume inflorescentiis laxioribus e floribus paucioribus sicco fuscis constitutis, fructu maiore recedit.

Frutex circa 1.5 m. altus (ex *Kerr*), glaber; ramuli sicco iuventute subplumbei, parum compressi, haud sulcati, mox pallide brunnei, demum cinerei vel brunneo-cinerei, lenticellis haud conspicuis, ad 3 mm. diametro. *Folia* oblongo-ovata, oblongo-lanceolata, vel oblongo-elliptica, apice acute acuminata, basi cuneata vel acuminato-cuneata, 9-13.5 cm. longa, 3-5.7 cm. lata, chartacea, sicco olivacea vel fusco-olivacea, nervis lateralibus utrinque circa 10 intra marginem anastomosantibus saepissime pagina utraque conspicuis vel subconspicuis, margine integra, parum recurva, petiolo 3-4 mm. longo suffulta. *Cymae* et axillares et infra folia ortae, 3-6-florae, pedunculo communi 4-5 mm. longo suffultae; pedicelli graciles, 3-4 mm. longi; alabastra sicco cum pedicellis fusca, breviter acuminata. *Receptaculum* breve, latum, intra supra ovarium costatum. *Calycis* tubus brevis, apice truncatus vel irregulariter denticulatus. *Petala* 4 vel 5, oblata, breviter acuminata, ad 2 mm. longa et 3 mm. lata, sat crassa, azurea (ex *Kerr*). *Stamina* 8 vel 10. *Fructus* sicco substramineus, ambitu subellipticus, basi oblique gibbosus, circa 10 mm. longus et 8 mm. diametro, tubo persistente ad 2 mm. longo coronatus; semen solitarium.

Nakawn Sritamarat, Kao Luang, 200-300 m., evergreen forest, *Kerr* 15408.

Memecylon Geddesianum Craib [Melastomaceae-Memecyleae]; a *M. laevigato* Blume cymis longius pedunculatis, floribus paucioribus, alabastris longe acuminatis, a *M. Chevalieri* Guillaumin foliis pro longitudine angustioribus, petalis maioribus, stylo longiore differt.

Frutex circa 3 m. altus (ex *Kerr*), glaber; ramuli lateraliter sulcati, mox teretes, cortice brunneo vel cinereo-brunneo obtecti, lenticellis haud conspicuis. *Folia* oblongo-elliptica, elliptica, lanceolata, vel subobovata, saepe parum inaequilaterialia, apice obtuse acuminata, basi cuneata, 5-8.5 cm. longa, 2-4 cm. lata, subcoriacea, sicco supra pallide viridia, subtus lutescentia, costa supra impressa subtus prominente, nervis lateralibus obscuris, margine cartilaginea, parum recurva, petiolo circa 5 mm. longo supra canaliculato suffulta. *Cymae* axillares, solitariae, pedunculo communi circa 1 cm. longo incluso ad 1.5 cm. longae, pauciflorae; bracteae angustae, circa 1.25 mm. longae, deciduae; pedicelli 2.5 mm. longi; alabastra longe acuminata. *Receptaculum* supra ovarium productum, circa 1.5 mm. longum. *Calyx* brevis, apice truncatus. *Petala* subrotundata vel quadrato-rotundata, apice longius acuminata, ad

3.25 mm. longa et 2.75 mm. lata. *Filamenta* 3 mm. longa, antheris 1.5 mm. longis, loculis 1 mm. longis. *Stylus* 5 mm. longus.

Surin, Sangka, 200 m., by stream in evergreen forest, *Kerr* 8268.

Memecylon kratense Craib [Melastomaceae-Memecyleae]; a *M. Griffithiano* Naud. foliis basi rotundatis vel cordatulis haud cuneatis vel rotundatis recedit.

Frutex glaber; ramuli iuventute 4-alati, straminei, mox teretes, cortice cinereo vel cinnamomeo-cinereo obtecti, lenticellis haud conspicuis. *Folia* lanceolata, vel oblongo-lanceolata, apice gradatim angustata, subobtusata, basi rotundata, interdum cordatula, rarius truncata, usque ad 18 cm. longa et 4.5 cm. lata, rigide chartacea, sicco viridia, subtus parum pallidiora, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 20 pagina inferiore et interdum etiam superiore subconspicuis, nervulis obscuris, margine recurva, anguste cartilaginea, petiolo ad 2 mm. longo suffulta. *Flores* infra folia orti, fasciculati, vel rhachi sat valida breviter pauci-barbata brevi racemosim gesti; pedicelli 5 mm. longi, basi articulati; bracteae deciduae; alabastra obtusa. *Receptaculum* 2.5 mm. longum, supra ovarium productum, summo apice 4 mm. diametro intra supra ovarium costatum. *Calyx* ante anthesin distincte lobatus, sub anthesin denticulatus. *Petala* 4, oblata vel elliptico-oblata, apice rotundata, interdum breviter acuminata, ad 2.5 mm. longa et lata. *Stamina* 8, filamentis brevibus.

Krat, Kao Saming, *Put* 531.

Memecylon tricolor Craib [Melastomaceae-Memecyleae]; a *M. amabile* Bedd., var. *malaccense* C. B. Clarke foliis pro longitudine multo angustioribus recedit.

Frutex circa 1.5 m. altus (ex *Kerr*), glaber; ramuli iuventute conspicue 4-angulati vel ad angulos interdum fere alati, graciles, cinereo-corticati, mox teretes, cortice brunneo-cinereo obtecti, lenticellis haud conspicuis. *Folia* saepissime lanceolata, rarius oblongo-lanceolata vel ovato-lanceolata, apice fere semper obtusa, basi cuneata, 3-6 cm. longa, 0.7-1.7 cm. lata, subcoriacea, sicco viridia, subtus pallidiora, costa supra impressa subtus prominente, nervis lateralibus nervulisque obscuris, margine integra, recurva, anguste cartilaginea, petiolo circa 2 mm. longo supra canaliculato suffulta. *Cymae* in paniculas et axillares et infra folia ortas pedunculo communi 2-4 mm. longo incluso ad 1 cm. longas circa 1 cm. diametro superne vel saepe e basi ramosas dispositae; pedunculi 4-angulati, sicco virides vel saepe azureo-tincti; bracteae lanceolatae, 1.5 mm. longae, deciduae; pedicelli teretes, sicco azurei, 2-4 mm. longi, ima basi articulati; alabastra obtusa vel breviter obtuse acuminata. *Receptaculum* subturbinatum, ad ovarii apicem haud vel vix constrictum, supra ovarium productum, circa 2 mm. longum, summo apice circa 3 mm. diametro, intra subcostatum. *Calyx* ante anthesin breviter lobatus. *Petala* 4, paulo ante anthesin oblata, obtusa, 2 mm. longa, 2.5 mm. lata, sat crassa. *Stamina* 8.

Sakon, Wa Nawn, 200 m., open deciduous forest, *Kerr* 8495.

Lagerstroemia Noei Craib [Lythraceae-Lythreae]; ab affinibus *L. Balansae* Koehne et *L. Collinsae* Craib alabastris apice longe acuminatis distinguenda.

Frutex circa 1 m. altus (ex *Noe*); ramuli graciles, teretes, primo pilis pallide fulvis brevibus stellatis tecti, pilis saltem paucis diu persistentibus, annotini cortice pallide brunneo obtecti, lenticellis obscuris. *Folia* opposita vel subopposita, oblonga vel suboblonga, apice obtuse acuminata vel subacuminata, basi rotundata, 5-8 cm. longa, 2.2-3.5 cm. lata, rigide chartacea, sicco viridia, subtus parum pallidiora, iuventute pagina utraque pilis brevibus stellatis pallide fulvis oblecta, matura supra glabra, subtus subglabra vel saepissime ad costam pilis paucis stellatis instructa, nervis lateralibus utrinque circa 7 intra marginem anastomosantibus supra conspicuis subtus prominulis, nervulis rete gracile pagina utraque conspicuum efficientibus, integra, petiolo 2-3 mm. longo indumento ei ramulorum simili tecto supra canaliculato suffulta. *Flores* in paniculam terminalem pedunculo communi circa 2 cm. longo incluso 13 cm. longam basi 5 cm. latam internodiis infimis 2 cm. longis quam supremis duplo longioribus ramulis oppositis obliquis ad 4 cm. longis dispositi vel interdum panicula foliis breviora pauciflora ramulis inferioribus axillaribus; rhachis cum pedunculis et pedicellis indumento ei ramulorum simili tecta; pedicelli ad 7 mm. longi, apice bibracteolati vel floribus terminalibus subsessilibus; alabastra turbinata, apice acumine 2 mm. longo instructa, basi angustata, 12 mm. longa, dense fulvo-tomentosa, haud costata. *Receptaculum* circa 4 mm. longum, intra glabrum. *Calycis* segmenta 5, oblongo-deltoidae, acuminata, 7 mm. longa, 4 mm. lata, crassa, intra superne dense albo-tomentosa. *Petala* 5, oblato-rotundata, 1.4 cm. longa, 1.5 cm. lata, ungui 2 mm. longo suffulta, dorso pilis paucis stellatis deciduis instructa. *Antherae* subrotundatae, circa 1.25 mm. diametro, connectivo lato. *Ovarium* pilosum, stylo 15 mm. longo ima basi pubescente aliter glabro.

Korat, Ban Chum Seng, *Noe* 246.

XXXVI.—MISCELLANEOUS NOTES.

DR. J. M. COWAN, M.A., D.Sc., F.L.S., has been appointed, by the First Commisisoner of Works, Assistant to the Regius Keeper, Royal Botanic Garden, Edinburgh.

Dr. Cowan was formerly in the Indian Forest Service. After he retired he acted, for a time, as Superintendent of the Royal Botanic Gardens, Calcutta, and recently has been working as a Temporary Botanist in the Herbarium at Kew. In 1929 he went on an expedition, on behalf of Kew and the John Innes Horticultural Institution, to Persia for the purpose of studying agricultural and horticultural methods, and to make a collection of the representative plants of the country (*K. B.* 1930, App. I., pp. 5, 6).

DR. C. R. METCALFE, M.A., Ph.D., has been appointed, by the Minister of Agriculture and Fisheries, Assistant Keeper, Jodrell Laboratory, Royal Botanic Gardens, Kew.

We note with much pleasure that DR. D. H. SCOTT, F.R.S., has been elected an Honorary Fellow of the Royal Society of Edinburgh.

RETIREMENT OF MR. L. A. BOODLE.—The inevitable flow of time has resulted in the loss to Kew of the services of another valued officer in the person of Mr. L. A. Boodle, Assistant Keeper of the Jodrell Laboratory, who reached the age limit on May 4th last. Mr. Boodle started on his scientific career at the Royal College (then the Normal School) of Science in 1886, where he had the advantage of being a pupil of Dr. D. H. Scott, under whom he served later at Kew when Dr. Scott was Honorary Keeper of the Jodrell Laboratory (see *K.B.* 1892, p. 245; 1906, p. 383). Mr. Boodle was appointed Demonstrator of Botany at the Royal College in the year 1890, and held that post until October 1st, 1904, when he was appointed an Assistant at the Royal Botanic Gardens, Kew, in the Jodrell Laboratory. On the retirement of Dr. Scott in 1906, Mr. Boodle took charge of the Laboratory, and was appointed Assistant Keeper on February 5th, 1909.

He was elected a Fellow of the Linnean Society in 1888 and served on the council on two occasions. His knowledge of botanical literature and of the anatomical structure of plants has been of invaluable help to Kew in a vast number of critical matters, and he has given very valuable assistance in connection with the identification of specimens from the Egyptian Tombs. His critical knowledge and remarkably sound judgment will be sadly missed by his colleagues, and he leaves Kew with their sincere good wishes and regards.

SIR GEORGE WATT was born in Old Meldrum, Aberdeenshire, on April 24th, 1851, and died at Lockerbie, Dumfriesshire, on April 2nd, 1930. He received a medical education in Aberdeen and Glasgow, taking the degrees of M.B. and C.M. at Glasgow in 1873. Teaching attracted him, and he became prodissector to the Professor of Anatomy in Glasgow; but almost immediately, on the recommendation of Sir Joseph Hooker, he was selected by the India Office for service under the Government of Bengal as the first professor of Botany in the Presidency College, Calcutta. He went to India at the end of 1873; and taught for ten years, but never in the Presidency College, for the first laid plans were changed; and Watt, disappointed, accepting an alternative post in the Bengal Education Department, was sent to the college at Hughli to initiate the teaching of Botany there and take his share in other work. He studied the flora of Lower Bengal and of other parts of India in his ample vacations, and formed a private herbarium. He devised an excellent

system of numbering his specimens in the field by means of tag-labels detached from the correspondingly numbered sheets of his field note-books, which system has now been generally adopted.

Success in collecting, and the credit brought to him by two papers on Indian Botany in the *Journal of the Linnean Society*, led him to seek in botanical exploration a more interesting field of work; and at his own request, in 1881, he was attached as surgeon to the Burma-Manipur Delimitation Commission, with permission to use the opportunity for botanising. Before he had finished working out the results of the exploration of the frontier a new opportunity offered in connection with an Exhibition in Calcutta, and Watt was put in charge of the Economic Court. He threw all his energy into the preparations, and prepared an ordered account of the economic products of India, covering 1700 pages of print, which served both as a request for exhibits from local bodies all over India, as the plan upon which the exhibits were arranged on receipt, and also as a catalogue to the Court. The work marked out Watt's future, for the Government of India, observing how methodically he proceeded, and his conspicuous ability, requested him, at the close of the Exhibition, to elaborate the catalogue into his "*Dictionary of the Economic Products of India*," and at the same time to make preparations for the Colonial and Indian Exhibition of London, 1886. The first volume of the Dictionary was on sale at the Exhibition, and at its close he received the honour of the C.I.E.

The further eight volumes of the Dictionary were written after his return to India, where he now held the appointment of Reporter on Economic Products to the Government, in the Department of Revenue and Agriculture. He was also put in charge of a part of the Indian Museum, Calcutta, that he might form there a permanent exhibit of Indian produce in the newly built Economic Court. This Court was opened to the public at the commencement of 1900. Meanwhile by touring and collecting material he had laid the foundations for his subsequent work on cotton, and had written his "*Blight and Pests of the Indian Tea Plant*," and other papers.

When the Dictionary had been sold out, Watt was instructed to revise it as regards the commercial products only. But within a couple of months of commencing to do this, he was called away to prepare a fourth exhibition—the Delhi Exhibition of Indian Art. By a great effort he organised it in eight months and at the opening ceremony on January 2nd, 1902, his success was recognised by the honour of a knighthood. Shortly after the close of the Exhibition his book "*Indian Art at Delhi*" appeared; and he left for England, arrangements having been made for carrying on his further work at Kew. In 1907 he published his "*Wild and Cultivated Cottons of the World*," and in 1908 the "*Handbook of the Commercial products of India*."

On the conclusion of this laborious undertaking he took a trip to S. Thomé to study Cacao cultivation, and on his return patented

machinery for curing Cacao. He then made Lockerbie his home, and for five years was lecturer on Indian trees to the forestry students at Edinburgh. He was a County Councillor, a Justice of the Peace, and a leader in educational matters. Horticulture was his hobby, and the grounds of the Crichton Royal Institution, at Dumfries, were laid out under his direction.

The successes of his career were made by his great energy and his devotion to orderliness: the gates leading to the career were two and both were opened by the famine policy of the Government. His first Indian appointment was created at the wish of Sir George Campbell, then Lieutenant-Governor of Bengal, as the result of a conviction born out of the Orissa famine of 1864 that teaching in India should be made to touch upon Agriculture: and his transfer to the Government of India followed the adoption of the recommendations of Sir John Strachey's Famine Commission, particularly that which urged the carrying on of scientific enquiry designed to lead to the gradual increase of the food supply of the country. It was because he was mindful of the intentions of his first appointment that he paid attention during his years of teaching to economic plants, and planned a book upon them, and undoubtedly his medical training was of use to him in economic research.

I. H. B.

Impatiens Barnesii.—When applying this name to a new species from Southern India, in *K.B.* 1930, p. 153, the fact was unfortunately overlooked that the same name had been used in *K.B.* 1909, for a Philippine species (*Impatiens Barnesii* Hook. f., pp. 284 and 287). As I am anxious to retain the connexion with the collector of the Indian plant, I propose to rename the latter **Impatiens neo-Barnesii**, nov. nom.

C. E. C. FISCHER.

Imperial Botanical Conference, 1930.—The Imperial Botanical Conference (1930), under the Presidency of Dr. A. W. Hill, C.M.G., F.R.S., will be held in the Metallurgical Lecture Theatre (Prince Consort Road) of the Imperial College of Science and Technology, South Kensington, on Friday, 15th August, at 10.30 a.m.

Agenda.

1. To consider Reports of Committees appointed to deal with Resolutions put forward at the final Session of the Imperial Botanical Conference (1924).
2. To discuss a proposal that an Imperial Botanical Conference, on the lines of that held in 1924, be arranged to take place; if such a Conference be approved, to decide on its date and to set up the necessary organization.
3. Any further business.

Professor W. Brown, Imperial College of Science and Technology, South Kensington, S.W.7, is Hon. Secretary.

Index Londinensis, Volumes 2 and 3, 1930.*—In October, 1929, the first volume of this important work made its appearance.† It included all plants from *Aa* to *Campanopsis*. The editor, Dr. Stapf, and his collaborators have now brought their great task two stages further with the issue of Volumes 2 and 3. The former, although dated 1930, appeared towards the end of 1929, and consists of 548 pages. It comprises references to illustrations of all plants from *Campanula* to *Dsysphania*, inclusive. Volume 3, published in June, 1930, consists of a little over 554 pages, and includes references to illustrations of all plants from *Earina* to *Justicia*, inclusive. With its issue half of the whole work is completed. The Index is recognised by many as a work of great utility, and a trustworthy and voluminous guide to all who desire to see pictures of plants or parts of plants. It should, in this respect, supply every need of the practical gardener, be he florist or arboriculturist, and of the botanist, whether he be systematist, morphologist, or dilettante collector. The work will help to direct attention to a good deal of the older literature which has been neglected in the past and which frequently contains much that is valuable. It will be found to fill many a gap caused by the omission of pictures of intrinsic merit in themselves but which, for one reason or another, have been entirely left on one side by botanical workers. It should also point the way to a proper discrimination in the choice of illustrations in the future. Another important function of the Index consists in the revision of the nomenclature of well-known large genera such as *Bignonia*, *Croton*, *Pinus*, etc., which hitherto have included a confused medley of plants which, according to modern ideas, should be placed in quite distinct genera. This revision, let us hope, may have some effect in inducing gardeners to name their plants more correctly. As regards the nomenclature, strict adherence to the International Rules has not been observed, e.g. *all* specific names are not necessarily spelt with a small initial letter and sometimes greater respect is paid to classical origins than to the law of priority. This semi-independence in the matter of nomenclature can in no sense detract from the value and usefulness of the work. The Oxford Press are again to be congratulated on the excellence of the printing.

W. C. W.

Botanical Magazine.—The fourth and final part of Vol. clii (1927) has now been published and contains the following plant portraits:—*Rhododendron Griersonianum* Balf. f. & Forrest (t. 9195), a native of Southwestern Yunnan; *Primula Cawdoriana* F. Kingdon Ward (t. 9196), from the basin of the Tsang-po, S.E. Tibet; *Cornus paucinervis* Hance (t. 9197), which is widely spread in China; *Phalaenopsis violacea* Hort. Bogor. ex H. Witte (t. 9198), a native of Sumatra and Perak; *Ranunculus Ficaria grandiflorus* F. Schultz (t. 9199), from the Mediterranean Basin; *Rheum palmatum dissectum* Stapf, f. *rubriflora* (t. 9200), a new sub-species found in

*Published by the Clarendon Press, Oxford. Each volume price £5 5s.

†*Kew Bulletin*, 1929, p. 305.

Central Asia, Kansu and around Kuku Nor, Tibet; *Abies Faberi* Craib and *Abies Forrestii* Craib (t. 9201), both natives of China; *Rhododendron hedyosmum* I. B. Balf. (t. 9202), a dwarf species from Western Szechuan; *Columnnea microphylla* Klotzsch & Hanst. (t. 9203), an endemic species in Costa Rica; and *Ephedra procera* Fisch. & Mey. (t. 9204), a native of the orient and distributed from Greece to the Caucasus and Afghanistan.

Chenopodium Nuttalliae, a Mexican cereal.—The use of the seed of *Chenopodium Quinoa* Willd. as a cereal in mountain areas in South America has long been known (K.B. 1909, pp. 425-27). It is cultivated particularly at the higher altitudes in the Andes and supplies food where other food crops cannot easily be grown. The plant has been introduced to other countries and has been found to do well in parts of Europe. A number of different cultivated forms of "Quinoa" exist, differences in the size and colour of the seed from different parts of South America being very noticeable. During the period of the Great War its cultivation in Germany was brought to the fore, the grain proving suitable in bread-making and as a food for cattle and poultry.* In 1916 the "Kriegsernährungsamt" (Department for the distribution of food during the War) purchased the greater part of the harvest in that year so as to prevent the use of good seed as food.

In more recent years the use of an allied species, *Chenopodium Nuttalliae* Saff., by the inhabitants in certain parts of Mexico has been brought to notice. This plant, known to the Aztecs in Mexico as "Uauhtli," has in all probability been cultivated by them from time immemorial and is used in very much the same manner as "Quinoa" in the Andes. The plant differs from *C. Quinoa* in general appearance, and in the fact that the seed, when divested of the pericarp, is horn-coloured and not ivory-white as in *C. Quinoa*. The common form of *C. Nuttalliae* possesses achenes of a pale yellow or rose colour, though a form with dark brown seeds exists.

One of the methods of preparing the grain for food in Mexico is by roasting. The grain, a little at a time, is scattered into an earthenware pot heated over a fire. This causes the grain to pop or burst open like "pop-corn." As soon as the grain bursts it is removed from the pot, or burning occurs, and a fresh charge is added. A sample of the "popped" grain received at Kew is of a pleasing clean white colour and very light, the unbroken pieces being roughly ovoid in shape with a constriction in the centre and measuring 4-5 mm. in length and 2-3 mm. in width. In this condition, eaten with sugar and milk, it is said to afford an excellent breakfast dish. The ground grain is utilized by the inhabitants as a meal in various ways and the leaves and young shoots as a spinach. A method of utilizing the unripe inflorescences as food before the seeds

*Inter. Rev. of the Sci. and Prac. Agric., Rome, viii. p. 745 (May 1917).

harden is given as follows:—"The spikes are washed and dipped in batter composed of egg, flour, and grated cheese, and then fried in lard. The ends of several spikes are thus held together, and it is the custom to seize the stem and draw them through the teeth, thus detaching the very palatable green buds [unripe achenes], which form thick clusters." The immature inflorescence prepared in the above way or in other ways is called "Uauhtzontli."

F. N. H.

The World's Grasses.†—At the present time when so much attention is being given to the economic aspect of the world's grasslands, and such a large amount of systematic, genetical, and ecological research is being carried out on the grasses themselves, the publication of what may be considered an advanced text-book of agrostology should be of great assistance. In the above work of about 360 pages, Dr. Bews has gathered together a wealth of information for the student. This is presented in nine chapters in which the author deals with the morphology, cytology, classification, phylogeny, ecology, etc., of the grasses.

In an introductory chapter, a general account of the family is given, together with notes on floral structure, trends of evolution, seed dispersal, etc. This is followed by a chapter on the general differentiation of the tribes and genera, in which their phylogeny and relationships are considered. Dr. Bews has applied his theory of ecological evolution to the Gramineae and his conclusions will be of especial interest both to the systematist and the ecologist. He points out that those grasses which approach most closely to the liliaceous type, such as the Bamboos, are found in the moist tropics or in hygrophilous situations elsewhere, whilst those types which the author considers most advanced are adapted to the most adverse climatic conditions. The order of classification formulated closely approximates to that adopted by Hitchcock in his "Genera of Grasses of the United States." Thus the Bambuseae are considered most primitive on account of their floral structure and type of habitat. The Phareae are placed next to the Bambuseae. Though certainly an ancient group, they are obviously more closely related to the Paniceae as their spikelet structure shows. The Festuceae and Aveneae respectively follow the Phareae. The subfamily Pooideae concludes with the Oryzeae. The second large group of grasses—the Panicoideae, commences with the Melinideae, a heterogeneous collection of genera which are mostly referable to other tribes. The Paniceae are shown to be more primitive than the Andropogoneae, the latter showing advance in having better protected florets, more specialized inflorescences, and occurring in less favourable types of habitat.

* "*Chenopodium nuttalliae*, a food plant of the Aztecs," W. E. Safford, Jour. Washington Acad. Sci., Sept. 10, 1918, pp. 521-7.

† The World's Grasses, their differentiation, distribution, economics and ecology, by J. W. Bews. Longmans, Green and Co., London, pp. 408, fig. 48. Price 21s.

A key is given to the tribes and genera. This has been largely compiled from the works of Hackel, Stapf, Hitchcock, Chase and Camus. Those genera which have been placed in various tribes are keyed out in each of these.

Three chapters are devoted to the genera, in which the latter are arranged in a sequence to show their relationships. Under each is given the approximate number of species and the general distribution, together with notes on their ecology and economic uses.

In the first of two chapters dealing with the general ecology of grasses and grasslands, a number of types of habitat are considered and classified. The second chapter gives an outline of the world's grasslands.

Finally an account is given of the very numerous uses of the members of the family. The main cereal and fodder types are described and information is given on the cultivation of grasses and the management of grasslands, lawn-grasses and the making of lawns, etc.

The work concludes with a good, though far from complete, bibliography. Two important omissions from this are Steudel's "Synopsis Plantarum Glumacearum" and Hackel's "Monograph of the Andropogoneae." There is an appendix containing some recent additions to the family and an index. The book is fairly well illustrated, although one could have wished for better and more complete dissections to accompany the drawings and also for a few good photographs illustrating the types of grassland described.

C. E. H.

The Birds of Tropical West Africa.*—The distribution of the bird life, it is pointed out, is so entirely dependent on the distribution of the belts of vegetation, that the author has devoted considerable space to a general description of the belts of vegetation of Tropical West Africa and their correlation with faunal distribution. The area of Africa here discussed forms part of the West African Botanical Region and embraces two of the recognised Avifaunal Sub-Regions. The distribution of the vegetation is graphically shown on a map in colour, which has been specially prepared, from the most recent information, for this work and its companion "The Flora of West Tropical Africa."

In the section devoted to the relationship of the vegetation belts to the distribution of the bird life, the main types of vegetation are discussed and then contrasted with the Avifaunal divisions. It has not been found possible to use the same terms, as the vegetation terms are physiognomic and the Avifaunal geographic. The divisions, however, correspond.

The work will be found of value to all who are interested in natural history. To aid the novice without any technical

*By D. A. Bannerman. The Crown Agents for the Colonies, 4, Millbank, Westminster, 1930, pp. lxxv. + 376, full page plates and maps in colours 10, text figs. 119. Price 22s. 6d.

knowledge of ornithology an illustrated Key has been prepared by means of which the whole scheme of classification is much simplified.

The author, who is the acknowledged authority on this branch of the subject, has produced a work of first importance in a manner which cannot fail to make a wide appeal. His efforts have been ably seconded by the publishers, who have brought out a volume exceedingly well printed and admirably illustrated. This undoubtedly becomes a standard work on its subject for the area in question, and also provides a fund of information for reference for all countries which are visited by the birds described.

A Preface, by the Secretary of State for the Colonies, refers to the assistance in publication given by the British West African Colonies and the British Museum (Natural History).

T. F. C.

Victorian Orchids.*—The orchids of most countries seem to attract the attention of amateur botanists more readily than does any other group of plants. This is the case in Victoria, where there is an enthusiastic band of workers engaged in the study of this fascinating family. Mr. Pescott, a leading member of the group, attempts in this little book to give an account of the Victorian Orchids so far as they are known at present. Good descriptions are provided together with notes on distribution and other interesting biological facts. Some of the species are illustrated by photographs, which are often excellent. The value of the book, especially for the ordinary amateur interested in orchids, would be considerably enhanced, however, had Mr. Pescott provided artificial keys to both genera and species. Partial keys to *Thelymitra*, *Caladenia* and *Pterostylis* are indeed supplied, but even these are scarcely complete enough. In spite of this the book may be considered a valuable contribution to orchidology, since it gathers together much which was previously scattered in different publications.

V. S. S.

Australian Rain-Forest Trees.†—Anyone who is acquainted with tropical rain-forest, wherever it may occur, knows the immense wealth of species present and how difficult it is to identify the many different trees encountered. Those interested in the rain-forests of Queensland may therefore consider themselves fortunate in possessing such a thorough account of the chief species as is found in Mr. Francis's book. Each species is described fully, both field and technical characters being adequately dealt with, while there are

*The Orchids of Victoria. By E. E. Pescott. The Horticultural Pty., Ltd., Melbourne, 1928, pp. 92+suppl., 1 coloured and 14 photographic plates. Price 6s.

†By W. D. Francis. The Council for Scientific and Industrial Research, 314 Albert Street, East Melbourne, 1929, pp. ix+347, 213 half-tone plates, 25 figs., and rainfall map. Price 10s. Postage outside Australia 10d.

excellent illustrations both of the tree in situ and of the leaves, flowers, etc., the latter being made from herbarium specimens. In addition, descriptions of many of the less important trees and of the tree-like shrubs are included in order to render the work more complete. All the descriptions, which are entirely original, are in non-technical language, and are accompanied by notes on the distribution and economic properties of the species.

There are introductory portions on the rain-forest vegetation and its relation to various climatic and soil factors, and on such interesting features as the production of buttresses, etc. The bark and timber are also dealt with, there being some excellent photomicrographs of both. Descriptions of the families present and an artificial key, enabling the student to identify any unknown plant more or less precisely, complete what is altogether an extremely useful and admirable book.

It is to be hoped that Mr. Francis may at some time be enabled to provide a supplementary volume dealing with those rain-forest trees which are restricted to the Tropics in Queensland, and which have been omitted from the present work owing to our imperfect knowledge of them.

V. S. S.

Illustrations of British Plants.*—A supplement or a really new edition of Bentham's well-known 'Handbook of the British Flora,' with its companion volume of 'Illustrations' by Fitch, has long been needed. Mr. Butcher and Miss Strudwick are to be congratulated on the results of their joint attempt to supply this need. The present volume contains 485 black-and-white figures, accompanied by concise descriptions, of critical, rare, or newly discovered British species of plants. The variable and complex genera *Rubus*, *Hieracium*, *Euphrasia*, and *Salix* are wisely omitted, or represented by a few examples, and only selected microspecies of several other genera are included. The figures of Batrachian *Ranunculi*, *Callitriche*, *Sagina*, and *Bromus* are likely to be particularly useful. Most of the drawings and descriptions are excellent, though they naturally vary in merit. The figures of willows, poplars, and grasses especially deserve commendation, but the plates of *Eranthis hyemalis* and *Silene maritima* are somewhat below the average standard. A number of misprints, as *Bromus hordaceus* (for *hordeaceus*), should be corrected in the next edition. Three new species of the genus *Thalictrum* are described and it is to be regretted that actual specimens are not quoted for these, especially for *Thalictrum umbrosum* Butcher. In spite of some minor defects this book is bound to be of great value to all British botanists and should stimulate interest in the critical study of British plants.

W. B. T.

*Further Illustrations of British Plants, by R. W. Butcher, drawings by F. E. Strudwick. L. Reeve & Co., Ltd., 1930, pp. 476, price 12/-.

BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1930 ROYAL BOTANIC GARDENS, KEW

XXXVII.—RUSHES IN NORFOLK.

From time to time people who interest themselves in the revival of ancient village industries ask questions as to the cultivation, collection and use of rushes, and in this connection the following letter written to Kew on October 10th, 1853, may be of interest. It has to do with the collection and sale of rushes for making rushlights, and appears to be in response to a request made by Sir William Hooker for information upon the marketing of rushes in Norwich for that purpose.

Norwich, Oct. 10th, 1853.

" Dear Sir,

" The following are the results of enquiries made as you requested as to the statistics of Rush Fair.

" Rush Fair is held on the 2nd of August in the Yard and Barn of the Artickoke Inn, which stands on the site of the old ' Leper House without Magdalen Gates ' about 20 yards from the gates. The sale of Rushes is all that now remains of the once flourishing Magdalen Fair which, about 35 years since, was held at the same date on a piece of waste land just beyond the first milestone on the Sprowston Road, about 74 miles beyond Magdalen Chapel, in favour of which I suppose the original fair was granted. After this piece was inclosed, the tenant had to find a suitable field to hold the fair on and Mr. Beckwith tells us that he once officiated as steward to the Pie Powder court which was held during the fair. I remember about 25 years since seeing the Bailiffs with their halberds endeavouring to pacify a party of quarrelsome rustics, for the fair was too well-known by the quantity of fighting and wrestling customarily practised there. At this time there were Booths, Shows and a good horse and cattle fair.

" The rushes at the present time are gathered and prepared by women and children from a small tract of marsh on the North of the River Bure, containing the parishes of Horning, Hickling, Catfield and the neighbouring villages, all within a short distance of the Abbey of St. Bennet of Hulme. The species employed are the *Juncus effusus* and *J. glomeratus*, and the women aver that they have to wade up to their waists in water to obtain the longest and best samples. When cut they are divested with a penknife of the bark on two opposite sides leaving the other two to support the pith, they

are then soaked in a running stream until they are cleansed of all the green sap and then dried and packed for the Fair.

"The Rushes are made up into whips containing 12 rushes each, the whips into dozens and the dozens into grosses, neatly tied together at the top end and when set up for sale in the fair they have a very clean and attractive appearance.

"The number of gross sold in 1853 at the Fair was 504 at prices varying from 2/6d. to 8/- at an average of 4/6d. per gross.

"Each gross is reckoned sufficient for 12 dozen lbs. of candles; at this rate the quantity sold would make 870,912 candles.

"I believe that there are some sold at Yarmouth and elsewhere but whether they are the residue of the Fair I cannot ascertain. Like other markets there is a deal of manoeuvring with the dealers. The country people usually agree not to take less than a certain price, but if this does not suit the buyers and they 'hold off' it is sometimes noon before any bargains are made. The average of the two or three years would be desirable as I hear that last year the supply was less than this.

"I trust the above information is correct, but I cannot entirely reconcile some varying statements; should I find any important errors I will write and correct them.

I remain, etc.,

F. G. BAYFIELD."

In a supplementary letter the following particulars are said "to have been procured from young Mr. Kitton who lives with Mr. Wigham."

"The Rush Fair, formerly called Maudlin Fair, was formerly held on a portion of Mousehold Heath called the 'Fairstead'; it is now held at the 'Artichoke' Public House, Magdalen Street, and commences at 4 o'clock in the morning.

"The rushes are the produce of Hickling, Winterton, Sea Palling, all villages in Norfolk, and are gathered at the latter end of June, it being considered a Harvest by the inhabitants of the above villages. A woman with 4 children would earn on the average from £3 to £4. The rushes made into a 'bundle' containing 36 rushes, 12 small bundles make 1 large bundle, 12 large bundles 1 gross. The quantity brought last fair was 1,500 gross and the amount realized was £375, being 5/- per gross. Norfolk rushes are considered the best. A large-sized brown paper is made here called rush paper for packing the rushes. A trade is also done at Somersham, Hunts., in rushes.

"The reeds besides being used for thatching are used here instead of laths for plastering upon.

"I have made enquiry if they are used in weaving and I am told they are not. The Slaies were formerly made of *split cane* and were called by the weavers 'reeds.'

XXXVIII.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA*: II. CHONDODENDRON CANDICANS, A MENISPERMACEOUS BUSH-ROPE OF GUIANA. N. Y. SANDWITH.

The floor of the Guiana forest is more or less copiously sprinkled with seedlings of trees and bush-ropes which deserve more careful attention from collectors than they usually receive. A prolonged stay in a single locality is bound to provoke an interest in such vegetation in any intelligent observer, and provides the only satisfactory means for collecting and studying it. These seedlings frequently present constant characters in the shape, texture, venation and indumentum of their leaves which differ to a very remarkable degree from those of the mature tree or rope which towers, it may be, 150 feet above them. The botanists of the Oxford University Expedition to British Guiana, 1929, while encamped on the Moraballi Creek, Essequibo River, found particularly good instances of this phenomenon in such genera of tall trees as *Mora* and *Catostemma*. In the latter instance the seedlings provided excellent distinguishing characters between two species, the mature foliage of which was extremely similar.

The seedling leaves of the great bush-ropes, especially those of *Bauhinia* species, are very striking both in shape and indumentum, and they are sometimes found in herbaria in the covers of indeterminatae or queried as new species. The bush-rope which is the subject of the present paper was actually described on three, perhaps on four, occasions from seedling material alone, simply because the beautiful leaves had attracted the notice of collectors, who omitted to take the whole plant with its roots; and the absence until recently of flowering material of the mature plant collected at the same time as that of the seedling has caused it to be placed in the wrong genus by botanists in herbaria.

The identification of seedlings of bush-ropes is obviously a more difficult matter than that of seedling trees, because they are found in abundance over a wide area and often at some distance from the base of the rope which is sprawling over the forest canopy; and any collector in the tropical forest will testify to the difficulty and uncertainty of procuring good material of such ropes, even when the flowers have been found on the forest floor, or detected through field glasses in the canopy. Moreover, the drupaceous fruits of a Menispermaceous climber are no doubt attractive to birds, and account for the presence of quantities of seedlings within a wide radius in the neighbourhood of a mature rope. The dioecism of the Menispermaceae further complicates the question, and adds greatly to the difficulty of their identification both in the field and the herbarium. Thus the mature rope when brought to the ground may prove to be either a male or a female parent, or it may be only another plant of the same generation which has succeeded in finding the support necessary for its development, and has reached the canopy.

*Continued from K.B. 1930, p. 215.

Presumably only those seedlings which rise in a favourable position at the base of a trunk can ever hope to climb to maturity; and it may be assumed that the vast majority come to nothing more than the small erect plants with curious and beautiful leaves which puzzle the collector as he walks through the forest. No plants were observed in an intermediate stage in the process of climbing up a trunk. Probably this process is a very quick one, and the successful seedling puts out no leaves until it has reached the canopy; the behaviour, however, of such young ropes and of their unsuccessful contemporaries requires a special study, which would be of the greatest interest and value.

Seedlings of such a climber were found by the botanists of the Oxford Expedition in an area of morabukea forest by the Moraballi Creek which had been chosen as a sample plot for ecological work. They occurred in large numbers in this type of forest, which is darker than most, and has a scantier vegetation on its floor. They reached a height of from one to four feet, and were remarkable for the smooth snow-white lower surface of the ovate or elliptic, cuspidate, strongly 3-5-nerved leaves, which contrasted sharply with the green and glabrous upper surface. This colour is due to an indumentum that is so finely adpressed that it cannot be distinguished satisfactorily through an ordinary lens, and the surface appears to be glabrous. A rope which was evidently related to these seedlings was found in the same plot, its flowers being discovered through field-glasses; and excellent flowering and leaf material was secured by felling one of the supporting trees. The inflorescence showed the plant to be a male, and the rope was well known to the two native Arawaks who brought it down under the name of Teteabo which, translated into Creole, means "Granny's Backbone." The same Indians were, of course, familiar with the seedlings which, they agreed, were those of Teteabo, and there can be little doubt as to the correctness of the identification.

On returning to Kew, a single sheet was discovered in the Kew Herbarium which agreed with this flowering material. It was collected by Jenman in 1888 on the Issororo River, British Guiana, and had been labelled "*Sciadotenia?*" by Diels. The specimen bears good leaves, but only two small axillary paniculate inflorescences, from which all the flowers have fallen, and it is hardly surprising that it was not placed with certainty in any particular genus. Fortunately, the material collected by the Oxford Expedition places the identification of this plant beyond all doubt. The large, conspicuous panicles with very numerous flowers on long pedicels immediately prove it to belong to the genus *Chondodendron*, and the specimens bear a very close superficial resemblance to the type material of *C. polyanthum* Diels. Dissection of the flower shows, in fact, that this species falls into the section of the genus comprising species with six sepals, and hitherto represented by *C. polyanthum* Diels and *C. iquitatum* Diels of the Amazons forests. From these

two it is easily distinguished by the much smaller dimensions of all the floral parts; if, therefore, these specimens had not been correlated with the seedling material, they would certainly have been described as a new species of *Chondodendron*.

No difficulty, however, was experienced in finding a name for the seedling specimens. They agree exactly with the type of *Sciadotenia leucophylla* Miers, collected in "Guiana belgica" by Alexander Anderson, and deposited in the herbarium of the British Museum. Anderson collected in Demerara in 1791, before the colony was formally ceded to Britain in 1814-15. *S. leucophylla* appears in Diels' Monograph of the family in the Pflanzenreich as a synonym of *S. candicans* (Rich.) Diels, which is based upon *Abuta candicans* Rich. ex DC., and it is clear that Diels saw the type specimens of both *leucophylla* and *candicans*, so that the identification may be accepted as correct. *A. candicans* was evidently described by De Candolle from exactly similar seedling material from French Guiana; and the same is true of still another plant, *Cocculus dichroa* Mart. from Pará, which is treated as a synonym of *S. candicans* by Diels. One cannot help wondering if Diels himself has not followed his predecessors when, in Rec. Trav. Bot. Néerl. xxii. 348 (1925), he describes an *Abuta? Pullei* Diels sp. nov., from material which is obviously that of a seedling, with leaves that are very similar in colour and indumentum, but apparently not cuspidate.

It will be noticed that Diels has assigned fruiting material collected by Huber on the Rio Acre to *Sciadotenia candicans*. This is not represented at Kew, but from Diels' description it does not appear to be at all typical of the fruiting inflorescence of *Sciadotenia* as figured by him in fig. 28; in fact, the racemose inflorescence with pedicels 8-12 mm. long is far more likely to belong to *Chondodendron*.

The leaves of these seedlings resemble those of the mature plant in shape, but differ from them in the following respects. The petioles are glabrous not tomentellous, and the thickened portion below the lamina is shorter; they are, moreover, more conspicuously striate, a character shared by the stem and branches. The lamina is thinner in texture, and often three-nerved, being five-nerved only in the broader examples. The upper surface tends to keep a bright green colour in the herbarium, whereas that of the leaves of the mature plant dry a dark olive or even a brownish-olive. The lower surface has the conspicuous snow-white and remarkably fine indumentum which has already been mentioned; that of the leaves of the mature plant is a less conspicuous, greyish-white colour, and the tomentum is not quite so fine or dense, so that the reticulation is far more apparent. The venation of both surfaces of the mature leaf is stronger and more complex. Most, if not all, of these distinctions appear perfectly natural and would be expected to occur in such a case.

As the result of this evidence collected from the field and the herbarium, Teteabo must bear the name *Chondodendron candicans*,

and the new combination is accordingly made here, and is followed by a description of the branchlets, leaves and male inflorescence of the mature plant.

Chondodendron candicans (Rich. ex DC.) Sandwith, comb. nov. atque descr. ampliata; *C. polyantho* Diels atque *C. iquitano* Diels affinis, partibus floris masculi multo minoribus differt.—*Abuta candicans* Rich. ined. in Herb. Juss. ex DC. Syst. i. 543 (1818). *Sciadotenia leucophylla* Miers, Contrib. Bot. iii. 344 (1871). *S. candicans* Diels in Engl. Pflanzenreich, iv. 94, p. 87 (1910). *Cocculus dichroa* Mart. in Flora xxiv. Beibl. ii. 46 (1841).

Frutex silvester, ingens, scandens, hactenus quoad folia plantarum incipientium humilium terra sparsarum tantum etsi optime descriptus. *Caulis* volubilis, crassus, apice ramis per summas arbores pervagantibus terminatus. *Ramuli* annotini nigrescentes, pubescentes vel glabrati, teretes, leviter striati, 4 mm. diametro; hornotini novelli cinereo-purpurascens, dense tomentelli, teretes, obscure striati vel sulcati, 2–3 mm. diametro; internodia 1–6 cm. longa. *Folia* ovato-elliptica, apice 1–1.5 cm. plus minusve abrupte cuspidata, basi obtuse cuneata vel fere rotundata, 6–17 cm. longa, 3–10 cm. lata, versus ramuli apicem sensim decrescentia, satis rigide chartacea, integerrima, supra glabra subnitida siccitate obscure olivacea, subtus cinereo-alba passim tomento denso minutissimo oblecta, fortiter quinquenervia vel saepe subquintuplinervia, nervis primariis lateralibus arcuatis, secundariis angulo saepius fere recto exorientibus subrectis parallelisque, rete venularum supra prominente subtus intricatissimo; petiolus tomentellus, leviter obscure striatus, 2–8 cm. longus, circiter 1 mm. diametro, superne sub lamina usque ad 1 cm. longitudinem distincte incrassatus. *Inflorescentiae masculae* in quoque ramulo novello crebrae conspicuae, supra- ac infra-axillares, paniculatae, passim densissime cinereo-tomentellae, triangulari-lanceolatae vel subpyramidales, ad 15 cm. longae, basi vulgo 4–10 cm. latae; rami primarii utrinque vulgo 7–10, saepius angulo fere recto patentes paralleli scalariformes, alterni, imi parte nuda ad 3 cm. longa, sursum decrescentes; pedicelli satis conferti, vulgo 6–10, speciose arcuati, 2–10 mm. longi; bracteolae flores amplectentes, minutae, ovatae, 0.5 mm. longae, circiter 0.3 mm. latae. *Flores* facile caduci, alabastro globosi circiter 1 mm. diametro. *Sepala* sex; exteriora ovata, concavo-cymbiformia, 0.8 mm. longa, 0.6 mm. lata, extra tomentella, intus nisi prope margines glabra; interiora majora, rhomboideo-ovata, obtusa, ad 1.5 mm. longa, 1.2 mm. lata, extra dense tomentella, intus glabra. *Petala* sex, obovata vel rhomboidea, fere unguiculata, ad 0.6 mm. longa atque lata, utrinque glabra. *Stamina* ad 0.75 mm. longa, sursum incrassata, glabra. *Inflorescentia feminea* non visa.

BRITISH GUIANA. "Guiana belgica," Alex. Anderson (Herb. Mus. Brit.—type of *Sciadotenia leucophylla* Miers). In morabukea forest, Moraballi Creek, Essequibo River, Nov. 6th, 1929, Sandwith

561. Issororo River, 1888, Jenman 5199.—Vernacular Names: "Teteabo" (Arawak); "Granny's Backbone" (Creole). Jenman notes it as the Warrau Indians' "other kind of poison."

XXXIX.—FERNS COLLECTED IN FIJI BY SIR EVERARD IM THURN, K.C.M.G. C. H. WRIGHT.

An enumeration, by Dr. W. B. Turrill, of the flowering plants (excluding orchids) collected in Fiji by Sir Everard Im Thurn during 1905–1907 was published in the Journal of the Linnean Society, Botany, vol. xliii. pp. 15–39 (1915). Various circumstances prevented the ferns being fully dealt with at that time, but a preliminary list, which was then drawn up, has now been revised. The localities mentioned in it will supplement those quoted by Dr. E. B. Copeland in his "Ferns of Fiji," published in 1929 in Bulletin no. 59 of the Bernice P. Bishop Museum, Honolulu, and founded chiefly on the collections of Messrs. Gillespie and Parks. The dates of collection indicate the time when each species produces fruit.

It has not been considered necessary to add the distribution of each species outside Fiji, as this can readily be obtained from Dr. C. Christensen's Index Filicum, the classification and nomenclature of which are followed in this list.

List of abbreviations:—

C. Chr.=C. Christensen. Index Filicum and supplements. 1905–1917.

Gibbs=L. S. Gibbs. A Contribution to the Montane Flora of Fiji (Journ. Linn. Soc., Bot., xxxix. 137–212, 1909).

H. B.=W. J. Hooker and J. G. Baker. Synopsis Filicum, ed. ii. 1874.

Horne=J. Horne. A Year in Fiji, 1881 (Ferns by J. G. Baker).

Seem.=B. Seemann. Flora Vitiensis, 1873 (Ferns by W. Carruthers).

Trichomanes caudatum Brack.; H.B. 85; Seem. 344; Horne 279; C. Chr. 637.

Mount Victoria, 5000 ft., 1 May, 1905, *im Thurn* F. 25.

T. rigidum Sw.; H.B. 86 partim; Horne 279; C. Chr. 649; Gibbs 184.

Mount Victoria, 5000 ft., 1 June, 1905, *im Thurn* 28.

T. Bauerianum Endl.; C. Chr. 636. *T. apiifolium* Presl; H.B. 86; Horne 279.

Nandarivatu, Matakula warpath, 24 Nov., 1906, *im Thurn* 278.

T. maximum Bl.; H.B. 86; Horne 279; C. Chr. 644; Gibbs 184. *T. millefolium* Presl; Seem. 345.

Hill above Nandarivatu, 30 Jan., 1906, *im Thurn* 53.

Lace fern, viviparous.

T. gemmatum J. Sm.; H.B. ed. i. 87 partim; C. Chr. 640. Mount Victoria, 5000 ft., 1 May, 1905, *im Thurn* F. 23.

Hymenophyllum multifidum Sw. ; H.B. 69 ; Seem. 342 ; Horne 279 ; C. Chr. 364 ; Gibbs 185.

Mount Victoria, 5000 ft., 1 May, 1905, *im Thurn* 24.

Dryopteris patens O. Kuntze ; C. Chr. 283. *Nephrodium patens* Desv. ; H.B. 262.

Nandarivatu, 31 March, 1906, *im Thurn* 231.

D. orientalis C. Chr. 281. *Nephrodium albopunctatum* Desv. ; H.B. 264 ; Horne 282.

Nandarivatu, 13 March, 1906, *im Thurn* 148.

D. unita O. Kuntze ; C. Chr. 299. *Nephrodium cucullatum* Baker ; H.B. 290.

Nandarivatu, 1 March, 1906, *im Thurn* 124.

Didymochlaena truncatula J. Sm. ; C. Chr. 225. *D. lunulata* Desv. ; H.B. 358 ; Horne 281. *D. sinuosa* Desv.

Nandarivatu, 13 Feb., 1906, *im Thurn* 104.

Polystichum aristatum Presl ; Seem. 358. *Aspidium aristatum* Sw. ; H.B. 255 ; Horne 281.

Nandarivatu, 13 Feb., 1906, *im Thurn* 99 and 105.

Leptochilus cuspidatus C. Chr. 384. *Acrostichum repandum* Bl. ; H.B. 419 ; Horne 283.

Nandarivatu, 13 Feb., 1906, *im Thurn* 103.

Oleandra neriiformis Cav. ; H.B. 302 ; C. Chr. 466. *O. mollis* Presl ; Seem. 360 ; Horne 282.

Nandarivatu, 15 Feb., 1906, *im Thurn* 113.

Nephrolepis cordifolia Presl ; H.B. 300 ; Horne 282 ; C. Chr. 453. *N. tuberosa* Presl ; Seem. 361.

Nandarivatu, 11 March, 1906, *im Thurn* 143.

N. biserrata Schott ; C. Chr. 453. *N. acuta* Presl ; H.B. 301 ; Seem. 361 ; Horne 282.

Nandarivatu, 11 March, 1906, *im Thurn* 144.

Humata botrychioides Brack. ; C. Chr. 353. *Davallia botrychioides* Baker ; H.B. 90, 467 ; Horne 279.

Nandarivatu, among small bushes in open rocky ground, 1 March, 1906, *im Thurn* 123.

H. sessilifolia Mett. ; C. Chr. 354 ; Gibbs 186. *Davallia sessilifolia* Bl. ; H.B. 89.

Nandarivatu, 6 March, 1906, *im Thurn* 131.

Odontosoria chinensis J. Sm. ; C. Chr. 464. *Davallia tenuifolia* Sw. ; H.B. 102 ; Horne 280. *D. chinensis* J. E. Sm. ; Seem. 339.

Nandarivatu, Mba road, 11 March, 1906, *im Thurn* 98.

Lindsaya decomposita Willd. ; C. Chr. 392. *L. lobata* Poir. ; H.B. 111 and 471 ; Horne 280. *L. Seemanni* Carruth. ; Seem. 338. Mount Victoria, April, 1905, *im Thurn* 32.

Diplazium melanocaulon Brack. ; C. Chr. 235. *D. coriaceum* Carruth. ; Seem. 356. *Asplenium melanocaulon* Baker ; H.B. 240 ; Horne 281.

Nandarivatu, 13 Feb. 1906, *im Thurn* 101.

Asplenium gibberosum Mett. ; C. Chr. 113. *Davallia gibberosa* Sw. ; H.B. 100 and 470 ; Seem. 339 ; Horne 280.

Nandarivatu, 15 Feb., 1906, *im Thurn* 108.

A. lucidum Forst. ; C. Chr. 119. *A. obtusatum* var. *lucidum* Baker in H. B. 207.

Nandarivatu, 22 Nov., 1906, *im Thurn* 272.

A. praemorsum Sw. ; C. Chr. 127. *A. furcatum* Thunb. ; H.B. 214 and 457.

Na Vai, 28 March, 1906, *im Thurn* 214.

A. bipinnatifidum Baker in H.B. ed. i. 221 ; C. Chr. 102. *A. bipinnatum* Brack. ; H.B. 221 ; Seem. 355 ; Horne 281.

Hill above Nandarivatu, on tree branches, *im Thurn* 52.

Blechnum cf. **vulcanicum** Kuhn ; C. Chr. 161. *Lomaria vulcanica* Bl. ; H.B. 176 ; Horne 281.

Nandarivatu, Sindetree Hill, 21 Nov., 1906, *im Thurn* 261.

Fertile frond only.

B. lanceolatum Sturm ; C. Chr. 155. *Lomaria lanceolata* Spreng. ; H.B. 177 ; Horne 281.

Na Vai, 8 March, 1906, *im Thurn* 111.

Syngamma Hookeri C. Chr. 346 and 629. *Hemionitis lanceolata* Hook. ; H.B. 398 ; Seem. 372 ; Horne 283.

Na Vai, 8 March, 1906, *im Thurn* 138.

Cheilanthes tenuifolia, Sw. ; H.B. 138 ; Seem. 347 ; Horne 280 ; C. Chr. 180.

Nandarivatu, growing among short scanty grass in open sunny places, 2 March, 1906, *im Thurn* 127.

Common, at least on north slope of island.

Adiantum hispidulum Sw. ; H.B. 126 ; Seem. 346 ; Horne 280 ; C. Chr. 28 ; Gibbs 186.

Lower Fall, Nvalia, 3 Feb., 1906, *im Thurn* 70. Nandarivatu, 13 Feb., 1906, *im Thurn* 97.

Monogramma paradoxa Bedd. ; C. Chr. 430. *M. Junghuhnii* Hook. ; H.B. 375 ; Horne 283 ; Gibbs 186.

Nandarivatu, 6 March, 1906, *im Thurn* 136.

Vittaria elongata Sw.; H.B. 395 partim; Horne 283; C. Chr. 653.

Nandarivatu, Nadrau Road, 26 March, 1906, *im Thurn* 197.

V. scolopendrina Thw.; H.B. 396; Horne 283; C. Chr. 655.

Nandarivatu, 25 Feb., 1906, *im Thurn* 117.

Antrophyum plantagineum Kaulf.; H.B. 393; Seem. 371; Horne 283. C. Chr. 61.

Na Vai, 28 March, 1906, *im Thurn* 212. Nandarivatu, 12 Feb., 1906, *im Thurn* 96.

A. reticulatum Kaulf.; H.B. 393; Horne 283; C. Chr. 61.

Na Vai, 23 March, 1906, *im Thurn* 213.

Hymenolepis spicata var. **mucronata** C. Chr. 355. *H. mucronata* Fée. *H. spicata* Gibbs 186. *Acrostichum spicatum* L.f.; H.B. 424 partim; Horne 283.

Nandarivatu, 10 Feb., 1906, *im Thurn* 94, and 26 Nov., 1906, *im Thurn* 289.

Calymmodon latealatus Copel. *Polypodium cucullatum* Bl. partim; H.B. 324; C. Chr. 520.

Among moss on rocks and tree trunks on wet part of Mount Victoria, 5000 ft., 1 May, 1905, *im Thurn* 29.

Polypodium contiguum J. Sm.; C. Chr. Suppl. ii. 57. *Davallia contigua* Spreng.; H.B. 94; Seem. 338; Horne 279; C. Chr. 208. *Prosaptia contigua* Presl.

Hill above N'valu, 30 Jan., 1906, *im Thurn* 54.

P. loxogramma Mett.; C. Chr. 541; Gibbs 187. *Gymnogramme lanceolata* Hook.; H.B. 387; Horne 283.

Nandarivatu, by water supply, 26 Nov., 1906, *im Thurn* 290.

P. crassifrons Baker in H.B. ed. i. 325; C. Chr. 519.

Mount Victoria, 5000 ft., 1 May, 1905, *im Thurn* 26.

P. Brownii Wickstr.; H.B. 355; Horne 282; C. Chr. 514. *Dictyopteris attenuata* Presl; Seem. 366.

Nandarivatu, 4 Feb., 1906, *im Thurn* 73.

P. linguaeforme Mett.; H.B. 358; Horne 282; C. Chr. 540; Gibbs 187.

Nandarivatu, 20 Nov., 1906, sheathing on to tree trunks, *im Thurn* 258.

P. triquetrum Bl.; H.B. 359; Horne 282; C. Chr. 571.

Nandarivatu, Suva Road, near second milestone, *im Thurn* 265.

P. Phymatodes L.; H.B. 364; Horne 283; C. Chr. 553. *Pleopeltis Phymatodes* T. Moore; Seem. 368.

Hill above Nandarivatu, 30 Jan., 1906, *im Thurn* 51.

P. nigrescens Bl.; H.B. 364; Horne 283; C. Chr. 547. *Pleopeltis nigrescens* Carruth.; Seem. 368.

Na Vai, 22 March, 1906, *im Thurn* 220.

P. Powellii Baker in H.B. ed. i. 364; C. Chr. 556.

Nandarivatu, 18 Feb., 1906, *im Thurn* 109, and 1 March, 1906, *im Thurn* 125.

Drynaria rigidula Bedd.; C. Chr. 249. *Polypodium rigidulum* Sw.; H.B. 368; Horne 283.

Nandarivatu, 1 March, 1906, *im Thurn* 126.

Elaphoglossum feejeense Brack.; C. Chr. 306. *Acrostichum feejeense* Hook.; H.B. 401 and 519; Seem. 372; Horne 283.

Nandrau, 5 Dec., 1906, *im Thurn* 315. Vesari Swamp, on tree trunks, 23 Aug., 1907, *im Thurn* 368.

Gleichenia glauca Hook.; C. Chr. 321. *G. longissima* Bl.; H.B. 12.

Nandarivatu, Suva Road, near second milestone, 22 Nov., 1906, *im Thurn* 264.

Schizaea dichotoma J. E. Sm.; H.B. 430 partim; Seem. 375; Horne 284; C. Chr. 616; Gibbs 187.

Nandarivatu, 2500 ft., 30 April, 1905, *im Thurn* 15. Nandarivatu, open ground along Suva Road, 22 Nov., 1906, *im Thurn* 270.

Lygodium reticulatum Schkuhr; H.B. 439; Horne 284; C. Chr. 413; Gibbs 188. *Hydroglossum scandens* Presl non Willd.; Seem. 376.

Hill above Nandarivatu, 30 Jan., 1906, *im Thurn* 55. Nandarivatu, 3 Dec., 1906, *im Thurn* 301.

Leptopteris Wilkesiana H. Chr. Farnk. 335; C. Chr. 390. *Todea Wilkesiana* Brack.; Seem. 375; Horne 284. *T. Fraseri* var. *Wilkesiana* H.B. 427.

Nandarivatu, along Mba Road, 11 Feb., 1906, *im Thurn* 141.

Marattia Cooperi T. Moore; C. Chr. 414.

Nandarivatu, old Malakula warpath, 24 Nov., 1906, *im Thurn* 277.

Ophioglossum pedunculatum Desv.; C. Chr. 471. *O. vulgatum* H.B. ed. i. 445 partim.

Nandarivatu, 3 Dec., 1906, *im Thurn* 307.

O. reticulatum L.; H.B. 446 partim; C. Chr. 472.

Nandarivatu, 26 Feb. 1906, *im Thurn* 119.

Botrychium daucifolium Wall.; H.B. 162; C. Chr. 162; Gibbs 188.

Nandarivatu, old Nadrau Road, 24 Nov., 1906, *im Thurn* 276.

Lycopodium phyllanthum Hook. et Arn.; Baker, Handb. Fern Allies, 22.

Mount Victoria, April, 1905, *im Thurn* 33. Nandarivatu, 13 Feb., 1906, *im Thurn* 95.

Psilotum triquetrum Sw.; Horne 279; Baker, l.c. 30; Gibbs 189.

N'valu, lower fall, 3 Feb., 1906, *im Thurn* 71. Nandarivatu, by water supply, 26 Nov., 1906, *im Thurn* 291.

Selaginella flabellata Spring; Horne 279; Baker, l.c. 98.

Nandarivahi, 13 Feb., 1906, *im Thurn* 102.

"Common. Tall growing, say 4-5 ft."

S. firmula A. Br.; Baker, l.c.

Nandarivatu, 13 March, 1906, *im Thurn* 107.

XL.—THE GENUS BRACHYSTEGIA IN NYASALAND.

P. TOPHAM.*

The trees of the genus *Brachystegia* form a most important constituent of the vegetation of Nyasaland. The vegetational type in which this genus is predominant occupies roughly one-third of the total area of the country.

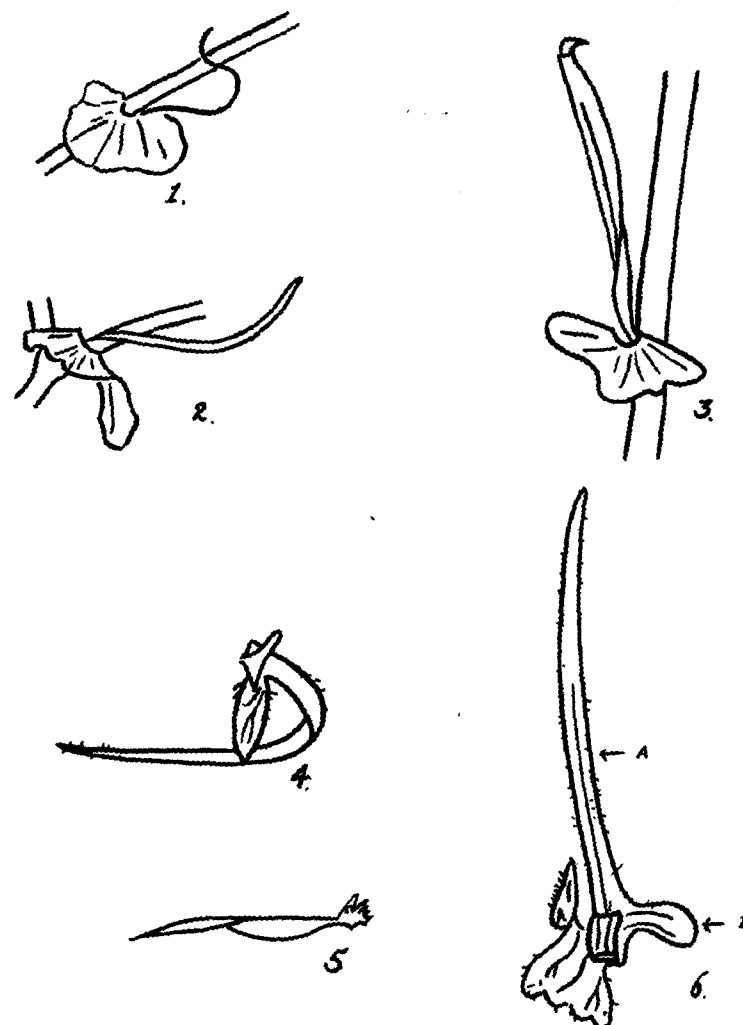
The local uses for the trees are numerous, firstly as firewood and as poles for the construction of huts; secondly many species are of value for the bark which is put to diverse uses by the natives in all parts of the country. It is commonly beaten out into bark-cloth which still is sometimes worn as clothing and commonly is made into small sacks; another use for a round of bark is to make of it a beehive. There is no evidence to show that any of the products of these trees are used medicinally; some species contain a good deal of tannin.

A certain amount of herbarium material has been collected in Nyasaland during the last four years, especially by Dr. J. Burtt Davy during a visit in 1929. The following key is based on all specimens taken up till the end of 1929. No new species is described, since the few specimens that did not fit into the key are insufficiently complete to form the basis of a description.

In the revision of this genus in the *Kew Bulletin*, 1923, by J. Burtt Davy and J. Hutchinson, only nine species were shown as occurring in Nyasaland, and in "The Leguminosae of Tropical Africa" by Edmund G. Baker, 1930, only ten. It is quite probable that some half-dozen more species may yet be found, but it is unlikely that, of these, many will be new. The following key includes twenty-four species and one variety.

Variation is extremely wide in many species; in particular, the coppice shoots are often very variable, while exposure and aspect produce curiosities.

*Research conducted at the Imperial Forestry Institute, Oxford, in collaboration with Dr. Burtt Davy; the identifications verified with the types at Kew, by the courteous permission of the Director.



Stipules of *Brachystegia*, shewing variation within a species.

1, 2, 3. *B. filiformis* (nat. size).

4, 5, 6. *B. Hockii* (x 3).

6. A. appendage; B. broad foliaceous base.

Vernacular names supplied by the most reliable of natives are apt to cover two or more species, or sometimes several names are given to one species by mistake.

In revising the key made by Burt Davy and Hutchinson, it was found simplest to distinguish three main groups according to the number of pairs of pinnae to the leaf. It is evident that the presence or absence of stipules has significance as a character, but in identifying new material it is not always satisfactory, as the stipules are variable (see fig. p. 349) and remain on the tree a varying length of time. In the first group all specimens, except one coppice shoot, have stipules either persistent or early deciduous, all have hirsute leaves and all have at least twelve juga. In the second group (6-11-jugate), the hairy specimens have stipules, which are deciduous late or early. In the third group (2-5-jugate), the glabrous species are all entirely exstipulate, while the others have stipules when young but these are deciduous.

Accordingly, it would appear that the "Stipulatae" of Burt Davy and Hutchinson should include every species which in its youngest stages has stipules, and we should not attempt to discriminate between those in which the stipules are persistent and those in which they are deciduous, since it has been observed in the field that the time of falling is so variable a character.

The following key has been drawn up for use in the field. The flowering season is so short that as a rule only leaves are available.

Key to the species of the genus *Brachystegia* known to occur in Nyasaland.

Leaflets 12 or more (up to 30) pairs (rarely 10 as in *B. Woodiana* and *B. Wildemaniana*); leaf-rhachis or lamina, or both, pubescent (except in a coppice shoot of *B. Wildemaniana* De Wild.); stipulate in all species, but the stipules early deciduous in *B. flagristipulata*.....Section I. PLURIJUGATAE.

Leaflets 6-11 pairs; the species with indumentum have stipules, but the glabrous species are exstipulate or their stipules are early deciduous.....Section II. INTERMEDIÆ.

Leaflets fewer than 6 pairs; petiolules very short; uppermost pair of leaflets generally the largest; in glabrous species stipules are absent, but in species with indumentum the stipules are early deciduous (not seen in *B. mpalensis*)...Section III. PAUCIJUGATAE.

Section I. PLURIJUGATAE.

Leaflets 24-25 pairs or more; both rhachis and lamina more or less hairy above and beneath:

Leaflets about 2 mm. broad, up to 30 pairs; midrib very excentric; stipules often early deciduous (but not so in Nyasaland material).....1. *B. mimosaeifolia*.

Leaflets about 1 cm. broad, about 25 pairs; midrib more or less central; stipules persistent.....2. *B. Boehmii*.

Leaflets 21-23 pairs; leaf-rhachis more or less hirsute but leaflets more or less glabrous or with faint white pubescence on lamina; leaflets approximate, midrib rusty below, apices slightly emarginate, bases unequal subcordate; leaf-rhachis enlarged, more or less winged a little below the juga. The leaf as a whole is elliptic in form; stipules persistent.....3. *B. Goetzei*.

Leaflets 14-20 pairs, rarely fewer (*B. Woodiana* and *B. Wildemaniana*):

Stipules deciduous at an early stage:

Midrib more or less central; leaflets in normal leaves mostly 1.0-1.2 cm. broad. Inflorescence with spreading lateral branches. Normally fewer than 20 pairs of leaflets but a specimen from Tanganyika at present included has 20-25 pairs.....4. *B. flagristipulata*.

Midrib markedly excentric; leaflets normally 4-6 mm. broad, about 16-jugate. Inflorescence dense with few branches.....5. *B. tamarindoides* (from Rhodesia).

Stipules persistent:

Midrib markedly excentric; leaflets 4-6 mm. broad, about 16-jugate.....5. *B. tamarindoides* (from Nyasaland).

Midrib more or less central:

Hairs on the leaf-rhachis brown:

Indumentum on midrib fairly dense both above and beneath, rusty on midrib, white on lamina, rather variable in texture and length. Leaflets lanceolate, 14-19-jugate (rarely, from Tanganyika, 20-22-jugate); reticulation close or coarse; bases of leaflets either truncate or slightly cordate, apices slightly or rarely conspicuously emarginate. Stipules very variable particularly in coppice, from 4 cm. long and spatulate to 1 cm. long and linear.....6. *B. filiformis*.

Indumentum on midrib above and beneath more or less sparse; leaflets 10-17 pairs.....7. *B. Woodiana*.

Hairs on leaf-rhachis white or with a few brown hairs actually at the juga; stipules much more persistent on coppice than on old wood. (One coppice specimen, considered to belong here, is glabrous and with spatulate stipules 6-8 cm. long) 8. *B. Wildemaniana*.

Section II. INTERMEDIÆ.

*Stipules wanting or early deciduous:

Leaves wholly glabrous:

Rhachis of inflorescence glabrous; racemose branches of the panicle few (5 or 6); bracts glabrous except for the midrib and the ciliate margins, pronouncedly ribbed; bracteoles quite glabrous except for the ciliate margins. Leaflets 2-4 cm. x 0.6-1.1 cm., in 6-7-8 pairs, standing away from the rhachis by a minute but definite petiolule.....9. *B. Bournei*.

Rhachis of inflorescence tomentellose; branches of the panicle more numerous (7-9); bracts and bracteoles puberulous and distinctly ribbed:

Leaflets 9-12 pairs, 3.5-5.5 × 1.0-1.7 cm.; base of leaflet approximate to rhachis without petiolule...10. *B. longifolia*.
Leaflets 8 pairs, smaller than in the species.....

11. *B. longifolia* var. *parvifolia*.

Leaflets 6 pairs, see exceptional specimens of *B. edulis* and *B. Oliveri* in Sect. III.

Leaves (either rhachis or leaflets or both) hirsute :

Indumentum of rhachis composed exclusively of white hairs ;
leaflets 7-10 pairs, oblong-lanceolate :

Branchlets with short spreading white hairs ; leaflets
2.2-4.5 cm. long, 8-9-jugate (indumentum sometimes
sparse, causing confusion with *B. longifolia*).....

12. *B. apertifolia*.

Branchlets minutely rusty pubescent ; leaflets about 7-8 cm.
long, 7-10-jugate13. *B. (leonensis?)*.

Indumentum not exclusively of white hairs ; leaflets 7-11 pairs,
generally about 3 cm. × 1 cm., the bases narrowed on one
side ; usually the leaf-rhachis thickened below the juga.

Very variable, especially the coppice.....14. *B. utilis*.

*Leaves stipulate ; stipules more or less persistent ; leaves more or
less hairy :

Leaflets 10 or more pairs (see Sect. I) 7. *B. Woodiana* and
8. *B. Wildemaniana*.

Leaflets fewer than 10 pairs ; indumentum of leaf-rhachis
generally composed of white hairs :

Leaflets subglabrous except on the midrib.....15. *B. Bragaei*.

Leaflets pubescent above and below.....16. *B. velutina*.

Section III. PAUCIJUGATAE.

Leaf-rhachis or leaflets more or less hairy : [Species of *Isobertlinia*
having leaves resembling those of *Brachystegia* would fall into this
group.]

Blade of leaflet glabrous but rhachis sparsely hairy as a rule ;
leaflets 2-3 pairs ; leaf rhachis channelled above.....

17. *B. mpalensis*.

Blade of leaflet more or less hairy especially on the midrib below ;
leaflets 3-5 pairs ; stipels definitely persistent ; branchlets
pubescent towards the extremities :

Bracteoles glabrous ; raceme few-flowered, spiciform ; leaflets
chartaceous, with 6 pairs of lateral nerves, usually 3-4-jugate ;
leaf-rhachis softly pubescent, sulcate.....18. *B. venosa*.

Bracteoles pubescent ; raceme densely- and many-flowered,
spiciform ; leaflets subcoriaceous, usually 4- or 3- or 5-jugate,
leaf rhachis and branchlets ferrugineous-tomentose.....

19. *B. Randii*.

Leaf-rhachis and leaflets glabrous :

†Leaflets rounded, truncate, or cordate at the base :

Winter bud-scales ovoid and mostly appressed-tomentellose
with golden hairs ; old leaflets yellowish-green, the base

spreading from the rhachis at an acute angle ; leaf-
rhachis definitely grooved ; inflorescence of solitary
axillary spikes :

Leaflets 4-5 (rarely 6) pairs, acute ; flowers very fragrant
(resembles *B. Randii* which differs in that it is pubescent)

20. *B. edulis*.

Leaflets 3-4 pairs, obtuse.....21. *B. Hockii*.

Winter bud-scales more or less glabrous except for the ciliate
margin ; and then the hairs not golden :

Nerves arising from base of leaflet on lower side 2 ; vena-
tion much more prominent above than below, the
reticulation of the basal nerves extending by loops to
the apex on both sides of the midvein ; leaflets 3-jugate,
ovate-lanceolate, falcate ; rhachis thickened below the
juga ; bark grey and smooth ; buds sometimes ciliate
all over, but generally glabrous and shining except for
the ciliate margins.....22. *B. polyantha*.

Nerves arising from base of leaflet on lower side 2 or 3 ;
venation prominent on both surfaces ; leaflets elliptic
or oblong, juga 3-5 (rarely 6).....23. *B. Oliveri*.

Nerves arising from base of leaflet on lower side 4, the
innermost not generally extending to the apex ; venation
prominent on both sides ; leaf rhachis shallowly
channelled or striate ; leaflets 3- (rarely 4-) jugate,
variable in shape but generally falcate and asymmetrical ;
stipels absent and rhachis not thickened below the juga ;
bud-scales generally striated on becoming glabrous ;
inflorescence a panicle of spikes.....24. *B. floribunda*.

†Leaflets markedly cuneate and unequal (or very rarely sub-
equal) at the base, penninerved, with reticulation fine.....

25. *B. appendiculata*.

1. *B. mimosaefolia* Hutch. & Burt Davy in Kew Bull. 1923,
153.

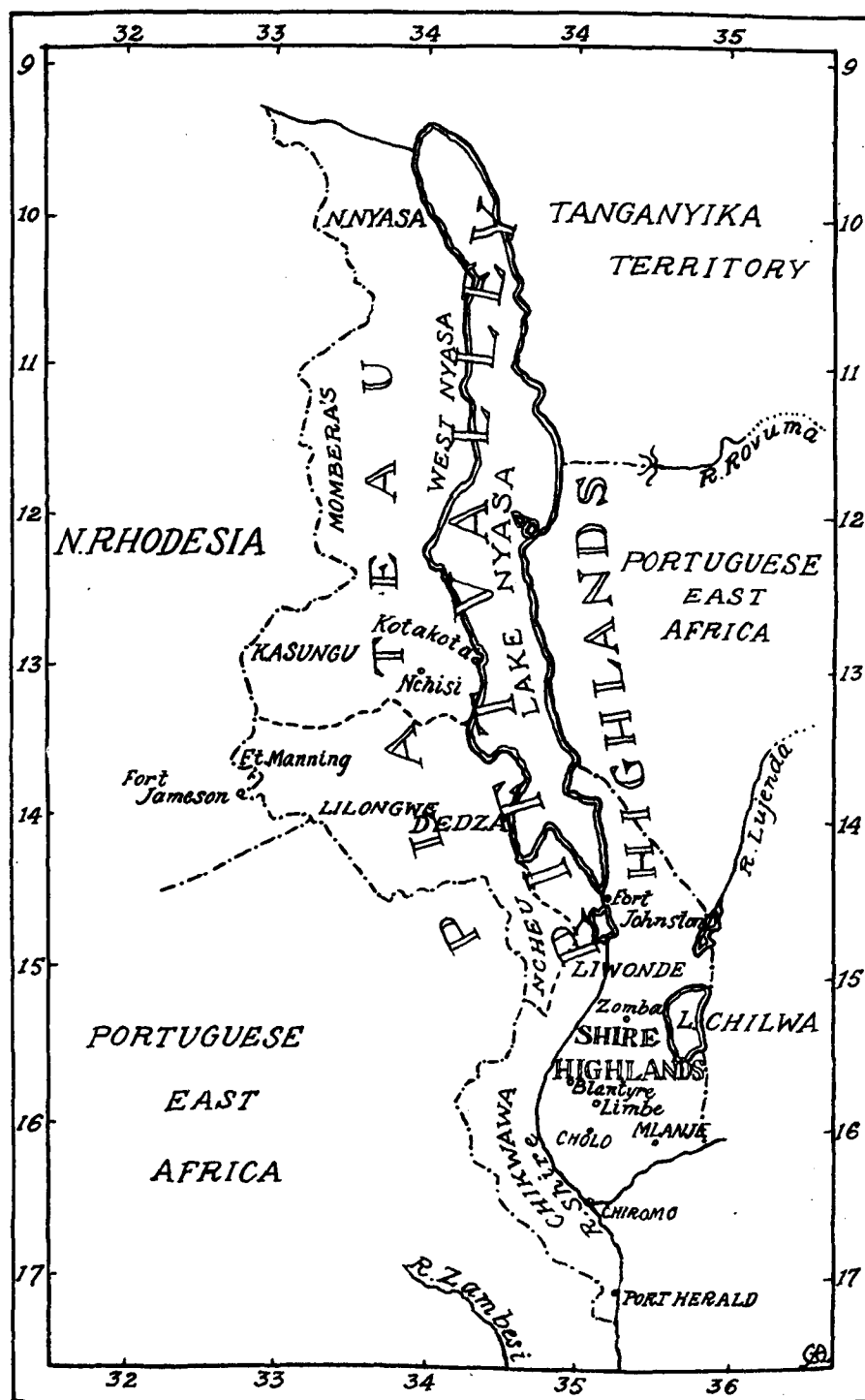
N. RHODESIA : Broken Hill, about 1300 m., flg. Sept. 1909,
Rogers 8552 (type) ; Nchanga, 16 Aug. 1927, stipules persisting,
Bourne 19 !

NYASALAND : Mombera's Dist., Njuyu, about 1200 m., on sandy
soil with subsoil moisture ; a low spreading tree forming dense
clumps, quite common in the district, but not found in other dis-
tricts ; 4 Nov. 1927 with flowers, young fruits, also persistent stipules,
Topham 52 ! Native name : Tuunda (chiTumbuka).

2. *B. Boehmii* Taub. in Engl. Pfl. Ost. Afr. C : 197 (1895).

TANGANYIKA TERR. : Posi near Igonda, Lake Dist., *Boehm*.
159a (type).

NYASALAND : Mlanje, 950-1800 m., fl. Oct., *Purves* 194 ! Small
tree 20-30 ft., yields bark cloth. Native name : Mjombo (chiYao :
Purves).



S. RHODESIA: Haroni R., at about 1650 m., *Swynnerton* 1028. Native name: Umbfuti (Chindao).

3. **B. Goetzei** Harms in Engl. Bot. Jahrb. 30: 318, t. 13 (1901). TANGANYIKA TERR.: Unyika, near Dorf Piseki, buschwald at 1400 m., fl. Nov. 1899, *Goetze* 1423 (type). Native name: Nguanzo (Tanganyika).

NYASALAND: S. Province, *Carver* 18! Dedza Escarpment, W. side of Rift valley, at 1600 m., tree much attacked by wax scale, 13 Sept. 1929, *Burt Davy* 1642/29! Ncheu Dist., M'mawa's village, road from Ncheu to Ft. Johnston, 16 Sept. 1929, *Burt Davy* 1731/29! Ft. Johnston District, escarpment on E. side of Rift Valley, beside road to Namwera, at 1000 m., *Burt Davy* 1774/29! Native names in Nyasaland: Mombo (chiChewa), Mjombo (chiYao).

4. **B. flagristipulata** Taub. in Engl. Pfl. Ost. Afr. C. 198 (1895). TANGANYIKA TERR.: Usaramo, 1894, *Stuhlman* 6400! (type); *Stoltz* 1757 (not perfectly matched); without precise locality, *Hendry* in Forestry herb. 525! Native name: Muyenzi (Myombo, *Hendry*).

N. RHODESIA: Serenje, 23 Aug. 1927, *Bourne* 87!

NYASALAND: Lake Nyasa, in fruit only, *Archdeacon Johnston* 313! (considered to belong here); Ncheu District, upper Livulezi valley, provides poles and bark lashings, flowers finished but some stipules fallen others persisting, 22 Jan. 1928, *Topham* 82! Native name: Mombo (chiNyanja and Dedza, chiChewa); Champira Hill, Kasungu Dist., about 1000 m., growing in *Brachystegia* forest, provides useful bark, collected by native forester Mkwanda, July-Aug. 1928, *Topham* 143! Native name: Chiombo (northern chiChewa). The two last enumerated match *Johnston* 313.

5. **B. tamarindoides** Welw. ex Benth in Trans. Linn. Soc. 25: 312 (1866).

ANGOLA: Huilla, between Lopollo and the lake of Ivantala, common, occasionally constituting little woods; "a tree 15-25 ft. high, or, in the forests free from conflagration more than 40 ft. high; crown thyrsiform, trunk branched a little above the base, branches and branchlets subtortuose; leaflets in the state of sleep bifariously imbricate upwards along the rachis." (Welw.); fl. Oct. 1859, young fruit, Feb. 1860, *Welwitsch* 585 (type); wooded places on the banks of Cacolar R., *Welwitsch* 585 b, 4157; Kubango, near right bank of the river near the fort Princess Amelia, fl. Oct. 1905, *Gossweiler* 2136; Malange Dist., *Gossweiler* 1352.

BELGIAN CONGO: Katanga Prov., near Elisabethville, fruit Aug. 1919, *Burt Davy* 17845, 18016, "string is prepared from the bark."

N. RHODESIA: Mazabuka Dist., Sianjalika, large tree, Aug. 1929, *Stevenson* 17! Ft. Roseberry, 11 Nov. 1927, *Bourne* 125! Native names: Mulwepa (chiTonga, *Stevenson*), Moosamba Kiloko (Katanga, *Burt Davy*).

NYASALAND : Mombera Dist., plain S. of Choma Mt., on sandy soil in *Brachystegia* type of forest but probably with subsoil moisture, very rare and not seen in other localities, fl. 9 Nov. 1927, *Topham* 70 ! Appears to be eastern analogue of the species. Native names : Tuunda (chiTumbuka) Muhama (chiTumbuka ? chiNg'oni ? Nyasaland chiTonga ?).

This species, very rare in Nyasaland, grows in association with *B. mimosaeifolia*, and the two species have been found only in one district. They are in plateau country near the Rhodesian boundary. In both species (as found in Nyasaland) the stipules are more or less persistent.

6. **B. filiformis** *Hutch. & Burt Davy* in Kew. Bull. 1923 : 150.

N. RHODESIA : Broken Hill, about 1250 m., Nov. 1909, *Rogers* 8605 (type) ; Mazabuka Dist., Sikasondasima, 22 Apr. 1929, a large tree, *Stevenson* 35 !

S. RHODESIA : Haroni R., about 1800 m., fruit Sept. 1906, *Swynnerton* 1028 ; Victoria Falls, in Sandveld, *Burt Davy* 17831. Native names : Mubombo (chiTonga, *Stevenson*), Umbfuti (Chindao), Amachibero (Mashona), Mbombo (chiLundi), Moo samba (chiKaundi).

NYASALAND : Dedza Dist., cross roads at Mphunzi, 1200 m., 12 Sept. 1929, *Burt Davy* 1606/29 ! 1607/29 ! S. Nyasa Dist., beside the road Ft. Johnston to Namwera (E. side of Rift valley), 800 m., 17 Sept. 1929, *Burt Davy* 1778/29 ! Liwonde Dist., 23 miles by road S. of Nyenyezi Estate, 18 Sept. 1929, *Burt Davy* 1831/29 ! 1833/29 ! Liwonde Dist., by road between Liwonde and Zomba, 18 Sept. 1929, *Burt Davy* 1841/29 ! 1843/29 ! 1848/29 ! Zomba Dist., foot of kopje in Lake Chilwa plain, about 600 m., *Burt Davy* 1905/29 ! 1906b/29 ! Blantyre Dist., Shire Highlands near Mpemba Hill, *Burt Davy* 1938/29 ! Mlanje Dist., Tuchila plain, 900 m., *Burt Davy* 1960/29. Native names : Mumba (Kota Kota, ex Kew Bull. 1923), Musumbu (chiNyanja, ex Kew Bull. 1923 ; the name is used by northern Achewa for similar trees), Mombo (chiChewa and chiNyanja), Mjombo (chiYao).

TANGANYIKA TERR. : Dar-es-Salaam Dist., Masanganya Reserve, at 300 m., *L. T. Wigg* 382 ! "large tree growing in the poorer soils on the low ground below hills covered with good forest of *Azelia* and *Trachylobium* ; its associates are Myombo Nkhaka and Myombo Botha (*B. euryphylla*) and *Pterocarpus Bussei* forming dry forest ; used for making bark corn-bins." Native name : Myombo Luhombo (Kisaramo).

7. **B. Woodiana** *Harms* in Engl. Bot. Jahrb. 30 : 82 (1901) ; *B. oblonga* Sim For. Fl. Port. E. Afr. 49 (1909).

TANGANYIKA TERR. : Keegwah, lat. 5°5 S. long. about 32° E., about 1300 m., *Speke & Grant* 1.

PORTUGUESE E. AFRICA : Quelimane, Magenja da Costa and around Arenga, a common medium-sized tree, *Sim* 5574.

S. RHODESIA : Salisbury, a fine tree, *Rand* 554.

BELGIAN CONGO : Elisabethville, *Burt Davy* 18017 (may belong here).

NYASALAND : Shire Highlands, *Buchanan* in herb. Wood 6960 (type) ; *Buchanan* 334 in herb. Mus. Brit. ; Mombera's Dist., Kasitu River valley, Samson's village, fl. and fruit, 30 Oct. 1927, *Topham* 66 ! Dedza Dist., near Mphunzi, fl. 24 Sept. 1928, *Topham* 127 ! same locality, 11 Sept. 1929, *Burt Davy* 1608/29 ! Zomba Dist., *Burt Davy* 1896/29 ! Lilongwe Dist., Likasi Valley, near Mbabazi, fl. 6 Oct. 1927, *Topham* 48 ! Native names : Mecombo (*Speke & Grant*), Modi (*Sim*), Machabel (*Rand*) ; in Nyasaland : Mjombo or Njombo (chiYao), Mombo (chiChewa and chiNyanja), Chiombo (chiTumbuka).

In Nyasaland the bark is one of the best for the many uses it is put to. In addition, according to Speke and Grant, it is used to make canoes ; they further mention that the tree has sensitive leaves, a feature not noted, or looked for, in Nyasaland. *Rand* states that the pods are a favourite food for the elephant.

8. **B. Wildemaniana** *R. E. Fries* in Wiss. Ergeb. Schwed. Rhod.-Kongo-Exped., 1911-12, 1 : 68 (1914).

RHODESIA : N.E. Rhodesia ; Malolo-Katewe between Lakes Bangweolo and Tanganyika, fl. Nov. 1911, *R. E. Fries* 1204 (type).

The following are believed to belong to this species, but I have not seen the type.

NYASALAND : Dedza Dist., Dedza Escarpment, W. side of Rift valley, 1000 m., a coppice shoot, 13 Sept. 1929, *Burt Davy* 1654/29 ; Ncheu Dist., Foothills to escarpment, W. side of Rift valley, 19 miles S. of Namikokwe drift, Mua-Zomba road, coppiced tree 20 ft. high, 16 Sept. 1929, *Burt Davy* 1729/29 ; S. Nyasa Dist., road Ft. Johnston to Namwera, on escarpment 800 m., E. side of Rift valley, 17 Sept. 1929, *Burt Davy* 1777/29. Cholo Dist. ? Chinkwania Village on Cholo-Chiromo road, 300 m., *Burt Davy* 2221/29 ! 2222/29, 2223/29. Native names : Mombo (chiChewa and chiNyanja), Mjombo (chiYao).

9. **B. Bournei** *Greenway*, Kew Bull. 1928, 200.

N. RHODESIA : Nchanga, leaves and fruit only, *Bourne* 78 (type) ! Native name : Muwombo (chiLamba, chiWamba).

NYASALAND : Dedza Dist., one mile W. of Mphunzi Hill, an old Lilongwe road, locally common, yields bark string, fl. and fruit 23 Sept. 1928, *Topham* 124 ! Linthipe valley road 12 miles from Dedza, 11 Sept. 1929, *Burt Davy* 1605/29 ! Native name : Mombo (chiChewa).

10. **B. longifolia** *Benth.* in Hook. Ic. Pl. 14, t. 1359 (1881).

NYASALAND : Shire Highlands, *Buchanan* 22 (type) ! 217 (in part, in Herb. Mus. Brit.), "a bark cloth tree" with soft wood ; Dedza Dist., near Linthipe drift about 1200 m., common in locality, 17 July 1927, *Topham* 19 ! Lilongwe Dist., Dzalanyama reserve near Katete river, bark of very good quality, fl. 29 Sept. 1927, *Topham* 44 ! Ft. Manning Dist., beside main road to Lilongwe

2 miles E. of turning to Likasi estate on boundary of N. Rhodesia, growing in much-mixed type of retrogressive *Brachystegia* forest, about 1200 m., yields very good bark cloth, 2 Sept. 1929, *Burt Davy* 1097/29! Dedza Dist., Dedza, foot of granite kopje near Angoni Highlands hotel, about 1600 m., 9 Sept. 1929, *Burt Davy* 1458/29! 1460/29; Dedza Dist., Linthipe valley road 12 miles from Dedza, about 1300 m., 12 Sept. 1929, *Burt Davy* 1610/29!

A form of the same species with abnormally broad leaflets has been collected in Dedza Dist., W. side of Mphunzi Hill, locally common, 5 July 1928, *Topham* 2! Dedza escarpment, W. side of Rift valley, 1100 m., a coppice shoot, 13 Sept. 1929, *Burt Davy* 1647/29!

What is probably the same species was collected in the Zomba Dist., Lake Chilwa plain, 650 m., young foliage, *Burt Davy* 1909/29. Native names: Mombo (chiChewa at Dedza and chiNyanja), Msanga (chiChewa in North, but possibly given in error), Mvukwe (chiYao, probably in error), Mjombo (chiYao, *Buchanan*).

11. *B. longifolia* var. *parvifolia* *Topham* var. nov.—Leaflets only 8 pairs, smaller than in the typical form.

NYASALAND: Kopje near Dedza hotel, about 1600 m., 9 Sept. 1929, *Burt Davy* 1457/29! (type) 1461/29! Dedza Dist., Linthipe valley road 12 miles from Dedza, 11 Sept. 1929, *Burt Davy* 1604/29! S. Nyasa Dist., W. side of Rift valley, Nyenyezi Estate, about 1000 m., 18 Sept. 1929, *Burt Davy* 1803/29; Kasungu Dist., Chimaliro hills, "useful for bark cloth," sent by native forester Mkwanda. Native names: Mjombo (chiYao), Mombo (chiChewa and chiNyanja), Chitawe (northern chiChewa).

12. *B. apertifolia* *Hutch. & Burt Davy* in Kew Bull. 1923, 154. BELGIAN CONGO: Dilolo, June 1908, *Sapin*.

ANGOLA: Pedras de Guinga, between Condo and Quisonde, fruit March 1857, *Welwitsch* 571 (may belong here). Native name: Moozamba.

NYASALAND: Ntondwe, *Cameron* 134 (type)! Dedza escarpment, W. of Rift valley, 1450 m., 13 Sept. 1929, *Burt Davy* 1646/29! Dedza 1 mile west of Mphunzi Hill, 1300 m., 23 Sept. 1928, *Topham* 125! Native names: Nangwesu (chiYao; probably given incorrectly); Mombo (chiChewa, Dedza).

This species has a strong affinity with *B. longifolia* Benth. but is more or less hairy.

13. *B. leonensis* *Hutch. & Burt Davy?* in Kew Bull. 1923, 156. Specimens which appear to belong to this species have been collected as follows:—

N. RHODESIA: Mazabuka Dist., Chisuwua, Aug. 1929, *Stevenson* 43!

NYASALAND: Dedza Escarpment, 1500 m., on edge of a gully, 13 Sept. 1929, *Burt Davy* 1630/29! Ncheu Dist., M'mawa's village, road from Ncheu to Ft. Johnston, 16 Sept. 1929, *Burt Davy* 1742/29! 1745/29! Cholo Dist., Limbe road 15 miles S. of Limbe, 1100 m.,

good bark cloth, 27 Sept. 1929, *Burt Davy* 2209/29! Native names: Kamponi (chiChewa, Dedza), Mchenga (chiYao, chiNyanja).

14. *B. utilis* *Hutch. & Burt Davy* in Kew Bull. 1923, 155.

BELGIAN CONGO: Katanga Prov., Kimbaembe R. near Elisabethville, fruiting Aug. 1919, *Burt Davy* 17962.

ANGOLA: Huilla, between Mumpulla and Nene, a small tree, *Welwitsch* 584.

PORTUGUESE E. AFRICA: Mozambique Terr., Mosurizi, up to 1300 m., fruit Feb. 1907, *W. H. Johnson* 105.

N. RHODESIA: Serenje, 23 Aug. 1927, *Bourne* 84! Lusaka, *Bourne* 63!

NYASALAND: Mlanje, about 1000 to 1600 m., fl. Oct. 1905, *Purves* 193 (type); Zomba and vicinity, 800 to 1250 m., fl. Dec. 1896, *Whyte*! Dedza Dist., Linthipe, fruit 17 July 1927, *Topham* 23! Mombera's Dist., Njuyu Hill, fl. 4 Nov. 1927, *Topham* 54! Kasungu Dist., Chimaliro Hills (sent by native forester Mkuanda) 1928, *Topham* 140! Kota Kota Dist., Nchisi, below the rest-house, about 1700 m., 6 Sept. 1929, *Burt Davy* 1326/29! 1328/29! 1330/29! extremely variable in leaves and in the pods; a little lower down the mountain in the same locality, 7 Sept. 1929, *Burt Davy* 1411/29! Dedza Dist., Linthipe Valley road 12 miles from Dedza; 11 Sept. 1929, *Burt Davy* 1603/29! 1609/29! Liwonde Dist., 23 miles S. of Nyenyezi Estate, 18 Sept. 1929, *Burt Davy* 1836/29! Cholo Dist.? Shire Highlands, 27 Sept. 1929, *Burt Davy* 2200/29! Native names: at Nchisi given as Msenga (northern chiChewa), ChiThowe (chiTumbuka), Nangwesu (chiYao), earlier specimens at Dedza, Mombo (chiChewa), Zale (chiYao), Chiombo (chiTumbuka); specimen from Kasungu, Mjeye (chiYao).

This species shows very great variation owing mainly to the soil and aspect. Some vigorous shoots resembled the normal leaves of *B. velutina*, while exposed leaves from the same tree were on the same scale as in *B. tamarindoides*. Hence, no doubt, the large variety of vernacular names.

15. *B. Bragaei* *Harms* in Engl. Bot. Jahrb., 30: 82 (1901).

PORTUGUESE E. AFRICA: Beira, *Braga* 152 (type).

S. RHODESIA: Melsetter Dist., about 200 m., fl. Sept. 1907, "stamens white," *Swynnerton* 657! Nyahodi R., at 1650 m., *Swynnerton* 1027, Native name: Mootsatsa (*Swynnerton*).

NYASALAND: Lilongwe Dist., Dzalanyama Reserve, about 1300 m., Sept. 1927, *Topham* 98! Native name: Tsamba (chiChewa).

16. *B. velutina* *De Wild.* in Fedde Repert. ii: 512 (1913).

BELGIAN CONGO: Elisabethville in 1911, *Hock* (type), in 1916, *Ringoet*, in 1919, *Burt Davy* 17784; Tschinsenda, about 1400 m., fl. Oct. 1912, *Rogers* 10371.

N. RHODESIA: Serenje, 23 Aug. 1927, *Bourne* 86!

NYASALAND : Dedza Dist., Linthipe valley, growing in mixed *Brachystegia* forest, 17 July 1927, *Topham* 24 ! Lilongwe Dist., Lilongwe R., Dzalanyama reserve, locally common, fl. 25 Sept. 1927, *Topham* 42b ! Ft. Manning Dist. on Rhodesian boundary 2 miles E. of turning to Likasi, 1250 m., 2 Sept. 1929, *Burt Davy* 1099/29 ! Dedza Dist., foothills of escarpment near Namikokwe drift, 800 m., 14 Sept. 1929, *Burt Davy* 1673/29 ! Native names : Mombo (general chiChewa and chiNyanja) ? Njanjobvu (chiYao—specimen at Linthipe). This species is quite common in some localities.

17. **B. mpalensis** *Micheli* in Compt. Rend. Soc. Bot. Belg. 36 : 73 (1897) ; Illustr. Fl. Cong. t. 88.

BELGIAN CONGO : m'Pala, *Descamps* 27 (type) ; m'Towa, fl. Aug. 1895, *Descamps*.

N. RHODESIA : N. W. Rhodesia, Chilanga, fl. Sept. 1909, *Rogers* 8451 ! Broken Hill, about 1300 m., *Rogers* 8608 ; N. E. Rhodesia, Serenje, 25 Aug. 1927, *Bourne* 88 ! Native names : Kapootoo (chiNyanja), Mapootoo (chi-Kaundi), Mpatchi (chiLunda) teste *Rogers*.

S. RHODESIA : Victoria, *Monro* 330.

NYASALAND : 1 June 1926, *Carver* 20 ! (a doubtful match). Native names : Tsamba (chiNyanja) Msumbuti (chiYao).

18. **B. venosa** *Hutch. & Burt Davy* in Kew. Bull. 1923, 158.

N. RHODESIA : High-veld near Victoria Falls, an erect tree, fl. Sept. 1905, *Allen* 165 (type).

NYASALAND : Stevenson Road, fl. Nov., *Scott Elliot* 8380 ! 8389.

19. **B. Randii** *Bak. fil.* in Journ. Bot. 1899, 433. *B. spicaeformis* var. *parviflora* Benth. in Trans. Linn. Soc. 25, 313 (1866).

BELGIAN CONGO : Katanga Prov., near Elisabethville, *Burt Davy* 17846b.

TANGANYIKA TERR. : Robeho, lat. 6°38' S., alt. 4700 ft., *Speke and Grant* 32 ; Tabora Prov., Kasisi River, tree of the dry forests, at 1200 m., *L. T. Wigg* 54 ! Kashote, Kwassi Reserve, 1500 m., average-sized tree of the dry forests, *L. T. Wigg* 95 ! Forest Herb. 434 ! 530 ! Native name : Mutundu (Kinyanwezi language). The name m'Nenga given on *Speke and Grant's* label (see Kew. Bull. 1923 : 161) probably refers to *Pterocarpus Bussei*, according to Mr. Wigg of the Tanganyika Forest Service.

N. RHODESIA : Livingstone, *Rogers* 17456.

S. RHODESIA : Salisbury, *Rand* 610, 611 (types) ; flowers sweet-scented ; near Salisbury 1600 m., fl. Oct. 1916, *Eyles* 648 ; fl. Sept. 1917, *Eyles* 845 ! *Rogers* 5796 ; Umtali Div., Odzani R. valley, 1914, *Teague* 301 ; Victoria Falls in sandveld, *Burt Davy* 17834, *Gibbs* 145 ; without precise locality, in 1870, *Baines* ; Queque, *Rogers* 5845 ; Sebakwe, 1350 m., fl. Sept. 1904, *Eyles* 174 ; Victoria, *Monro* 456, 468, 526, 540. Native names : Msaassa (*Rand and Eyles*), Mchenga or Mnenga (*Speke and Grant*).

NYASALAND : Mlanje plateau, 2000 m., fl. and fruit Oct. 1905, *Purves* 208 ! Mombera's Dist., Kasitu valley near Samson's village, 1200 m., fl. 30 Oct. 1927, *Topham* 68 ! Kota Kota Dist., Nchisi, about 1600 m., 5 Sept. 1929, *Burt Davy* 1274/29 ! Dedza Dist., Dedza Escarpment, 13 Sept. 1929, *Burt Davy* 1623/29 ! Zomba Dist., *Burt Davy* 1870/29 ! Native names : Kamphoni (chiChewa, Dedza), Mchenga (chiYao), Mpapa (northern chiChewa), Msambuti (chiYao used at Nchisi for this or an allied species).

This species appears to be nearly identical with *B. edulis*. As grown in Rhodesia, the flowers are said to be sweet-scented (*Rand*), as also are specimens of *B. edulis* in Nyasaland. The only visible morphological difference is in the hairiness of the leaves. The Nyasaland species was not collected with scented flowers as flowering specimens were not fully developed. The bark is much used for bark cloth and bark cord, bags, etc. *Rand* quotes it as giving a red gum rich in tannin ; and *Speke and Grant* mention that their tree had a red juice.

20. **B. edulis** *Hutch. & Burt Davy* in Kew Bull. 1923, 162.

KENYA COLONY : Coast districts, in sand or sandy soil, *Battiscombe* 33 ! *Webber* 604 ; Shimba Hills, coast, *Battiscombe* 109.

TANGANYIKA TERR. : Nyasa Highlands, Kyimbila, about 1200 m. fl. Nov. 1910, *Stolz* 400 ! North of Magoye, on dry forest slopes of escarpment, about 1700–1900 m., fl. 20 Oct. 1929, *L. T. Wigg* 2 ! 9 ! Junga Prov., Tukuyu, dry forest in Nyasa Trough, 840 m., fl. 10 Oct. 1929, *L. T. Wigg* 34 ! 37 ! 38 ! 51 ! Native names : Muguti (Kinya Kyusa) ; Lutewere (Sangu ?).

N. RHODESIA : Highlands of Batoka country, in 1860, *Kirk* (type) ; near Muata Marija about 1300 m., *Kirk*.

S. RHODESIA : Inyamadzi valley, about 800 m., fl. 8 Sept. 1906, *Swynnerton*, 1024.

NYASALAND : Shire Highlands, *Buchanan* 210 ! Lilongwe Dist., Dzalanyama reserve, about 1300 m., fl. 25 Sept. 1927, *Topham* 43 ! (provides good tall poles) ; Mombera's Dist., Kasitu valley at Samson's about 1300 m., fl. 30 Oct. 1927, *Topham* 67 ! Dedza Dist., W. of Mphunzi Hill, about 1400 m., fls. and young green leaves, 22 Sept. 1928, *Topham* 116 ! (locally common, very fragrant) ; Lilongwe Dist., by main road 15 miles W. of Lilongwe, 3 Sept. 1929, *Burt Davy* 1087 ! Dedza Dist., foothills near Namikokwe drift, flowers very fragrant, two specimens apparently identical but local native names differ, 14 Sept. 1929, *Burt Davy* 1663/29 ! (bark makes poor string), *Burt Davy* 1664/29 ! (bark makes good string), Shire Highlands, *Burt Davy* 1923/29 !, Mlanje Dist. on Mt. Mlanje at about 1600 m., scented flowers, *Burt Davy* 2000/29 ! 2001/29 ! 2002/29 ! 2003/29 ! 2004/29 ! 2005/29 ! 2010/29 ! 2011/29 ; 2012/29 ? 2013/29 ! (collected to show variation). Native names : Kamponi (chiChewa general, also chiTambuka), Mvukwe (at Nchisi, but probably in error), Mpapa (at Nchisi by Yaos, probably

error), Mchenga (chiYao general), Tsamba (chiNyanja in Dedza foothills) Kamponi (chiNyanja in Dedza foothills).

Bark used for cloth; seeds eaten (*Kirk*) hence the name. Native names: Mriki (Kidyo), Mriti (Suswahili), Mootsaka (*Swynnerton*), Motondo (*Kirk*).

The fragrance of the flowers, which remain open after the young leaves have turned from crimson to a fresh green, distinguishes the species completely from others except only *B. Randii*. The wood is used for hoe handles, especially by the Yao. The bark is used for bark cloth-making, and the poles are of some service.

In most of the specimens at Kew the branchlets are quite glabrous, but there is a little indumentum on *B. D. Burt* 363 and *Stolz* 1637, while the branchlets of *Wigg* 51 are rusty-tomentose.

21. **B. Hockii** *De Wild.* in Fedde Repert. ii, 512 (1913). *B. Hockii* var. *papyracea* *De Wild.*; *B. trijuga* *R. E. Fries*; *B. mpalensis* var. *latifolia* *De Wild.*

BELGIAN CONGO: Katanga, in 1911, *Hock* (type); near Lufaku, fl. Aug. 1899, *Verdick* 64; Sankesia, fl. Aug. 1911, *Bequaert* 170; Elisabethville, fruit Aug. 1919, *Burt* 17815, 17966; Elisabethville, *C. de Neuter*, without number!

ANGOLA: Malange Dist., *Gossweiler* 1324, 1337; Kubango, *Gossweiler* 1911. Kutchi River, *Gossweiler* 3370.

N. RHODESIA: Between Luapula River and Luera River, fl. Sept. 1911, *R. E. Fries* 586; Meali, near Bangweolo Lake, Oct. 1911, *R. E. Fries* 1068; Bwana Mkubwa, Aug. 1911, *R. E. Fries* 321; Victoria Falls in sandveld, *Burt* 17835; Mazabuka Dist., Namakwanda, Aug. 1929, *Stevenson* 34! Native names: Mukutu (*Verdick*), Kaputu (*Burt* 17835), Mushovi (*Gossweiler*), Musamba (*de Neuter*), Musewe (chiTonga, *Stevenson*).

NYASALAND: Kota Kota Dist., Nchisi, 1800 m., Sept. 1929, *Burt* 1203/29! 1275/29! same locality, 1700 m., 6 Sept. 1929, *Burt* 1337/29! consecutively to 1345/29! 1349/29! 1350/29! 1360/29! 1361/29! Same locality but altitude about 1550 m., a seedling, 7 Sept. 1929, *Burt* 1410/29! Dedza Dist., Dedza escarpment, W. of Rift valley, 12 Sept. 1929, *Burt* 1624/29 1626/29! 1627/29! 1628/29! 1631/29! 1637/29! S. Nyasa Dist., Escarpment, E. side of Rift valley, road Ft. Johnston-Namwera, 16 Sept. 1929, *Burt* 1780/29, 1789/29. Native names: Tsamba (common chiChewa and chiNyanja), Mvukwe (northern chiChewa), Mpapa (chiTumbuku, possibly in error), Msumbuti (chiYao).

This tree, at Nchisi, rapidly sent up coppice growth when protected from fire.

22. **B. polyantha** *Harms* in Engl. Bot. Jahrb. 30: 319 (1901).

TANGANYIKA TERR.: Untali, Kivira Thal., about 1400 m., fl. Nov. 1899, *Goetze* 1478 (type).

N. RHODESIA: Chifwefwe, 21 Aug. 1927, *Bourne* 84!

NYASALAND: Kota Kota Dist., Nchisi, about 1500 m., 7 Sept. 1929, *Burt* 1408/29! Dedza Dist., on escarpment down to Mua, 13 Sept. 1929, *Burt* 1643/29! S. Nyasa Dist., E. side of Rift valley, 16 Sept. 1929, *Burt* 1739/29! 1744/29! Native names: Mseza (chiChewa, chiNyanja), Mtwana (chiYao).

This tree grows on steep hillsides, generally at from 2000 to 4000 ft., on impoverished soil. It is mostly found in pure stands, and is often of fine proportions having a clean bole for thirty feet, and is about 10 inches diameter at breast height. The very characteristic feature is the grey smooth bark. The tree is, however, of little use.

23. **B. Oliveri** *Taub.* in Pfl. Ost. Afr. C. 197 (1895).

KENYA COLONY: Mombasa, *Wakefield* (type).

N. RHODESIA: Ft. Jameson, Aug. 1929, *Burt* 1009/29! 1045/29! (probably belong here).

NYASALAND: Dedza Dist., W. of Mphunzi, 5 July 1927, 1300 m., *Topham* 7! 8! (may belong here, the specimens differing from *B. floribunda* in the venation of the leaflets); foothills to escarpment near Namikokwe drift, 800 m., 14 Sept. 1929, *Burt* 1672/29! S. Nyasa Dist., E. side of Rift valley, 17 Sept. 1929, *Burt* 1779/29! Liwonde Dist.? road Liwonde to Zomba, 18 Sept. 1929, *Burt* 1844/29! 1852/29! Native names: Tsamba (chiChewa, chiNyanja), Msumbuti (occasional, chiYao), Msimonje (chiYao).

24. **B. floribunda** *Benth.* in Hook. Ic. Pl. 14: 43 (1881).

NYASALAND: Shire Highlands, *Buchanan* 10 (type)!, Dedza Dist., W. of Mphunzi Hill, 5 July 1927, *Topham* 1! Near Chiwao Hill, 24 June 1927, *Topham* 10! W. of Mphunzi H., fl. 23 Sept. 1928, *Topham* 123! Kota Kota Dist., Nchisi, 5 Sept. 1929, *Burt* 1276/29! 6 Sept. 1929, *Burt* 1327/29! 1346/29! 1347/29! 1348/29! 1351/29! 1362/29! Dedza Dist., near Hotel on granite kopje, 9 Sept. 1929, *Burt* 1456/29! 1459/29! on Dedza mountain up to 6000 ft. where it abruptly ceases, 10 Sept. 1929, *Burt* 1483/29! Mphunzi cross roads, 11 Sept. 1929, *Burt* 1590/29! 1612/29! (Ft. Johnson Dist., E. side of Rift valley, *Burt* 1781/29, also 1788/29! may belong here). Shire Highlands, *Burt* 1920/29! 1921/29! 1922/29! (Mlanje Dist.?, *Burt* 2017/29! 2203/29! 2205/29! 2208/29! also may belong here). Native names: Tsamba (chiChewa, chiNyanja), Msumbuti (chiYao), Mphimbe (given at Dedza by Chewa), Mpapa (chiTumbuka, also at Nchisi by Chewa).

TANGANYIKA TERR.: north of Magoye, in dry forest on slopes of scarp, at about 1700 m., the plateau above with temperate rain-forest remnants at 1910 m., the plains below with *Acacia*-tall grass savannah at 960 m., fl. 20 Oct. 1929, *L. T. Wigg* 1! Magoye Basin, edge of scarp, at about 1900 m., *L. T. Wigg* 8! Native name: Kipabasi (*Sangu*?)

On the upper part of the Dedza escarpment this tree, when left uncut, is conspicuous as a small tree forming almost thickets

in such places as burial grounds, in otherwise bare country. The bark is of some use for lashings.

25. **B. appendiculata** Benth. in Trans. Linn. Soc. 25: 313, t. 42 (1866).

NYASALAND: near Zomba and E. end of Lake Shirwa (precise locality Magamero beside water, Chirazulu Dist.) fl. Oct. 1861, Meller (type!) not re-collected. Native name: Chenga (Meller).

XLI.—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS. H. N. RIDLEY.

MELIACEAE.

Dysoxylum Motleyanum Ridley, sp. nov.; a *D. procero* Hiern affini differt foliis submembranaceis minoribus, nervis paucioribus tenuibus, panícula gracili multiramoso glabro, floribus minoribus roseis.—*D. procerum* var. *Motleyanum* C. DC. in DC. Monogr. i. 487 (1878).

Arbor mediocris glabra. *Folia* 18–20 cm. longa; petioli 5–8 cm. longi; foliola 2–4-juga, lanceolata, acuminata, basi obtusa, 6–14 cm. longa, 3–6 cm. lata, supra laevia subtus nervis 8-jugis tenuibus intra marginem inarquantibus; petioluli 3 mm. longi. *Paniculae* multiramosae, ramis 30 cm. longis patentibus gracilibus; pedunculi nulli; bractae triangulares, acutae, 1 mm. longae; pedicelli 2 mm. longi. *Flores* rosei in paribus dissitis 1 cm. remotis dispositi. *Calyx* patelliformis, 3 mm. longus, dentibus 4 acutis. *Petala* 4, lineari-oblonga, obtusa, 1 cm. longa, 3 mm. lata, extra sericea. *Tubus stamineus* cylindricus, 1 cm. longus, pubescens; antherae 8, oblongae. *Ovarium* glabrum, 4-loculare; stylus tenuis, ad basin hirtus. *Capsula* 5–7.5 cm. diametro, rosea. *Semina* castanea.

DUTCH BORNEO. S. & E. Division: Banjarmasin, *Motley* 996, 1291 (type). "Second-rate tree. Flowers rose. Fruit pink, 2 to 3 inches in diameter. Seeds chestnut-brown, much eaten by pigeons."

This plant was referred by C. De Candolle to a variety of the Indian species *D. procerum* Hiern, from which (as Stapf notes on the specimens in Herb. Kew.) it is very distinct. The whole tree is smaller, the leaves quite thin and smaller and lanceolate with fewer and finer nerves, the flowers are smaller and rose pink (not white as in *D. procerum*) and the panicle is very slender and glabrous. The plant in the Kew Herbarium collected by Vriese in Java, referred to *D. procerum* by C. De Candolle, is *D. excelsum* Bl.

Dysoxylum brachystachys Ridley, sp. nov.; *D. Beccariano* C. DC. affine, floribus minoribus, panícula glabra e ramorum axillis orta differt.

Arbor glabra. *Folia* 20 cm. longa; foliola bijuga, oblonga vel ovata, cuspidato-acuminata, basi angustata, 8–10 cm. longa, 4–5 cm. lata, membranacea, nervis subtus prominulis 4-jugis;

petioluli 5–8 mm. longi. *Paniculae* axillares, spiciformes, 1.5 cm. longae, puberulae; pedicelli 1 mm. longi. *Flores* parvi, 2 mm. longi. *Calyx* cupulatus, 4-dentatus, puberulus. *Petala* 4, glabra. *Tubus stamineus* petalis ferme aequilongus, cylindricus, basi petalis adnatus; antherae 8. *Discus* brevis, tubulosus. *Stylus* cylindricus, glaber, stigmatibus orbiculari.

BORNEO. Sarawak: near Kuching, *Haviland* 2133.

This differs from *D. Beccarianum* C. DC. in the smaller flowers and glabrous panicles. In most of Beccari's plants at least, the panicles spring from the trunk or thick branches of the tree.

Dysoxylum Havilandii Ridley, sp. nov.; *D. macrothyrsus* Miq. affine, foliis ovatis vel oblongis subtus rufescenti-pubescentibus, panícula hirta, floribus hirtis, fructu rufescenti-furfuraceo differt.

Arbor parva. *Folia* 4-jugata, 30 cm. longa, rufescenti-pubescentia; foliola ovata vel oblonga, acuta, basi rotundata vel angustata, 9–15 cm. longa, 6.5–7.5 cm. lata, coriacea, supra glabra, subtus rufescenti-pubescentia, nervis 9–12-jugis subtus elevatis; petioluli 0.5–1 cm. longi. *Paniculae* laxae, elongatae, usque 30 cm. longae, ramulis gracilibus 20 cm. longis hirtis. *Pedicelli* 1 mm. longi, hirti; bractae minutae, lanceolatae, acutae, hirtae. *Flores* in ramulis brevibus hirtis bini oppositi dissiti. *Calyx* patelliformis, 5-dentatus, 1 mm. longus, hirtus. *Petala* lineari-oblonga, obtusa, 1.2 cm. longa, hirta. *Tubus stamineus* petalis subaequilongus, cylindricus, 1 cm. longus, hirtus, margine undulato; antherae 8, oblongae. *Discus* cylindricus, hirtus. *Ovarium* conicum, dense appresse hirtum; stylus basi hirtus, tubo stamineo subaequilongus, stigmatibus discoideo. *Capsula* subglobosa, ad basin attenuata, 4 cm. longa, 5 cm. lata, rufofurfuracea. *Semina* 2.5 cm. longa, 1.5 cm. lata, subreniformia.

BORNEO. Sarawak: near Kuching, *Haviland* 2234 (type), 2713; Rejang, Sibul, *Haviland* 490. "Small tree."

This tree is allied undoubtedly to *D. macrothyrsus* Miq., but differs in the round ovate or oblong leaves hairy beneath, and the hairy panicles and flowers.

Dysoxylum macrocarpum Bl.

BORNEO. Sarawak: Baram, Entoyut River, *Hose* 470.

This plant occurs also in Java and Sumatra, but has not hitherto been recorded from Borneo. I have only seen specimens in fruit from Java, but Hose's flowering specimens fit C. De Candolle's description, and the quadrangular rachis and thick round leaflets drying pale greenish grey are very characteristic.

Chisocheton ruber Ridley, sp. nov.; speciei nulli affinis, floribus rubris glabris in racemis e trunco ut videtur ortis valde distincta.

Arbor. *Folia* magna, glabra, rachide subtricotata; foliola opposita, oblonga, acuminata, basi lata breviter subacuta, 20 cm. longa, 6.5 cm. lata, coriacea, nervis tenuibus vix elevatis 12-jugis; petioluli validuli, 6 mm. longi, omnino glabri. *Racemi* e trunco orti, breves, densi, 3.5–5 cm. longi, rachide pubescente; pedicelli

1-3 mm. longi, pubescentes. *Calyx* glaber, campanulatus, dentibus 5, obscuris. *Petala* 6, rubra, lineari-oblonga, superne dilatata, 2 cm. longa, glabra. *Tubus stamineus* petalis brevior, 6-dentatus, intus et extra hirtus; antherae 10, oblongae. *Discus* minimus, obscurus. *Ovarium* conicum, appresse hirtum; stylus hirtus.

BORNEO. Sarawak: Mt. Braang, 800 feet, limestone, *Haviland* 594. "A tree; corolla red."

This plant is remarkable for its glabrous oblong opposite leaflets and its red flowers in short racemes borne on a small boss on the trunk or a big branch.

Chisocheton setosus Ridley, sp. nov.; *C. pendulifloro* Planch. affinis, foliis oblongis utrinque setosis, rachide setosa, corolla glabra duplo longiore distincta.

Frutex vel *arbor*. *Foliola* oblonga subabrupte cuspidato-acuminata basi cuneata 33 cm. longa 8 cm. lata, membranacea omnino setosa, nervis circiter 25-jugis tenuibus subtus elevatis; petioluli 1 cm. longi, setosi. *Panicula* 30 cm. longa, rachide setosa, ramis 1 cm. longis, 9-15-floris dissitis setosis. *Pedicelli* 2 mm. longi setosi. *Calyx* infundibuliformis setosus 3 mm. longus, margine obscure dentato. *Petala* 6, glabra lineari-spathulata 2.5 cm. longa. *Tubus stamineus* petalis brevior cylindricus ad apicem hirtus, aliter glaber, dentibus bidenticulatis, antheris 8 inclusis. *Discus* brevis cupulatus glaber. *Stylus* gracilis hirtus, stigmatem capitato.

BORNEO. Brunei: Limbang, *Haviland* 598.

A most distinct plant in its densely bristly leaves and panicle. The long corolla is quite glabrous. The actual size of the leaves and the number of leaflets I cannot judge of, as I have only seen two leaflets and a short part of the rachis, nor do I know whether it is a tree, or a shrub like *C. penduliflorum* Planch., to which it appears to be allied, differing in its larger leaflets densely bristly on both sides and its much larger glabrous corolla.

Chisocheton illustris Ridley, sp. nov.; a *C. amabilis* Miq., cui affinis (e descriptione), foliis floribusque multo majoribus et hirtis differt.

Arbor. *Folia* 35 cm. longa, rachide pubescente. *Foliola* 7-juga oblonga vel ovata inaequilateralia 11-16 cm. longa, 4.5-8.5 cm. lata, cuspidata cuspidate obtusa 1 cm. longa, basi rotundata, coriacea, nervis 8-10-jugis cum costa subtus elevatis hirtis. *Petioluli* 2-5 mm. longi hirti. *Panicula* 35-45 cm. longa rachide angulato hirta; rami plerumque breves inferiores 6-9 cm. longi; pedunculi 20 cm. longi. *Flores* congesti albi pedicellis 5 mm. longis pubescentibus. *Calyx* cupulatus hirtus 3 mm. longus, margine obscure 4-lobus. *Petala* 6, linearia obtusa 1.7 cm. longa 2 mm. lata, parce pubescentia. *Tubus stamineus* 1.2 cm. longus extra glaber intus hirtus, dentibus 5, antheris 10. *Discus* pulviniformis glaber. *Ovarium* conicum. *Stylus* gracilis 1.6 cm. longus pilis appressis tectus, stigmatem parvo capitato.

BORNEO. Sarawak: Kuching, *Haviland* 2854 (type), 597; Rejang, Matu, 2853; Sibu river, 1883. "Calyx green, petals white."

Probably most nearly allied to *C. amabilis* Miq., but differing in the much larger size of leaves and flowers and in their hairiness. In some respects its affinity might be with *C. macrophyllum* Teysm., but the flowers are much larger.

Aglaia racemosa Ridley, sp. nov.; *A. elaeagnoideae* Benth. affinis, sed foliis majoribus nec subtus lepidotis, floribus in racemis brevibus paucifloris raro ramosis distincta.

Arbor. *Rami* lepidoti. *Folia* 18 cm. longa; petioli 4 cm. longi lepidoti. *Foliola* 5, elliptica, 9-12 cm. longa, 4.5-5 cm. lata, cuspidata cuspidate obtusa angusta 1.5 cm. longa, coriacea glabra haud lepidota, nervis 5-6-jugis, supra depressis subtus elevatis; petioluli 5 mm. longi. *Racemi* vel *paniculae* axillares 3-4 cm. longi, pauciflori; rachides canaliculati lepidoti; pedicelli 2 mm. longi longitudinaliter canaliculati. *Sepala* 5, ovata rotundata pubescentia. *Petala* 5, alba rotundata glabra. *Tubus stamineus* glaber, antheris minutis inclusis.

BORNEO. Sarawak: Kuching, *Haviland* 1781. "Petals white, anthers sessile on a tubular column, ovary 3-celled with 1 ovule."

Undoubtedly allied to *A. elaeagnoidea* Benth., but the leaves are larger and more rigid and there is no trace of scales on the adult ones at all. The leaf-buds, stem, petioles and inflorescence are lepidote. The flowers, 2 mm. long, are borne in lax racemes of about 6, but occasionally the inflorescence has a few branches.

Aglaia cuspidella Ridley, sp. nov.; *A. odoratissimae* Bl. affinis, sed foliis parvis ellipticis longe cuspidatis coriaceis, floribus minoribus distincta.

Arbor. *Rami* graciles, cortice pallido. *Folia* 4 cm. longa glabra. *Foliola* bijuga elliptica longe cuspidata cuspidate 1.5 cm. longa, basi obtusa, 5-8 cm. longa 2-5 cm. lata, coriacea; nervi superne inconspicui 5-jugi subtus vix elevati; petioluli 3 mm. longi. *Paniculae* 9-13 cm. longae, ramis inferioribus 2.5-4 cm. longis, furfuraceis. *Flores* complures perparvi; pedicelli 1 mm. longi; bractae lanceolatae acuminatae. *Calyx* 5-lobus lobis acutis hirtis. *Petala* 5 oblonga glabra. *Tubus stamineus* petalis paullo brevior, antheris 6.

BORNEO. Sarawak: Mt. Koum, *Haviland* 1706.

Very distinct in its elliptic long cuspidate leaves. The flowers are very young in all the specimens.

Aglaia Havilandii Ridley, sp. nov.; ab *A. mucronulata* DC. foliolis alternis, paniculis brevioribus nec lepidotis, calyce pubescente, petalis minoribus, antheris inclusis differt.

Arbor. *Folia* trijuga 15 cm. longa; rachide furfuraceo-puberula, foliola alterna coriacea elliptica cuspidata basi cuneata, 9-13 cm. longa, 4-5 cm. lata, glabra, supra laevia; costa subtus furfuracea elevata, nervis elevatis furfuraceis vel glabris 8-9-jugis; petioluli

validuli 1 cm. longi furfuracei. *Paniculae* axillares 12 cm. longae, furfuraceo-pubescentes, ramis 4 cm. longis. *Pedicelli* dissiti 1 mm. longi, furfuracei. *Calyx* 4-partitus, lobis lanceolatis pubescentibus. *Petala* oblonga obtusa 1 mm. longa glabra. *Tubus stamineus* petalis subaequilongus margine integer, antheris 5 inclusis.

BORNEO. Sarawak: near Kuching, *Haviland* 2740, 2261.

***Aglaia trimera* Ridley**, sp. nov.; ab *A. tripetala* Merrill foliolis haud falcatis nec basi inaequilateralibus, petalis multo minoribus differt.

Arbor glabra. *Folia* 30 cm. longa, rachide glabra; foliola 3-8, alterna vel subopposita oblonga vel elliptica, 8-12 cm. longa, 4.5-5.5 cm. lata, cuspidata (cuspidate 5-15 mm. longa) coriacea glabra, nervis 7-jugis subtus tenuibus elevatis supra depressis; petioluli 5-1.5 cm. longi. *Paniculae* 24 cm. longae, ramis 5 cm. longis dissitis, ramulis 1 cm. longis paucifloris squamosis; pedicelli 1 mm. longi. *Calyx* patelliformis, lobis 3 rotundatis squamosis. *Petala* 3, oblonga rotundata 1 mm. longa, extra lepidota. *Tubus stamineus* subcylindricus petalis ferme aequilongus, margine obscure crenulato, antheris 6 inclusis. *Fructus* globosus rufo-furfuraceus 1.5 cm. diametro.

BORNEO. Sarawak: Kuching, *Haviland* 2847; *Beccari* 1194 (fruit).

Allied to *A. tripetala* Merrill, but the leaves are not opposite nor falcate nor is the base inaequilateral, the petals are smaller and the staminal tube is not three-lobed.

***Aglaia Fraseri* Ridley**, sp. nov.; *A. ellipticae* Bl. affinis sed panicula laxa subglabra, floribus multo minoribus, antheris 5 distincta.

Arbor glabra. *Folia* rachide parce rufo-furfuracea 20 cm. longa; foliola 7 imparipinnata opposita lanceolata obtusa breviter acuminata basi angustata, 9-11.5 cm. longa, 3.5-4 cm. lata, subcoriacea, glabra, nervis 9-jugis tenuibus subtus elevatis, costa parce rufo-furfuracea; petioluli 5 mm. longi pubescenti-furfuracei. *Paniculae* longiores laxae multiflorae 25 cm. longae, rufo-furfuraceae: pedicelli 1 mm. longi pubescentes. *Calyx* 4-lobus lobis lanceolatis hirtis. *Petala* 5, vix 1 mm. longa, glabra ovata rotundata. *Tubus stamineus* cupuliformis antheris 5 margini crenulato adnatis.

BRITISH NORTH BORNEO. Kudat, *Fraser* 239.

This belongs to Section *Hearnia*, with the anthers projecting from the mouth of the staminal tube, which is thickened underneath each one. It is as near *A. (Hearnia) elliptica* Bl. as any species, but the leaves are smaller, as are the flowers, which are in quite lax panicles, much less hairy than in the latter species.

***Aglaia Motleyana* Stapf** ms., sp. nov.; ab *A. eduli* Miq. affini foliis alternis dissitis ovatis, paniculis longioribus nec hirtis, calyce majore diversa.

Arbor parva. *Rami* glabri lenticellati. *Folia* 5-8-foliolata, 20 cm. longa glabra; foliola alterna ovata acuminata basi rotundata, 11.5 cm. longa 5 cm. lata, chartacea glabra, nervis 8-9-jugis subtus elevatis; petioluli 5 mm. longi. *Paniculae* laxae 30-33 cm. longae, ramis 15 cm. longis, ramulis 4 cm. longis, furfuraceis; pedicelli 1 mm. longi. *Calyx* cupulatus, 1 mm. longus, pubescens, obscure 5-lobus lobis obtusis. *Petala* 5, citrina, obovato-rotundata, 2 mm. longa, glabra. *Tubus stamineus* liber, petalis brevior, obscure 5-lobus, antheris 5.

BORNEO. Labuan, *Motley* 225. "A small tree; flowers citron-yellow, very fragrant."

This plant Hooker made a variety of *Milnea edulis* Roxb. (*Aglaia edulis* Miq.) (in Trans. Linn. Soc. xxiii. 164), from which it is distinct in its remote ovate leaves, scurfy but not hairy panicle, and calyx larger in proportion to the corolla.

***Aglaia polyantha* Ridley**, sp. nov.; ab affini *A. Moultoni* Merrill rachide pubescenti-velutina, panicula patente, floribus majoribus, calycis lobis rotundatis differt.

Arbor. *Folia* 15 cm. longa, rachide pilis stellatis velutina; foliola 5, lanceolata vel oblonga acuminata basi cuneata (interdum oblique), 7-15 cm. longa 3.1-5.2 cm. lata, tenuiter coriacea, nervis 6-8-jugis costa subtus pubescente aliter glaberrima nitida, reticulationibus in utraque pagina elevatis; petioluli 3-5 cm. longi velutini. *Paniculae* laxae multiflorae multiramosae 15 cm. longae; rami 5-12 cm. longi pilis stellatis velutino-pubescentes; ramuli 5-10 mm. longi. *Flores* racemosi, pedicellis 2 mm. longis. *Calyx* patelliformis, lobis 5 rotundatis pubescentibus marginibus ciliatis. *Petala* glabra oblongo-rotundata 2 mm. longa. *Tubus stamineus* petalis paullo brevior, antheris 5 inclusis.

BORNEO. Sarawak: Kuching, *Haviland* 3200 (type). British North Borneo: East Coast, *Creagh*.

This seems to be most closely allied to *A. Moultoni* Merrill, differing in the velvety pubescent leaf-rachis and petiolules, the lax panicles (one of which is 15 cm. long and 20 cm. wide), the deeply lobed calyx with rounded, not acute, lobes, and the larger petals.

***Aglaia unifoliolata* Ridley**, sp. nov.; foliis unifoliolatis, paniculis brevibus laxis hirtis, floribus parvis, antheris 3 in tubo libero, ab omnibus distincta.

Arbor. *Rami* glabri cortice pallido. *Folia* unifoliolata elliptica cuspidata (cuspidate 8 mm. longa obtusa) 5-9 cm. longa 2.5-4 cm. lata, coriacea glabra, nervis 8-9-jugis in utraque pagina elevatis reticulationibus etiam elevatis; petioli 7 mm. longi. *Paniculae* axillares graciles laxae 6-8 cm. longae rufo-tomentosae, ramis paucis 5 cm. longis vel minoribus. *Flores* dissiti; pedicelli hirti 4 mm. longi vel breviores; bractae lanceolatae acutae minutae rufo-tomentosae. *Calyx* 4-lobus lobis ovato-lanceolatis acutis rufo-tomentosis. *Petala* 4, obovata obtusa 1 mm. longa glabra

citrina. *Tubus stamineus* subglobosus liber, margine integro; antherae 3 sessiles.

BORNEO. Sarawak: Kuching, *Haviland* 2849. "Petals yellow."

This is noticeable from its simple leaves and short, hairy panicles, and from the staminal tube obovoid with a small round aperture at the top. In all the flowers which I examined I could see but three stamens.

***Aphanamixis grandifolia* Bl.**

BORNEO. British North Borneo: Kudat, *Fraser* 187. Sarawak: *Beccari* 3967.

***Aphanamixis pedicellata* Ridley**, sp. nov.; ab *A. sumatrana* (Miq.) Harms, cui affinis, panicula graciliore, pedicellis longioribus, sepalis ovatis, antheris 5, capsula et seminibus majoribus, distincta.

Arbor parva. *Folia* 25-40 cm. longa glabra; foliola 9 imparipinnata oblonga vel elliptica, cuspidata, basi obliqua cuneata, 13-15 cm. longa 6 cm. lata, coriacea, nervis 10-jugis intra margines inarcuatis, subtus conspicuis; petioluli 1.5 cm. longi. *Paniculae* 45 cm. longae, pedunculo 15 cm. longo, ramis gracilibus dissitis 13 cm. longis. *Racemus femineus* 45 cm. longus; flores remoti alterni; pedicelli 5 mm. longi. *Sepala* 5, ovata obtusa rotundata ciliata basi connata. *Petala* 5, ovata rotundata 5 mm. longa glabra. *Antherae* 5, anguste ellipticae acutae. *Pistillodium* minutum triquetrum. *Capsula* globosa 3 cm. longa. *Semina* oblonga 1.5 cm. longa castanea.

BORNEO. Sarawak: *Beccari* 3566; Kuching, *Haviland* 2089, 2132 (type). "Small tree; buds purple, inner petals white, outer petals yellow."

This species is distinct from all in the area in its long flower-pedicel; in all the others described the flowers are sessile or subsessile. *A. sumatrana* (Miq.) Harms has the most distinctly pedicelled flowers, but the pedicels in this are very much shorter and thicker. *A. pedicellata* also differs in the more slender panicle branches, the rounded calyx lobes less deeply cut, the larger fruits and seed, and by its 5 stamens.

***Walsura borneënsis* Merrill.**

BORNEO. British North Borneo: Sandakan, Myburgh Province, *Elmer* 20167.

***Walsura multijuga* King.**

BORNEO. Sarawak: Kuching, *Haviland* 1980. "Small tree; flowers pale green."

***Walsura grandifolia* Ridley**, sp. nov.; *W. neurodi* Hiern affinis sed foliis in genere maximis, paniculis longioribus, floribus majoribus distincta.

Arbor parva. *Folia* 5-foliolata, glabra; petioli crassi, 10 cm. longi, superne plani, basi dilatati; foliola opposita, glabra,

rigide coriacea, elliptica, breviter acuminata, basi cuneata; foliolium terminale obovatum, 21 cm. longum, 10 cm. latum; inferiora 20-28 cm. longa 9 cm. lata; nervi 12-15-jugi, superne depressi, subtus valde elevati; petioluli foliolorum inferiorum 2 cm. longi, crassi, apice incrassati; petiolulus folioli terminalis 5 cm. longus. *Panicula* laxa, 35 cm. longa; pedunculus 15 cm. longus; rami remoti, basales 8 cm. longi, ramulis ad apicem 2.5 cm. longis paucifloris puberulis; bractae parvae lanceolatae pubescentes caducae; pedicelli 2 mm. longi pubescentes. *Calyx* 1 mm. longus pubescens 5-lobatus lobis subtriangularibus acutis. *Petala* oblonga obtusa 4 mm. longa, pubescentia. *Tubus stamineus* quam petala paullo brevior, laciniis elongatis linearibus pilosis; antherae ovatae, acutae. *Ovarium* pilosum.

BORNEO. Sarawak: near Kuching, *Haviland* 1635. "Small tree; anthers yellow, disc reddish."

Perhaps nearest to *W. neurodes* Hiern, but the leaves are very much larger, the panicles longer and laxer and the flowers larger.

***Walsura Hosei* Ridley**, sp. nov.; *W. velutinae* Ridl. affinis sed ferme omnino glabra, paniculis longioribus, sepalis ad basin ferme liberis subtus rugosis marginibus ciliatis, staminum filamentis omnibus apice bifurcatis, ovario glabro.

Arbor glabra. *Folia* 15 cm. longa glabra; foliola 4 vel 5, elliptico-lanceolata acuminata subacuta, basi cuneata vel acuminata obliqua, 4-11 cm. longa 2-5 cm. lata, membranacea, nervis 6-jugis tenuibus; petioluli 3 mm. longi, terminali 1 cm. longo. *Paniculae* cymosae 8-12 cm. longae, ramis paucis ad apicem, 3-4 cm. longis, puberulis; pedicelli 1 mm. longi. *Sepala* ferme ad basin libera rotundata extra rugosa, marginibus ciliatis. *Petala* 5, oblonga obtusa 2 mm. longa glabra. *Staminum* 10 filamenta oblongo-linearia, pilis paucis infra antheras exceptis glabra, omnia ad apicem bifurcata lobis obtusis. *Ovarium* pulviniforme glabrum.

BORNEO. Sarawak: Baram, Entoyut River, *Hose* 394.

Allied to *W. velutina* Ridl., but almost completely glabrous; the leaves thinner in texture; the flowers rather smaller, and globular in bud; the sepals free nearly to the base and wrinkled outside, rounded, with ciliate edges; the stamens all bifurcate at the top, and the ovary glabrous.

***Walsura velutina* Ridley**, sp. nov.; *W. multijugae* King affinis sed hirtior, foliolis paucioribus, staminum petalis oppositorum filamentis integris alternis bifurcatis, ovario hirtio.

Arbor pubescens. *Folia* 7-foliolata 20 cm. longa, rhachide pubescente; petioli 5 cm. longi; foliola opposita ovata vel elliptica obtuse acuminata basi obliqua, 6.5-9 cm. longa 3-4.5 cm. lata, costa nervisque 8-jugis subtus hirtis exceptis glabra; petioluli 2 mm. longi hirti. *Paniculae* axillares 5 cm. longae hirtae; bractae ovatae acuminatae minutae; pedicelli 1 mm. longi hirti. *Flores* parvi in apicibus ramorum erectorum congesti. *Calyx* lobis 5, ovatis obtusi

hirti 1 mm. longi. *Petala* 5, oblongo-ovata obtusa 2 mm. longa glabra. *Staminum* 10 filamenta oblongo-linearia intus pilosa, 5 petalis opposita apice integra, 5 alterna apice bifurcata. *Ovarium* pulviniforme hirtum, stylo brevissimo glabro, stigmatibus capitato.

BORNEO. Sarawak: Baram district, Mt. Trekan, 2000 ft. alt., *Hose* 643 (type), 629.

This is allied to *W. multijuga* King but has fewer leaflets, and the whole plant is more hairy.

***Chukrasia tabularis* Juss.**

BORNEO. Sarawak (?): Limestone Hills near Ban, *Haviland* 2074. "A large tree."

DICHAPETALACEAE.

***Dichapetalum gelonioides* Engl.—*Chailletia sumatrana* Miq.**

The Sumatran plant seems to me hardly different from some specimens of the Indian *gelonioides* and I can hardly separate *D. borneense* Merrill.

***Dichapetalum Beccarianum* (Stapf ms., sub *Chailletia*) Ridley, sp. nov.; a *D. deflexifolia* Turcz., cui affinis, foliis glabris nitidis, floribus minoribus, pedunculis brevioribus differt.**

Frutex scandens; rami glabri. *Folia* elliptica vel oblonga acuminata basi cuneata, 9.5–12 cm. longa 4.5–5 cm. lata, coriacea, supra glabra nitida subtus in costa parce hirta, nervis 4–6-jugis procul a margine inarquantibus reticulationibus conspicuis; petioli rufescenti-velutini 5–10 mm. longi. *Cymae* in axillis binae flavo-hirtae, pedunculis 1 cm. longis, ramis 1 cm. longis patentibus, ramulis 5 mm. longis. *Flores* parvi. *Sepala* ovata rotundata extra albo-lanuginosa. *Petala* unguiculata oblonga biloba, lobis obtusis. *Staminum* filamenta filiformia, glandulis ad bases 2. *Ovarium* conicum hirtum, stigmatibus capitato. *Fructus* 1–2-seminifer obovatus rugosus flavo-velutinus 1 cm. longus 1.5 cm. latus.—*Chailletia timorensis* Becc. in Malesia i. 176, not of DC.

BORNEO. Sarawak: Rejang river, *Beccari* 3892; nr. Kuching, *Haviland* and *Hose* 3365; Landak, *Teysmann* 11265; Lundu, *Ridley* 12465.

CELEBES. Penisola S.E. a Lepo-Lepo presso Kandari, *Beccari*.

There are fairly good specimens of De Candolle's Timor plant in Herb. Kew., and these are totally different from *Beccari*'s plant. He only guessed from the description that the two plants were the same, and had not seen the Timorese plant. *Beccari*'s plant has not hitherto been described.

In some of the Celebes forms the leaves are lanceolate, narrowed to both ends, 12 cm. long, 4.5 cm. wide. The plant is undoubtedly allied to *C. deflexifolia* Turcz., but the flowers are fewer and smaller, the peduncles slender and hairy, not velvety, and leaves glabrous.

***Dichapetalum grandifolium* Ridley, sp. nov.**; speciei nulli affinis, foliis magnis glabris, cymis elongatis paucifloris ferme glabris, staminibus brevibus distincta.

Frutex glabra. *Folia* elliptico-ovata vel elliptico-lanceolata obtusa basi cuneata, 18–20 cm. longa 7.5–11.5 cm. lata, coriacea, glabra, nervis 6–7-jugis intra marginem arcuantibus subtus elevatis; petioli 1 cm. longi. *Cymae* in axillis singulae, pedunculis 3 cm. longis, ramis 2 ad apices 1 cm. longis puberulis, pedicellis 1 mm. longis. *Sepala* 5, ovata rotundata 3 mm. longa albo-pubescentia. *Petala* 5, oblanceolata sepalis paullo longiora glabra usque ad medium fissa. *Stamina* 5, petalis vix longiora. *Stylus* brevis.

BORNEO. Sarawak: *Haviland* 2192.

This has the largest leaves of any Asiatic species, broad elliptic ovate with few nerves, and glabrous.

XLII.—STANDARD-SPECIES OF CERTAIN LINNEAN GENERA. M. L. GREEN.

I. COTYLEDON.

The distribution of the Nomenclature Proposals by British Botanists submitted to the International Botanical Congress, Cambridge, 1930, has elicited a communication from Dr. H. Harms (Berlin), in which he suggests that in view of recent literature, namely, *Berger's Crassulaceae* in Engler, *Pflanzenfamilien*, 18 A (1930) it might be desirable to propose *C. orbiculata* L. as the standard-species of *Cotyledon* in place of *C. hemisphaerica* L. (See Nomenclature Proposals of British Botanists, p. 156).

C. hemisphaerica was originally chosen by the writer as it is one of the historically oldest species, being figured in *Dillenius, Hortus Elthamensis*, t. 95, fig. 3.

Berger, however, has transferred *C. hemisphaerica* to the genus *Adromischus* Lem. It certainly is not desirable to suggest as a standard any species which may be regarded as belonging to another genus. With this in mind, therefore, *C. orbiculata* L., is proposed as a standard in accordance with Dr. Harms' suggestion. It is one of the seven species recognized in *Linn. Sp. Pl.* 1753, pp. 429, 1196, and it is the only one still included in the genus *Cotyledon* by *Berger*.

II. SCROPHULARIACEAE.

A paper by Dr. F. W. Pennell on the Genotypes of the Scrophulariaceae in the First Edition of *Linné's Species Plantarum* has recently appeared in *Proceedings of the Academy of Natural Sciences of Philadelphia*, lxxxii. pp. 9–26 (1930).

The type-species indicated in the paper have been carefully compared with the standard-species proposed by the writer, with the result that the latter have been found to agree with the type-species with the following exceptions.

657. *Bartsia* L. Sp. Pl. 602; Gen. Pl. ed. 5, 262. Type-species as determined by Pennell: *B. coccinea* L. Standard-species as proposed by M. L. Green: *B. alpina* L.

This example shows that it is not practicable in all cases to choose the historic type as the standard-species, as this would involve a break in historic continuity of application of the generic name. Five species were included in the genus by Linné, and of these, four have been removed to other genera, amongst them *B. coccinea* which has become *Castilleja coccinea*. If, therefore, *B. coccinea* were retained as the standard-species of *Bartsia*, it would involve highly undesirable changes in nomenclature. The suggested standard-species *B. alpina* L. is the only original species still retained in the genus with its present circumscription.

660. *Melampyrum* L. Sp. Pl. 605; Gen. Pl. ed. 5, 264.

The standard-species suggested by the writer was *M. pratense* L., one of the best known of the original species and the commonest in Sweden. Dr. Pennell points out that the historic type of *Melampyrum* is *M. arvense* L.

In Engler & Prantl, Pflanzenfam. IV. 3 B, p. 99 (1893) the genus *Melampyrum* L. is divided by von Wettstein into two sections, namely, *Obtusisepalum* Wettst., containing one species only, and *Eumelampyrum* Wettst., containing the remaining twenty-four species. This latter section he divides again into two groups (1) *Spicata* Wettst., containing four species of which *M. arvense* is one, and (2) *Laxiflora* Wettst., containing nineteen species including *M. pratense*. Undoubtedly the latter group is the more representative, and therefore the writer feels justified in retaining *Melampyrum pratense* L. as the suggested standard-species.

664. *Pedicularis* L. Sp. Pl. 607; Gen. Pl. ed. 5, 266.

The standard-species proposed was *P. palustris*, one of the best known of the original species. In working out the genotypes of the Scrophulariaceae, Dr. Pennell points out that *P. sylvatica* fits the generic description almost wholly, being the only species with ventricose calyx and subrotund capsule. In view of this it seems desirable to adopt *P. sylvatica* L. as the standard-species.

665. *Gerardia* L. Sp. Pl. 610; Gen. Pl. ed. 5, 266.

The standard-species chosen was *G. purpurea* L. The genotype according to Dr. Pennell is *G. tuberosa* L.

This is a further example of the type-species having been referred to another genus, and in this case to another family—*G. tuberosa* L. = *Stenandrium tuberosum* Urb. (Acanthaceae). For the same reasons as those given under *Bartsia* it is undesirable to choose the historic type as the standard-species. Therefore *G. purpurea* L. is retained as the suggested standard-species.

XLIII.—ON THE FLORA OF THE NEARER EAST: VII.*—
A CONTRIBUTION TO OUR KNOWLEDGE OF THE FLORA OF AZERBAIDJAN, N. PERSIA. B. GILLIAT-SMITH AND W. B. TURRILL: II.

ZYGOPHYLLACEAE.

Peganum Harmala L. Sp. Pl. 444 (1753).

Common round Tabriz, seeds, flowers white or greenish white, 12.10.29.

Distrib. Medit. Region to Cent. Asia.

This is the "rue" which is used so much in native customs. It is burnt at marriages to keep off the evil eye. It is ubiquitous round Tabriz. In Arabic it is called "Harmall," though the name is also applied to *Ruta chalepensis*. In Persian it is called "isfand" or "isband" and is undoubtedly the important herb referred to by English authors writing on Persia as "rue" or "wild rue." In the local Azerbaidjani Turki it is known as "Üzarih." *Ruta* is locally apparently unknown as a medicinal or pot herb and has no local name. In Persian it is "Sadāb," in Ottoman Turkish "Sedef," and in Bulgarian "Sedefce." *Peganum Harmala* in Bulgarian is "Zarniš." Around Tabriz it inhabits especially dry roadsides and cemeteries, associating with *Anabasis aphylla*.

Tribulus terrestris L. Sp. Pl. 387 (1753).

Near Tabriz, 11.6.27, No. 2068; garden weed, 8.27, No. 2085. Flowers yellow, from June onwards.

Distrib. Medit. Region, but now naturalized in many countries.

T. terrestris L. var. *grandiflora* Turrill var. nov.; a planta vulgare floribus luteis majoribus, petalis 7–8 mm. longis differt.

Tabriz, garden weed, 7.6.27, No. 2079; 6.27, No. 2145.

Several varieties of this species have been described but they are mostly based on fruit characters. The large flowers of our plant give a distinctive appearance to the specimens. The only other material, which I have seen, approaching that from Tabriz is a sheet in Herb. Kew. from Sardinia (E. Reverchon, s.n., Santa Teresa Gallura, par Tempio, lieux incultes, 3 Juillet, 1881). The suggestion is natural that the variety has arisen more than once in a mutational manner.

Zygophyllum Fabago L. Sp. Pl. 385 (1753).

Near Tabriz, 5.26, flowers white, gynaeceum red, No. 1517; 20.5.27, No. 1771.

Distrib. Medit. Region.

RUTACEAE.

Ruta Buxbaumii Poir. Encyl. vi. 336 (1804).

Aplophyllum Buxbaumii G. Don Gen. syst. i. 780 (1831).

Along the railway, Yam, 25.7.29, flowers yellow, No. 2578.

Distrib. Balkan Peninsula east to N. Persia and south to Palestine.

*Continued from K.B. 1930, p. 312.

R. villosa *M. Bieb.* Flor. Taur.-Cauc. 1. 310 (1808).

Hills to the south of Tabriz, 1.6.27, flowers greenish yellow, Nos. 1918, 1919.

Distrib. Armenia, Caucasus, N. Persia.

RHAMNACEAE.

Rhamnus cornifolia *Boiss. et Hohen.* in Boiss. Diagn. Ser. I. ix. 1 (1849).

Mishou Dag, rocks and crags, 2.9.29, No. 2633.

Distrib. E. Asia Minor, Kurdistan, Persia.

R. Pallasii *Fisch. et Mey.* Ind. Sem. Hort. Petrop. iv. 46 (1838).

Hills north of Tabriz, 24.4.29, No. 2557.

Distrib. Caucasus, Armenia, N. Persia.

ANACARDIACEAE.

Rhus coriaria *L.* Sp. Pl. 265 (1753).

Tabriz, in garden, 29.10.27, No. 2183.

Distrib. Medit. Region.

SAPINDACEAE.

Acer cissifolium *Koch* in Miq. Ann. Mus. Bot. Lugd. Bat. i. 252 (1863-64).

Tabriz, cultivated in the garden of the British Consulate, 5.26, No. 1411; 2.5.26, No. 1469. This introduced tree flourishes excellently.

Distrib. Native of Japan, now widely cultivated.

LEGUMINOSAE.

Alhagi camelorum *Fisch.* Hort. Gorenk. ed. II. 72 (1812).

Near Tabriz, 6.27, No. 1972. Flowers in June and July, fruits in August. The Turki name is "Dava oti" which means "camel weed." It is plentiful in waste places round Tabriz and also in the desert. Sometimes it appears not to flower but at other times the ruby-coloured blossoms are exceedingly plentiful.

Distrib. S. Russia east and south-east to N. Persia, Afghanistan, Cent. Asia, and N. India.

Astragalus aduncus *Willd.* Sp. Pl. iii. 1269 (1803).

Mt. Sir, Urmia district, 27.5.58, flowers pinkish-purple, No. 2290.

Distrib. Armenia, N. Persia.

A. bracteosus *Boiss. et Noë* in Boiss. Diagn. Ser. II. ii. 31 (1856).

Hills south-east of Tabriz, 25.5.27, No. 1896.

Distrib. E. Asia Minor.

A. Bungeanus *Boiss.* Flor. Or. ii. 436 (1872).

Near Tabriz, 11.4.27, flowers pinkish-purple, No. 1894; hills north of Tabriz, 24.4.29, No. 2555.

Distrib. Caucasus.

I am very doubtful if this species is really distinct from *A. aduncus* Willd., with which plant Marschall-Bieberstein, according to Boissier, confused it. In the absence of more complete material, with fruits, the exact relationships of plants of this group must remain in abeyance.

A. campylorrhynchus *Fisch. et Mey.* Ind. Sem. Hort. Petrop. 23 (1835).

Hills south of Tabriz, 12.6.28, flowers minute white, No. 2275.

Distrib. Armenia, E. Asia Minor, Afghanistan, Songaria.

A. Candolleanus *Boiss.* Diagn. Ser. I. ii. 80 (1843).

Hills north of Tabriz, 28.4.28, flowers dull pink, No. 2289.

Distrib. N. Persia.

A. Caraganae *Fisch. et Mey.* in Bull. Soc. Nat. Mosc. 1838, 344.

Urmia district, 5.26, No. 1555; near Tabriz, 5.27, flowers bright yellow, very showy, and sweet scented when quite fresh, No. 1903.

Distrib. Iraq, Armenia, N. and W. Persia, Talysch.

A. chrysostachys *Boiss.* Diagn. Ser. I. ii. 69 (1843).

Urmia district, south-east of the lake, 5.26, flowers golden, Nos. 1558, 1599.

Distrib. N. Persia.

A. chrysotrichus *Boiss.* Diagn. Ser. I. ii. 75 (1843).

Near Tabriz, 4.27, yellow flowers, Nos. 1891, 1892, 1908; hills south of Tabriz, 27.6.28, No. 2352.

Distrib. Persia.

The leaflets are more nearly glabrous in our plants than in authenticated material at Kew, but I am unable to find sufficiently important morphological differences to justify the creation of a new name. No. 2352 is a poor specimen and its identification is uncertain.

A. commixtus *Bunge* in Arb. Nat. Ver. Riga i. 246 (1847).

Hills south of Tabriz, 12.6.28, No. 2273.

Distrib. E. Asia Minor, N. Persia, Turkestan, Cent. Asia.

A. constrictus *Turrill* in Kew. Bull. 1929, 226.

Near Tabriz, 6.27, No. 1905a.

Endemic.

A. constrictus *Turrill* var. **tomentosus** *Turrill* in Kew. Bull. 1929, 227.

Near Tabriz, 6.27, No. 1905b; 6.28, No. 2355. Flowers cream-coloured and smelling like "sweet Alyssum."

Endemic.

A. (Sect. Rhacophorus) distantior *Turrill* sp. nov.; ab *A. Fenzlii* Boiss. foliis longioribus, foliolis distantioribus, bracteis longioribus distinguitur.

Fruticulosus erinaceus circiter 9 cm. altus, ramis brevibus spinis vetustis 1.5-4 cm. longis, crebre armatis. *Folia* 3-4.5 cm. longa,

foliolis 4-5-jugis oblongis apice acuminato-spinulosis 8 mm. longis 1.5 mm. latis adpressiuscule griseis; stipulae lanceolatae, 1.2 cm. longae, ciliatae, dorso glabrae, ima basi dense albo-tomentosae. Flores rubro-purpurei, axilli 3 capitulum pauciflorum globosum formantes; bractae membranaceae, anguste lineares, acutae, 8 mm. longae, superne hirsutae. *Calyx* usque ad basin in lacinias fissilis, laciniiis anguste linearibus 11 mm. longis albo-plumosis. *Vexillum* fere oblongum, apice rotundatum leviter emarginatum, 1.9 cm. longum, 6.5 mm. latum; alae 1.7 cm. longae, carina 1.6 cm. longa; petala interiora unguibus vaginae stamineae usque ad 2.5 mm. adnata. *Ovarium* ovoideum, 7 mm. altum, 3.75 mm. diametro, densissime adpresso-hirsutum; stylus 1.2 cm. longus, glaber.

Azerbaidjan: from the Urmia district, *Gilliat-Smith* No. 2636.

This evidently attractive species is closely related to *A. Fenzlii* Boiss. Diagn. Ser. II. v. 89 (1856), from which it differs in its larger parts and more distantly placed leaflets. The flowers appear to be larger than actual measurements show them to be. *A. Fenzlii* is known only from the Cilician Taurus.

The allied species *A. Barba-Jovis* DC. differs in the indumentum of the leaves. It is known from Armenia and eastern Anatolia.

A. ebenoides Boiss Diagn. Ser. I. ii. 70 (1843).

Plain below Mt. Sir, Urmia district, 27.5.28, flowers ruby-red, No. 2282.

Distrib. N. Persia.

A. eriopodus Boiss. Diagn. Ser. I. ii. 48 (1843).

Hills south-east of Lake Urmia and north of the town of Marágha, 26.5.26, flowers purple, No. 1606; hills to the south of Tabriz, 5.6.27, No. 1897, 14.6.28, No. 2269; fruits and seeds, 29.6.28, 49/1928.

Distrib. N. Persia.

The specimens are a little more shaggily hairy than the type specimen of *Aucher-Eloy* 4422 at Kew.

A. (Sect. Rhacophorus) glabristylus Turrill sp. nov.; ab *A. andalanico* Boiss. et Hausskn. foliolis 5-6-jugis, axillis usque ad 7-floribus, ab *A. eriosphaero* Boiss. et Hausskn. vexillo longiore differt.

Fruticulosus caulibus usque ad 1.8 dm. longis ramis brevibus crassis depressis valde armatis dense foliatis. *Folia* 3-6 cm. longa, foliolis 5-6-jugis planis vel subplanis ellipticis apice acute spinulosis usque ad 1.3 cm. longis 5 mm. latis pagina utraque dense albo-tomentosis, rhachide inferne albo-hirsuta apicem versus glabrescente, stipulis ovatis petiolo adnatis parte libera triangulare vix 2 mm. longa dorso albo-hirsutis deinde plus minusve glabrescentibus. Flores in axillis 6-7 dense aggregati, in capitulum subsphaericum circiter 3.5 cm. diametro conferti; bractae tenuiter lineares, 8-10 mm. longae, superne albo-villosissimae, inferne leviter pilosae

vel fere glabrae. *Calyx* 1.0 cm. longus, mox usque ad basin fissilis, dense et subpatule villosus usque ad basin. *Vexillum* 2.1 cm. longum, lamina violacea basi triangulari-auriculata ungui subaequilonga; alae carinae unguibus vaginae stamineae alte adnatae. *Ovarium* oblongo-cylindricum, 3.5 mm. altum, densissime villosum; stylus 1.4 cm. longus, glaber.

N. Persia: hills to the south of Tabriz, 5.6.28, *Gilliat-Smith* 2357 (nomenclatural type); hills south of Tabriz, 6.29, No. 2548.

The species described above is an addition to a very closely related group placed by Boissier in the section *Rhacophorus*. In addition to the species mentioned in the differential diagnosis our plant is closely related to *A. tatschalensis* Bornm., Bull. Herb. Boiss. Ser. II. v. 763 (1905), from which it differs chiefly by the smaller leaves, leaflets, and flowers, and the whiter denser indumentum of the leaves.

A. hololeucus Boiss. et Buhse Aufz. 59 (1860).

Above Zindjanab, Sahand Range, flowers pale-blue, 25-27. 6.29, No. 2520.

Distrib. N. Persia.

A. latifolius Lam. Dict. i. 319 (1783).

Hills south-east of Lake Urmia, 26.5.26, flowers purple, No. 1581.

Distrib. Armenia, N. Persia.

A. macrocephalus Willd. Sp. Pl. iii. 1260 (1803).

Yam, 23.6.29, flowers yellow, handsome, No. 2569.

Distrib. Asia Minor, Armenia.

The calyces are somewhat more finely silky and the flowers slightly smaller than in most specimens at Kew.

A. macrourus Fisch. et Mey. in Bull. Soc. Nat. Mosc. 1838, 346.

Mt. Sir, Urmia district, 27.5.28, flowers dirty yellow, No. 2286.

Distrib. N. Persia, Caucasus.

A. Michauxianus Boiss. Diagn. Ser. I. ii. 62 (1843).

Mt. Sir, Urmia district, 27.5.28, No. 2280.

Distrib. N. Persia.

A. mishouensis Turrill sp. nov.; ab *A. psiliostylo* Bunge spinis brevioribus stipulis albo-membranaceis angustioribus, foliolis minoribus, petalis filamentorum tubo brevissime adnatis facile distinguitur.

Planta fruticosa, valde spinosa, 1.5 dm. alta, ramis 9 cm. longis vel saepissime brevioribus glabris. *Folia* 2.5-3.5 cm. longa, foliolis 3-4-jugis lineari- vel oblongo-lanceolatis pagina superiore plus minusve concava acuminato-spinulentibus 6-8 mm. longis 1.5-1.75 mm. latis pagina utraque dense adpresse sericeo-pubescentibus, petiolulo 0.5 mm. longo; rhachis adpresse sericeo-cana; stipulae a basi ovata lanceolatae, circiter 5 mm. longae albo-membranaceae, margine ciliatae. *Inflorescentia* subcapitulata circiter

6-flora, subdensa; bracteae lanceolatae vel ovato-lanceolatae, acuminatae, subnaviculares, 0.8–1.0 cm. longae, usque ad 4 mm. latae, albo-ciliatae. *Calyx* albo-hirsutus, pilis longis brevibusque instructus; tubus 8 mm. longus; dentes subulati, 6 mm. longi, purpurascens, inferne longe pilosi, apicem versus fere glabri. *Vexillum* 1.8 cm. longum, lamina oblonga basi obtuse auriculato-angulata 1.2 cm. longa; alae 1.5 cm. longae; carina 1.4 cm. longa. *Stylus* 7–8 mm. longus, inferne adpresse pubescens, superne glaber. *Legumen* compresso-ellipsoideum, 5–6 mm. altum, dense adpresse pubescens, monospermum.

N. Persia: Tabriz district, summit of Mihsou Dag, grows in large dense cushions 2–3 m. in diameter, 30.8.28, flowers purple, *Gilliat-Smith* 2484.

The species described above has been difficult to place satisfactorily in any of Boissier's sections of the subseries *Tragacantha*. As Boissier states [Flor. Or. ii. 213 (1872)] he has altered the essential diagnostic characters used by Bunge [Gen. Astrag. (1868)] while retaining his names. It has resulted from this that species placed in different sections by Bunge are brought together by Boissier and the characters stressed by the authors are not exactly the same.

The most important characters of our plant, on the basis of Boissier's classification, are: the fairly large bracts, the absence of bracteoles, the calyx tube hirsute to the base, the claw of the vexillum narrowed to the base (stenonychinum), and the petals very shortly adnate to the base of the filament sheath. In all these characters except the last there is complete agreement with the diagnosis (as modified by Boissier) of the section *Rhacophorus*.

In general appearance *A. mishouensis* resembles *A. aureus* Willd. but this species has a broad claw to the vexillum (platonychinum)—or rather the claw is scarcely distinguishable from the lamina.

A. mollis *M. Bieb.* Flor. Taur.-Cauc. iii 495 (1819).

In garden in hills south of Tabriz, 18.5.28, flowers greenish-yellow. No. 2283.

Distrib. Armenia, Caucasus, N. Persia.

This may represent a new variety of the species since it has leaves much less hirsute than those of other specimens at Kew.

A. odoratus *Lam.* Encycl. i. 311 (1783).

Zindjanab, end of June, 1929, No. 2532.

Distrib. Asia Minor, Armenia, Caucasus, N. Persia.

A. paradoxus *Bunge* Astrag. i. 64 (1868); ii. 108 (1869).

Hills south of Tabriz, 14.4.26, flowers silvery-white, issuing from under the sand, No. 1371; 10.4.27, No. 1776.

Distrib. Azerbaidjan, Armenia.

A. (Sect. *Aulacolobus*) phaulanthus *Turrill* sp. nov.; ab *A. striatello* Pall. floribus multo minoribus, calyce haud vel vix nigro-hirtis dentibus haud lanceolatis distinguitur.

Herba annua, parcissime hispida, caulibus suberectis vel decumbentibus 1.5 dm. longis. *Folia* 4–6 cm. longa, imparipinnata, foliolis 6–8-jugis elliptico-oblongis apice retusis basi cuneatis 6–7 mm. longis 3 mm. latis petiolulis 0.5 mm. longis suffultis; stipulae, ovato-triangulares, acuminatae, 3–5 mm. longae, membranaceae, ciliatae. *Racemus* 2–3-florus, pedunculo rhachideque 3–4 cm. longo gracile foliis brevior vel aequilongo; bracteae triangulare-lanceolatae, acuminatae, 3 mm. longae, membranaceae; flores 5–6 mm. longi. *Calyx* 3.5 mm. longus, pilis albis nonnullis nigris adpressis instructus, dentibus aciculare-subulatis usque ad 2 mm. longis (in fructu leviter augmentis). *Petala* conspicue longitudinaliter violacea, purpureo-striata. *Legumen* arcuatum, acutum, 2 cm. longum, 5 mm. latum, glaberrimum, sutura ventrali carinata, dorsali bicarinata.

N. Persia: Tabriz, garden weed, 12.6.28, *Gilliat-Smith* 2271.

The section *Aulacolobus* in which our plant is to be placed, was formed by Bunge [Gen. Astrag. 18 (1868)] for three species: *A. aulacolobus* Boiss., *A. striatellus* M. Bieb., and *A. pictus* Boiss. The last was reduced by Boissier [Flor. Or. ii. 237 (1872)] to *A. conduplicatus* Boiss. From all three species *A. phaulanthus* is distinguished by its much smaller flowers. Tabriz is also considerably to the east or south of the distributional areas of the hitherto known species of this section of the genus.

A. platyraphis *Fisch.* ex Bunge Astrag. i. 37 (1868); ii. 48 (1869).

Near Tabriz, 4.26, flowers greenish-yellow, purple tipped, No. 1440; hills south of Tabriz, 4.5.29, No. 2499.

Distrib. Syria, Cappadocia, Iraq.

A. podocarpus *C. A. Mey.* Verz. Pfl. Cauc. 142 (1831).

Yam, 6.28, No. 2411.

Distrib. Armenia, N. Persia.

A. punctatus *Bunge* Astrag. i. 120 (1868), ii. 209 (1869).

Hills north of Tabriz, 15.5.28, flowers purple, No. 2291.

Distrib. Azerbaidjan.

The pedicels are slightly longer than in the type sheet at Kew.

A. robustus *Bunge* Astrag. i. 122 (1868); ii. 212 (1869).

Urmia district, 5.26, Nos. 1522, 1604.

Distrib. Azerbaidjan.

The identification, owing to the incomplete material available, is given with some hesitation. No. 1522 is in flower and has densely hairy ovaries; No. 1604 has quite ripe glabrous or almost glabrous fruits.

A. Rollovii *Grossheim* in Beih. Bot. Centrbl. xlv. 2. 223 (1927).

Hills south of Tabriz, 5.5.26, flowers purple and dull yellow, No. 1479; 12.5.27, No. 1902; 6.28, No. 2272; 1.6.28, No. 2288.

Endemic near Tabriz.

A. (Sect. *Hymenostegis*) *sirensis* Turrill sp. nov.; ab *A. uraniolimneo* Boiss. foliolis obovato-ellipticis, capitulis longe pedunculatis (e descriptione) distinguitur.

Planta suffruticosa, caespitoso-erinea, caulibus 1.0–1.2 dm. altis in parte inferiore spinis tenuibus recurvo-patentibus vel valde recurvis dense instructis. *Folia* 2 cm. longa, densissime albo-hirsuta, foliolis circiter 4-jugis obovato-ellipticis mucronatis 3–5 mm. longis 2–2.5 mm. latis; stipulae lanceolatae, 1.3 cm. longae, hyalinae, glabrae, margine longe ciliata excepta, longitudinaliter striato-nervosae, petiolo adnatae, parte libera 6–7 mm. longa. *Capitula* densa, circiter 12–15-flora, sphaeroidea, 2–2.5 cm. diametro, pedunculo 3–5.5 cm. longo patule villosulo suffulta e caespite valde exserta; bractae oblongae, acuminatae, 7–9 mm. longae, 3–3.5 mm. latae, glabrae sed margine ciliata apicem versus longe piloso-plumosae. *Calyx* 1.5 cm. longus, longe albo-pilosus, dentibus 5 mm. longis aciculari-subulatis. *Corolla* purpurea; vexillum 1.7 cm. longum, lamina oblonga 1 cm. longa apice truncata vel leviter retusa basi obtuse auriculata; alae 1.5 cm. longae, unguibus 8 mm. longis, basi filamentorum vaginae brevissime adnatis; carina 1.2 cm. longa. *Ovarium* cylindricum, densissime villosum, 4 mm. longum, circiter 9-ovulatum; stylus 8 mm. longus, compressus, stigmatibus minute ovoideo-globulare.

N. Persia: Mt. Sir, Urmia district, 27.5.29, Gilliat-Smith 2281.

The species here described forms a pretty plant with its white hairy leaves and peduncled heads of purple flowers. That it is correctly placed in the section *Hymenostegis* cannot be doubted, but in the absence of specimens of several species of the section its exact relationships are not so certain. The descriptions of *Astragalus paralurges* Bunge Gen. Astrag. III (1868) and Boiss. Flor. Or. ii. 379 (1872) agree in many important points with that here published but the vexillum of this species is said to be somewhat acute and the capitula lax. On the whole the closest agreement has been found with the description of *A. uraniolimneus* Boiss. (l.c. 380), a species from Russian Armenia "monte Alages et ad lacum Gocktschai (Scidl)." The much shorter peduncles, of equal length with the capitula, the different shaped leaflets, and obtuse bracts serve to distinguish Boissier's species from ours.

A. stenostachys Beck in Denkschr. Math.-Naturw. Cl. K. Akad. Wiss. li. 333 (1886).

Near Tabriz, 18.5.28, flowers purple, No. 2284.

Distrib. N. Persia.

A. tabrisianus Buhse e Fischer in Bull. Soc. Imp. Nat. Mosc. xxvi. 445 (1853); Boiss. et Buhse Aufz. 65 (1860).

Tabriz, hills to the south, 29.6.26, flowers purple, No. 1744; 6-7.27, No. 1907; Yam, 6.28, No. 2410.

Distrib. N. Persia.

The plants enumerated above have been identified solely by comparison with the descriptions quoted, there being no specimens so

named at Kew. "Hills to the south of Tabriz" indicate the northern prolongations of the Sahand range, whence Buhse obtained his original material. Fischer apparently is responsible for adding the material "ad Dshehan nameh B. Bode" to the species and so enlarging the original description. His comments show that he accepted a certain polymorphism within the species, for he says "Differentiae quas reperi non sufficiunt ad constituendum species separatas" and lists the differences shown by Buhse's plant presumably from the material above quoted. In the description the peduncles are said to be "breves aut parum longiores" and to be from "1 ad 3½ pollices longi." In our material, No. 1744 has peduncles 1–1.5 cm. long, in No. 1907 they are 0.5–2 cm. long, and in No. 2410 up to 10 cm. long. Other small differences variously combined and of varying degrees can also be noted in the specimens but there seems no sufficient reason with the material available for making more than one species.

A. teheranicus Boiss. et Hohen. in Boiss. Diagn. Ser. I. ix. 44 (1849).

Hills south of Tabriz, 5.5.26, flowers vary from pink to ruby-red and purple, No. 1480; 6.7.26, No. 1669; 29.6.26, No. 1742; 12.5.27, Nos. 1899, 1900.

Distrib. N. Persia.

A. tribuloides Del. Flor. Aegypt. Illustr. 70 (title-page 1812); Boiss. Flor. Or. ii. 224 (1872).

Hills south of Tabriz, 5.6.29, flowers minute white or mauve, No. 2500.

Distrib. Canaries, N. Afr., Egypt, Syria, Palestine east to N.W. India.

A. variistipula Turrill in Kew. Bull. 1929, 227.

Plains south of Tabriz, 5.27 (flowers pink or purple), 6.27 (fruits), No. 1901; hills south of Tabriz, 12.6.28, No. 2274.

Endemic.

A. xylobasis Freyn in Bull. Herb. Boiss. vi. 984 (1898). *A. xylorrhizus* Freyn et Sint. in Oesterr. Bot. Zeitschr. xlii. 46 (189) non Bunge.

Mt. Sir, Urmia district, 27.5.28, flowers purple, No. 2287.

Distrib. Paphlagonia, Armenia.

The specimens approach the var. *angustus* Fréyn et Sint. in Oesterr. Bot. Zeitschr. xlv. 28 (1894).

Cicer arietinum L. Sp. Pl. 738 (1753).

Yam, 8.27, flowers white or pink, No. 1973.

Distrib. Cultivated throughout the Medit. Region and frequently occurring as an escape.

Coronilla varia L. Sp. Pl. 743 (1753).

Hills north of Tabriz, 25.6.26, flowers white, pink, or red with black-edged keel, No. 1716.

Distrib. Cent. Eur. and Medit. Region.

Glycyrrhiza glabra L. Sp. Pl. 742 (1753).

Near Tabriz (in fruit), 17.7.27, No. 1984; garden south-east of Tabriz, 12.6.28, No. 2270.

Distrib. Medit. Region and Cent. Asia.

Lathyrus Cicera L. Sp. Pl. 730 (1753).

In gardens south-east of Tabriz, 29.4.26, No. 1437.

Distrib. Cent. Eur. and Medit. Region.

Lotus corniculatus L. Sp. Pl. 775 (1753).

Stream under Mishou Dagh, 8.29, No. 2610.

Distrib. E.N. Temp. Region and now widely introduced into other areas.

Medicago lupulina L. Sp. Pl. 779 (1753).

In garden, near Tabriz, 6.7.26, No. 1657.

Distrib. E.N. Temp. Region.

Melilotus officinalis Lam. Flor. Fr. ii. 594 (1778).

Garden weed, near Tabriz, 5.26, No. 1620.

Distrib. E.N. Temp. Region.

Onobrychis Buhseana Bunge ex Boiss. Flor. Or. ii. 541 (1872).

Near Tabriz, in flower and fruit, 6.7.26, flowers cream-coloured or pink with delicate veins, No. 1668; 29.6.26, No. 1730; 6.27 (very young and not yet in flower), No. 1895; hills to the south of Tabriz, 5.7.27, No. 1898.

Distrib. Tabriz district only.

The interesting series of specimens enumerated vary somewhat in the colour and size of the flowers. Širjaev [Publ. Fac. Sci. Univ. Masaryk 76, 37 (1926)] has already noticed a range in flower size. The identification has been made from description only since Buhse's specimens have not been available for comparison.

O. cornuta Desv. Journ. Bot. iii. 81 (1814).

Urmia district, 20.5.26, flowers very showy, pink of various shades, No. 1525; hills north of Tabriz, 15.5.27, No. 1779; Sir, Urmia district, 27.5.28, No. 2279. Grows in large dense cushions, 2-3 m. in diameter.

Distrib. Asia Minor to Syria, Caucasus, and Baluchistan.

O. subacaulis Boiss. Flor. Or. ii. 544 (1872)?

Near Khoi, 21.5.28, flowers pink or red, No. 2285.

Distrib. Azerbaidjan.

Fruit is needed to confirm the identification.

O. viciaefolia Scop. Flor. Carniol. ed. 2, ii. 76 (1727), var. **persica** Širjaev Publ. Fac. Sci. Univ. Masaryk 56, 181 (1925).

Urmia district, 5.26, flowers pink, No. 1523. Also cultivated at Kew as K. 427 from seed sent from near Tabriz.

Distrib. (of species) Eur., Orient.

(of var.) Persia.

Ononis leiosperma Boiss. Flor. Or. ii. 57 (1872).

Yam, 8.28, No. 2486. Common, flowers pink, July to September.

Distrib. Syria, Persia.

Sophora alopecuroides L. Sp. Pl. 373 (1753).

Urmia district, 5.26, flowers dirty, creamy white in dense thick spikes, No. 1518; near Tabriz, 25.6.26, No. 1714; near Tabriz, 6.27, No. 1904.

Distrib. E. Balk. Penins., Asia Minor eastwards to Persia, Afghanistan, Turkestan, and Cent. Asia.

Trifolium hybridum L. Sp. Pl. 766 (1753).

Near Tabriz, 8.27, No. 1974.

Distrib. Cent. Eur. and Medit. Region.

T. pratense L. Sp. Pl. 768 (1753).

Weed in garden, near Tabriz, 6.7.26, flowers pink-purple, No. 1663.

Distrib. E.N. Temp. Region.

T. repens L. Sp. Pl. 767 (1753).

Weed in garden, near Tabriz, 6.7.26, No. 1662.

Distrib. N. Temp. Region.

Trigonella arcuata C. A. Mey. Verz. Pfl. Cauc. 136 (1831). (*T. cancellata* Desv. var. *arcuata* Širjaev ms. 1929).

Hills to the south of Tabriz, 5.27, flowers yellow, No. 1906a.

Distrib. Armenia, N. Persia.

T. Noeana Boiss. Diagn. Ser. II. ii. 11 (1856) forma **integrata** Širjaev (ms. 1929).

Near Tabriz, 5.26, flowers yellow, No. 1646; 6.7.26, No. 1670; hills to the South of Tabriz, 5.27, No. 1906b; Tabriz, garden weed, 6.28, Nos. 2295, 2296; cultivated at Kew from Tabriz seed, 14.8.28.

Distrib. Cappadocia, Armenia, Iraq, N. Persia.

Vicia Ervilia Willd. Sp. Pl. iii. 1103 (1803).

Near Tabriz, 6.27, No. 1893; 8.27 (in fruit), No. 2128.

Distrib. Cent. Eur. and Medit. Region.

V. hyrcanica Fisch. et Mey. Ind. Sem. Hort. Petrop. ii. 53 (1836).

Near Tabriz, 5.26, flowers purple, No. 1644.

Distrib. Transcaucasia, Armenia to Persia and Afghanistan.

V. persica Boiss. Diagn. Ser. I. ii. 103 (1843) var. **stenophylla** Boiss. Flor. Or. ii. 583 (1872).

Above Zindjanab, Sahand Range, 25-27.6.29, flowers very showy, mauve to purple, No. 2517.

Distrib. (of species and var.) Armenia, N. Persia.

V. tenuifolia Roth Tent. Flor. Germ. i. 309 (1788), verging towards the var. **stenophylla** Boiss. Flor. Or. ii. 586 (1872).

Between Yam and Shor Dara (Dere), 24.6.28, flowers pink, No. 2408. Flowers in June and part of July.

Distrib. (of species) E.N. Temp. Region.

ROSACEAE.

Alchemilla acutiloba Stev. in Bull. Soc. Imp. Nat. Mosc. xxix. 173 (1856).

Yam, 21.8.27, flowers greenish yellow, No. 2087; under Mishou Dag, 9.9.28, No. 2482; brook under Mishou Dag, 5.8.29, No. 2584.

Distrib. Balkan Peninsula, Asia Minor, Caucasus, Iraq, N. Persia.

Amygdalus communis L. Sp. Pl. 473 (1753).

Near Tabriz, 4.26, No. 1393.

Distrib. Syria, east to N. Persia, and introduced into many countries.

Cotoneaster nummularia Fisch. et Mey. Ind. Sem. Hort. Petrop. ii. 34 (1836).

Mishou Dag, also Dik Dash at Yam, 8.28 (in fruit), No. 2472.

Distrib. E. Asia Minor, Syria, Iraq, Armenia, Persia, Caucasus, N. Africa, N.E. India, Cent. Asia.

Potentilla hirta L. Sp. Pl. 497 (1753) var. **pedata** Koch Syn. ed. 2, 237 (1843).

Mishou Dag and Dik Dash, 8.9.29, flowers yellow, No. 2624.

Distrib. (of species and var.) Eur. and Medit Region.

P. reptans L. Sp. Pl. 499 (1753).

Sahand and Yam, 5.6.29, flowers yellow, No. 2551.

Distrib. E.N. Temp. Region.

Prunus Armeniaca L. Sp. Pl. 474 (1753). *Armeniaca vulgaris* Lam.

Near Tabriz, 4.26, No. 1392.

Distrib. Caucasus, Transcaucasus.

P. divaricata Ledeb. Ind. Hort. Dorp. Suppl. 6 (1824); Boiss. Flor. Or. ii. 651 (1872).

Near Tabriz, 25.4.26, Nos. 1391, 1399. Turki "eltche," Persian "alutche."

Distrib. Balkan Peninsula east to N. Persia.

P. incana Stev. in Mem. Soc. Nat. Mosc. iii. 263 (1812). *Cerasus incana* Boiss. Flor. Or. ii. 647 (1872).

Hills north of Tabriz, 24.4.29, No. 2556.

Distrib. Asia Minor, Iraq, Armenia, Caucasus, N. Persia. Cent. Asia.

Prunus sp.

Near Tabriz, 25.4.26, No. 1400.

A flowering branch only, with hairy pedicels and sepals.

Poterium Sanguisorba L. Sp. Pl. 994 (1753).

Near Tabriz, 5.26, No. 1528; Yam, 22.5.27, No. 2071.

Distrib. Eur., Medit. Region, Cent. Asia.

Rosa canina L. Sp. Pl. 491 (1753) sensu Boiss. Flor. Or. ii. 685 (1872).

Wild garden in hills south of Tabriz, 5.29, No. 2563.

Distrib. Eur., Medit. Region, N. Asia.

R. canina L. var. **collina** Boiss. l.c.

Dik Dash, Yam, 21.8.27, No. 2093.

Distrib. Eur., Medit. Region, Cent. Asia.

R. foetida Herrmann Dissert. Rosa 18 (1762).

Urmia, 5.26, flowers yellow, No. 1570.

Distrib. Asia Minor, Syria, Armenia, Persia, Afghanistan.

R. foetida Herrmann var. **bicolor** Willmott. The Genus Rosa ii. 269 (1911).

West of Urmia, 5.26, flowers yellow and copper coloured, No. 1574.

Distrib. Here and there with the type variety.

R. glutinosa S. et S. Prodr. Flor. Gr. i. 348 (1806); Flor. Gr. t. 482 (1825); sensu Boiss. Flor. Or. ii. 679 (1872).

Mishou Dag, in fruit, 7.8.25, No. 2003 (fruit subglobular, hispid, appears to be fairly typical); Mishou Dag, in fruit, 30.8.28, No. 2485 (fruit elongated, glabrous); below Zindjanab, in flower only, 25-27.6.29, No. 2639 (young receptacles pubescent but not hispid, leaflets larger than usual; in the absence of fruits the identification is very tentative).

Distrib. (of species s. l.) Crete, Greece, Epirus, Albania, Macedonia, Dalmatia, Asia Minor, Syria, Armenia, N. Persia, Transcaspia.

The difficulties surrounding *R. glutinosa* S. et S. have been often commented upon by rhodologists who have been very evidently in disagreement with regard to its limitation and subdivision. Reference may be made to Christ in Boissier Flor. Or. Suppl. 222 (1888); Crépin in Bull. Soc. Bot. Belg. xxxi. ii. 49 seq. (1892); and Rolfe in Kew Bull. 1918, 153.

SAXIFRAGACEAE.

Parnassia palustris L. Sp. Pl. 273 (1753).

Yam, under Mishou Dag, very plentiful in wet grass fields, 21.8.27, No. 2078. Flowers in latter half of August and Sept., always in the mountains.

Distrib. N. Temp. Region.

Ribes aureum Pursh. Flor. Amer. Septentr. 164 (1814).
Tabriz, cult. in garden, 4.26, No. 1385; 26.4.26, No. 1415.
Distrib. N. Amer.

CRASSULACEAE.

Cotyledon libanotica Labill. Ic. Pl. Syr. Dec. iii. 3, t. 1 (1809) var. **glaber** Boiss. (sub *Umbilico*, Flor. Or. ii. 772: 1872).
Mishou Dag, 19.7.28, flowers white, No. 2438; 5.8.29, No. 2592.
Distrib. (of species) Syria, Palestine, Kurdistan, E. Asia Minor, N. Persia.
(of var.) Syria, E. Asia Minor, N. Persia.

Sedum album L. Sp. Pl. 432 (1753).
Mishou Dag, half-way up the mountain, in cracks in rocks, white flowers, 19.7.28, No. 2361.
Distrib. E.N. Temp. Region.

S. sempervivoides Fisch. ex M. Bieb. Flor. Taur.-Cauc. iii. 313 (1819).
Near Tabriz, 21.8.27, No. 2116; high up on Mishou Dag, whole plant deep red, 19.7.28, No. 2360.
Distrib. Asia Minor, Armenia, Transcaucasia.

LYTHRACEAE.

Lythrum Salicaria L. Sp. Pl. 446 (1753) var. **tomentosum** Boiss. Flor. Or. ii. 732 (1872).
Yam, marshy fields, 8.27, No. 1971.
Distrib. (of species) now almost cosmopolitan.
(of var.) especially from the Balkan Peninsula eastwards to N. Persia and Afghanistan.

ONAGRACEAE.

Epilobium Dodonaei Vill. Hist. Pl. Dauph. 507 (1789).
Stony plain, Shor Dara (Dere), near Yam, 24.6.28, flowers large pink, No. 2338; rocky stony places, 7.28, No. 2392.
Distrib. Cent. and S. Eur. east to Armenia, Caucasus, and N. Persia.

E. hirsutum L. Sp. Pl. 347 (1753) var. **tomentosum** Boiss. Flor. Or. ii. 746 (1872).
Yam, 8.27, flowers deep pink, No. 1970; cultivated at Kew from Yam seeds, 1929.
Distrib. (of species) E.N. Temp. Region, Africa.
(of var.) here and there with the species and especially common in the Medit. Region.

E. nervosum Boiss. et Buhse Aufz. 88 (1860).
Mishou Dag, rocks and crags, 2.9.29, flowers pink, No. 2634.
Distrib. Russia, Asia Minor east to Persia and Cent. Asia.

AIZOACEAE (FICOIDACEAE).

Mesembryanthemum polyanthum Haw. Syn. Pl. Succ. 270 (1812).
Cultivated in pots, Tabriz, 5-6.29, flowers bright pink-purple, No. 2574.
Distrib. S. Africa.

UMBELLIFERAE.

Anethum graveolens L. Sp. Pl. 263 (1753), var. **submarginatum** Lej. et Court. ex Thellung in Hegi Flor. von Mittel-Europa V. 2. 1293. (1925).
Cultivated at Tabriz, in a garden as a pot-herb, 7.26, flowers yellow, No. 1769; 7.27, No. 1983; 7.28, No. 2417; cultivated at Kew from Tabriz seeds, 14.8.28. In Persian "Shuvit."
Distrib. Widely cultivated, especially in the Orient.

Anthriscus nemorosa Spreng. Umb. Prod. 27 (1813).
Zindjanab, 25-27.6.29, No. 2640.
Distrib. Cent. and S. Eur. east to Caucasus and N. Persia, and Cent. Asia.

Astrodaucus orientalis Drude in Engl. und Prantl Pflanzenfam. iii. 8, 157 (1897). *Daucus pulcherrimus* Koch ex DC. Prodr. iv. 210 (1830).
Near Tabriz, 9.25, flowers white, inflorescence handsome, No. 1285; 5-6.26, No. 1641; 6.7.26, No. 1653; 26.5.27, No. 2106.
Distrib. S. Russia, E. Asia Minor, Armenia, Syria, Persia.

Bupleurum exaltatum M. Bieb. Tabl. Prov. Casp. 113 (1798) sec. Wolff in Engler, Pflanzenr. iv. 228, 134 (1910) var. **linearifolium** Boiss. in Ann. Sci. Nat. 150 (1844).
Dik Dash, Yam, 21.8.27, flowers yellow, No. 2105.
Distrib. (of species) Cent. and S. Eur. east to Afghanistan and Cent. Asia.

(of var.) Asia Minor, Syria, Iraq, N. Persia, Afghanistan, Turkestan.

B. rotundifolium L. Sp. Pl. 236 (1753).
Near Tabriz, 21.7.26, No. 1767; cultivated at Kew from Tabriz seed as K.418. Flowers from the end of May.
Distrib. Cent. and S.E. Eur. eastwards to Transcaucasia and N. Persia.

Carum cylindricum Boiss. et Hohen. Diagn. Ser. I. x. 23 (1849).
Near Tabriz, garden weed, 5.26, flowers white, No. 1481; 6.7.26, No. 1655; 1.5.27, Nos. 1888, 1889.
Distrib. Transcaucasia, Persia, Baluchistan.

Caucalis daucoides L. Sp. Pl. 241 (1753).
Hills south of Tabriz, 5.6.27, flowers pink-white, No. 1887, Yam, in a ploughed field, 21.8.27, No. 2090.
Distrib. Cent. Eur. and Medit. Region.

Chaerophyllum macrospermum Fisch. et Mey. ex Hohen. in Bull. Soc. Nat. Mosc. 327 (1838).

Mishou Dag, end of August 1929, Nos. 2616, 2627; 5.8.29, No. 2600 (variety or form with longer styles).

Distrib. Armenia, N. Persia.

Coriandrum sativum L. Sp. Pl. 256 (1753).

Near Tabriz, 21.7.26, flowers white, No. 1768; 7.27, No. 1978. Turki "Gashnish." Persian "Kashniz." The plant is used in salads.

Distrib. Medit. Region, Africa.

Cuminum Cyminum L. Sp. Pl. 254 (1753).

Cultivated at Tabriz from seeds obtained from a bazaar, flowers 5.28, fruits 6.28, No. 2304. Turki "Göi-zira" = green weed. The plant is used as a pot-herb.

Distrib. Widely cultivated in the East.

Daucus Carota L. Sp. Pl. 242 (1753) s.l.

Tabriz, cultivated, 7.27, No. 1981; in gardens east of Tabriz, 7.27, No. 2151; near Tabriz, 7.27, No. 1982.

Distrib. E.N. Temp. Region.

Echinophora trichophylla Smith in Rees Cycl. xii. (1819).

Near Tabriz, 27.6.27, No. 1976; 6.27, No. 2043. Flowers white, whole plant aromatic.

Distrib. Armenia, Azerbaidjan.

Eryngium caeruleum M. Bieb. Flor. Taur.-Cauc. i. 200 (1808).

Yam, 7.8.27, No. 2012. The whole plant varies in colour from grey to pale or dark blue.

Distrib. Transcaucasus, N. Persia, Khorassan, Turkestan, Afghanistan.

Falcaria vulgaris Bernh. Syst. Verz. Erf. 176 (1800).

F. Rivinii Host Flor. Austr. i. 381 (1827).

Yam, 8.27, flowers white, No. 1980; 21.8.27, No. 2107.

Distrib. Cent. Eur., Medit. Region, Cent. Asia.

Ferula ovina Boiss. Flor. Or. ii. 986 (1872).

West of Lake Urmia, flowers yellow, 5.26, No. 1610.

Distrib. Persia, Baluchistan.

Foeniculum vulgare Mill. Gard. Dict. ed. viii (1768). subsp. **capillaceum** Holmboe var. **dulce** Thellung in Hegi Illustr. Flor. von Mittel-Europa V. 2. 1287 (1925). *F. dulce* Mill. l.c.

Cultivated in garden at Tabriz as a pot-herb, 7.28, flowers yellow, No. 2416 Turki "Raziane," also known locally as "Dadli boyana." No. 1770, near Tabriz, 7.26, may belong to the same variety but the specimen is too young to determine with certainty.

Distrib. (of species) perhaps wild in Cent. and W. Eur. and Medit. Region.

(of var.) widely cultivated, especially in the Medit. Region.

Hippomarathrum crispum Koch in Nov. Act. Nat. Cur. xii. 136 (1824) var. **longilobum** Boiss. Flor. Or. ii. 932 (1872).

Yam, stony hills around Dik Dash, 28.8.27, No. 2088.

Distrib. (of species) Caucasus, Armenia, N. Persia.

(of var.) Azerbaidjan, Seidkhodji.

Lisaea heterocarpa Boiss. Flor. Or. ii. 1088 (1872).

Near Tabriz, cornfield weed 6.7.27, No. 1649; 7.27, No. 1886. Flowers May and July.

Distrib. Iraq, N. and Cent. Persia.

Malabaila Aucheri Boiss. in Ann. Sci. Nat. Ser. 3. i. 336 (1844).

Near Tabriz, 22.6.27, No. 1977; in gardens south-east of Tabriz, flowers yellow, 5.28, fruit 6.28, No. 2303; above Zindjanab, Sahand Range, 25-27.6.29, No. 2506.

Distrib. Iraq, N. and Cent. Persia.

Pimpinella Anisum L. Sp. Pl. 264 (1753).

Cultivated at Tabriz in a garden as a pot-herb, 7.28, flowers white, No. 2415. Locally known as "Antchibun," i.e. a corruption of Anisum.

Distrib. Exact place of origin unknown, now widely cultivated.

P. Tragium Vill. Prosp. 24 (1779); Hist. Pl. Dauph. ii. 605 (1787).

Yam. 12.7.28, flowers white, No. 2414.

Distrib. Cent. Eur. and Medit. Region.

Prangos uloptera DC. Prodr. iv. 239 (1830).

Mishou Dag, 12.7.28, No. 2418; near Tabriz, 7.29, No. 2571. The young shoots are pickled and called in Turki "Tchaschir."

Distrib. Iraq, Persia, Armenia.

Reutera aurea Boiss. Flor. Or. ii. 863 (1872).

Near Tabriz, 26.6.27, flowers golden yellow, No. 1975; also, probably, hills south of Tabriz, 27.6.28, No. 2413, but specimen very young.

Distrib. Armenia, N., Cent., and E. Persia.

Scandix iberica M. Bieb. Flor. Taur.-Cauc. i. 425 (1808); iii. 236 (1819).

Near Tabriz, garden weed, 26.4.26, flowers white, No. 1424; 5.26, No. 1482; 6.7.26, No. 1654; 25.4.27, No. 1885.

Distrib. Asia Minor, Syria, east to Armenia and N. Persia.

S. pinnatifida Vent. Hort. Cels. t. 14 (1800).

Hills south of Tabriz, 29.4.26, flowers white, No. 1432; near Tabriz, 5.26, No. 1612; 1.5.27, No. 1884.

Distrib. Medit. Region, east to Armenia and Persia.

Trachyspermum Ammi Sprague ex Turrill in Kew Bull. 1929, 228.

Tabriz, weed in garden, 7.8.27, No. 2104.

Distrib. Occurs as a weed and casual in the Medit. Region.

Turgenia latifolia Hoffm. Gen. Umbell. 59 (1814).

Near Tabriz, 22.5.27, flowers white or pink, No. 1650 ; 8.27, No. 1979 ; Yam, in a ploughed field, 21.8.27, No. 2089.
Distrib. E.N. Temp. Region.

Zozimia absinthifolia DC. Prodr. iv. 195 (1830).

Above Zindjanab, Sahand Range, 25-27.6.29, No. 2513 ; hills south of Tabriz, 7.29, No. 2530.
Distrib. Asia Minor, Cyprus, Syria, Arabia, Caucasus, Iraq, Persia, Turkestan, Baluchistan, Afghanistan.

Umbellifer.

Hills south of Tabriz, 5.29, flowers yellow, No. 2562. Material too incomplete for determination.

CAPRIFOLIACEAE.

Lonicera etrusca Santi Viagg. Mont. i. 113, t. 1 (1795).

Cult. in garden, near Tabriz, 6.7.26, No. 1684.
Distrib. Medit. Basin.

RUBIACEAE.

Asperula arvensis L. Sp. Pl. 103 (1753).

Near Tabriz, 5.26, No. 1613 ; blue flowers, 6.7.26, No. 1679 ; white flowers, 6.7.26, No. 1680 ; cultivated at Kew from Tabriz seed as K. 450.
Distrib. Eur., Medit. Region.

A. bracteata Grossh. in Bieh. Bot. Centrbl. xlv. 239 (1927).

Hills to the north of Tabriz, 15.5.27, flowers yellow, No. 2039.
Distrib. Persia.

A. glomerata Griseb. Spic. Flor. Rumel. et Bithyn. ii. 166 (1844).

Near Tabriz, 6.28, No. 2451 (corollas slightly hispidulous) ; above Zindjanab, Sahand Range, 25-27.6.29, No. 2501 (corollas pubescent). Whole inflorescence a nondescript brownish-green.
Distrib. Asia Minor east to Afghanistan.

A. trichodes Gay in DC. Prodr. iv. 582 (1830).

Hills to the south of Tabriz, 4.6.27, flowers whitish pink, No. 1803 ; near Tabriz, 6.27, No. 1840.
Distrib. Armenia, Persia.

A. humifusa Bess. Cat. Hort. Crem. Suppl. iii. 4 (1811), sec. M. Bieb. Flor. Taur.-Cauc. iii. 105 (1819).

Red hills to the north of Tabriz, 25.6.26, flowers white, No. 1719 ; Yam, 8.27, No. 2025 ; Yam, 21.8.27, No. 2025 ; Yam, 8.27, No. 2113 ; stream under Mishou Dag, 8.29, No. 2613.
Distrib. S.E. Eur., Orient.

Callipeltis Cucullaria DC. Prodr. iv. 613 (1830).

Near Tabriz, 5.6.27, No. 1799. Flowers greenish-yellow, May and June.
Distrib. Medit. Region.

Crucianella chlorostachys Fisch. et Mey. Ind. Sem. Hort. Petrop. i. 25 (1835).

Yam, 8.28, flowers greenish-white, No. 2439.
Distrib. Caucasus, N. Persia.

C. exasperata Fisch. et Mey. Ind. Sem. Hort. Petrop. iv. 8 (1838).
C. hispidula Fisch. et Mey. Ind. Sem. Hort. Petrop. i. 25 (1835) non Decaisne.

Hills to the south of Tabriz, 5.6.27, flowers greenish-white, No. 1802.
Distrib. E. Asia Minor to N. Persia and a var. (?) in Syria.

C. gilanica Trin. in Mem. Acad. Petersb. vi. 493 (1818). See E. Malinowski in Bull. Soc. Bot. Genève 2 sér. ii. 16 (1910).

Hills south of Tabriz, 5.6.27, flowers greenish, No. 1839 ; hills south of Tabriz, 6.28, No. 2277 (var. vel forma floribus roseis) ; hills south of Tabriz, 6.28, No. 2278 ; Yam, 25.7.29, No. 2580.
Distrib. Armenia, Iraq, N.W. Persia.

Galium coronatum S. et S. Prodr. i. 90 (1806) et Flor. Graec. t. 125 (1813). **G. humifusum** Stapf in Denk. Math.-Naturw. Cl. K. Akad. Wiss. 1. 107 (1885) non M.B.

Urmia district, 5.26, No. 1536 ; Sir, 27.5.28, No. 2332 ; near Tabriz, 5.28, No. 2449.
Distrib. S. Balkan Peninsula east to N. Persia.

It is evident that this is a very polymorphic species if accepted in the sense of Boissier [Flor. Or. iii. 80 (1875)]. Moreover, on sheet No. 1536 there are two specimens, one with stem and leaves glabrous or nearly so and the other densely pubescent in all its parts.

G. leiophyllum Boiss. Diagn. Ser. I. iii. 36 (1843).

Above Zindjanab, Sahand Range, 25-27.6.29, No. 2526 ; Mishou Dag, 5.8.29, No. 2599 ; Dik Dash, 8.29, No. 2647.
Distrib. Armenia, Kurdistan, N. Persia.

G. nigricans Boiss. Diagn. Ser. I. iii. 48 (1843).

Hills to the south of Tabriz, 5.6.27, flowers russet-brown, No. 1804 ; near Tabriz, 6.28, No. 2450.
Distrib. Syria, Iraq, N. Persia.

G. spurium L. Sp. Pl. 106 (1753) var. **echinospermum Desp.** Flor. Sarthe 118 (1838). **G. spurium L.** var. **Vaillantii G. et G.** Flor. Fr. ii. 44 (1850).

Tabriz, garden weed, 4.5.27, flowers cream to greenish-yellow, Nos. 2040, 2040a ; cultivated at Kew from Tabriz seed as K. 667, 10.7.28.

Distrib. (of species) E.N. Temp. Region.
(of var.) here and there in the species area.

G. tricornis Stokes in With. Arr. Brit. Pl. ed. 2. i. 153 (1787).

Near Tabriz, in garden, 24.4.27, flowers white, No. 2041.
Distrib. Eur. and Medit. Region.

G. verum L. Sp. Pl. 107 (1753).

Yam, 8.27, flowers yellow, No. 2026; under Mishou Dag, 10.9.28, No. 2469; brook under Mishou Dag, 5.8.29, No. 2585.
Distrib. E.N. Temp. Region.

Rubia tinctorum L. Sp. Pl. 109 (1753).

Under the red hills north of Tabriz, 25.6.26, flowers yellow, No. 1717.
Distrib. Medit. Region.

VALERIANACEAE.

Valeriana officinalis L. Sp. Pl. 31 (1753)?

Mishou Dag, 19.7.28, flowers white, No. 2391.
Distrib. E. N. Temp. Region.

The material is insufficient to make the identification certain.

Valerianella diodon Boiss. Diagn. Ser. I. iii. 57 (1843)?

Near Tabriz, in plain among corn, 2.5.26, flowers white to pink, No. 1463.

Distrib. E. Asia Minor, Syria, Iraq, Persia, Armenia.
The specimen is very young.

V. leiocarpa O. Kuntze var. **orientalis** O. Kuntze in Act. Hort. Petrop. X. 195 (1887). *Dufresnea orientalis* Bunge in Boiss. Flor. Or. iii. 109 (1875).

Hills to the south of Tabriz, 5.6.27, flowers white to pink, No. 1910; 6.28, in fruit, No. 2315; 6.29, No. 2534.

Distrib. E. Asia Minor, Armenia to Afghanistan and Baluchistan. Grossheim, in Beih. Bot. Centrbl. xlv. 2. 240 (1927), apparently uses the name *Dufresnea orientalis* DC. for this species, but wrongly quotes *Valerianella orientalis* (Schlecht.) Boiss. as a synonym.

V. oxorrhyncha Fisch. et Mey. Ind. Sem. Hort. Petrop. iv. 51 (1839).

Near Tabriz, 6.27, flowers white to pink, No. 1911.
Distrib. Armenia, Persia.

V. Szovitsiana Fisch. et Mey. Ind. Sem. Hort. Petrop. iii. 48 (1837).

Near Tabriz, 5.27, flowers white to pink, No. 1909; 5.28, No. 2072a; hills south of Tabriz, 5.29, No. 2533.

Distrib. E. Asia Minor, Syria, Arabia, Armenia, Persia, Afghanistan.

Valerianella spp.

Hills south of Tabriz, 2.5.26, flowers white to pink, No. 1462; 5.28, No. 2314. Specimens too young for determination.

DIPSACACEAE.

Cephalaria pilosa Boiss. et Huet in Boiss. Diagn. Ser. II. ii. 122 (1856) forma **glabrescens** Boiss. et Buhse Aufz. 112 (1860).

Yam, 7.8.27, flowers milky-yellow, No. 2011.
Distrib. (of species) Armenia, N. Persia.

C. syriaca Schrad. Cat. Sem. Hort. Gotting. (1814). Roem et Schult. Syst. iii. 45 (1818).

Near Tabriz, 21.7.26, flowers white, mauve, or pink, No. 1733; Yam, plain under Mishou Dag, 25.7.29, No. 2576.
Distrib. Medit. Region.

Pterocephalus canus Coult. in DC. Prodr. iv. 653 (1830).

Urmia district, Band, 25.5.28, flowers cream-yellow, No. 2266.
Distrib. Persia, Kurdistan.

Scabiosa argentea L. Sp. Pl. 100 (1753).

Tabriz, 29.6.26, flowers white, No. 1748; 8.6.27, No. 1839a; Dik Dash, Yam, 26.8.27, No. 2098.
Distrib. S. Russia, Hungary, Medit. Region.

The above specimens belong to the *S. ucranica* L. var. *virgata* Grossh. in Trav. Jard. Bot. Tiflis II. i. 31 (1920), which was raised to a species in Grossh. et Schischkin Plantae orientales exsiccatae No. 123 (with the distribution given as "Transcaucasia, Persia") and kept as such in Beih. Bot. Centrbl. xlv. Heft. 2, 241 (1927). From an examination of the excellent material now at Kew I am of opinion that the variety is not worth specific rank and may be no more than a habitat form.

S. Olivieri Coult. Mem. Dipsac. 36, t. 2, f. 10 (1823).

Hills south of Tabriz, 6.26, flowers white or mauve, No. 1691; 6.26, No. 1747; 5-6.27, No. 1838.
Distrib. Arabia, Iraq, Armenia, Persia, Baluchistan, Afghanistan.

S. rotata M. Bieb. Flor. Taur.-Cauc. iii. 102 (1819).

Near Tabriz, 29.5.27, No. 1837. Flowers white, mauve, pinkish, or bluish, in May and fruits in June.
Distrib. Asia Minor, Armenia, Caucasus, N. Persia.

COMPOSITAE.

Acantholepis orientalis Lessing in Linnaea vi. 88. (1831).

Hills south of Tabriz, 27.6.28, No. 2419.
Distrib. Syria, Iraq, Armenia, Persia, Beludzhia.

Achillea cuneatiloba Boiss. et Buhse Aufz. 117, tab. X. f. 2 (1860). Dik Dash, Yam, 2.8.28, No. 2427. Flowers yellow.

Distrib. Azerbaidjan, Armenia.

The specimen agrees with the original description very well except as regards the indumentum. In this it agrees with the original figure.

A. filipendulina Lam. Dict. i. 27 (1783).

Yam, 7.8.27, flowers bright golden yellow, No. 2008; Yam, under Mishou Dag, 5.8.29, No. 2589.
Distrib. Kurdistan, Caucasus, Armenia, N. Persia.

A. micrantha M. Bieb. Flor. Taur.-Cauc. ii. 336 (1808).

Urmia district, 5.26, flowers showy yellow, No. 1568; near Tabriz, 5.26, No. 1618; 6.26, No. 1725; Yam, 8.27, No. 2006.

Distrib. Asia Minor east to Afghanistan, Cent. Asia.

A. Millefolium L. Sp. Pl. 899 (1753).

Near Tabriz, 5.26, flowers white or pink, No. 1619; 6.26, No. 1726; weed in garden, 6.28, No. 2313. Flowers from end of May to July.

Distrib. N.-Temp. Region.

A. sahandica Turill sp. nov.; ab *A. cuneatiloba* Boiss. et Buhse foliorum superiorum lacinulis latioribus, capitulis subsphaeroideis vel latissime ovoideis differt.

Herba perennis, 3 dm. alta, caulibus suberectis foliosis inferne angulatis superne longitudinaliter striato-sulcatis breviter denseque pubescentibus. *Folia* ambitu oblonga, pagina utraque plus minusve dense pubescentia vel tomentoso-pubescentia juniora densissime albo-tomentosa, usque ad 11.5 cm. longa, 1.5-2.5 cm. lata, rhachi 1.25 cm. lata integra, lacinulis linearibus vel obovato-linearibus apice obtusis vel rotundatis circiter 2 mm. longis et 1 mm. latis. *Corymbus* terminalis, compositus, sublaxus. *Capitula* subsphaeroidea vel latissime ovoidea, 5 mm. longa, 5 mm. diametro, pedunculo circiter 3 mm. longo suffulta, involucri phyllis hirsutis internis oblongis vel anguste oblongo-lanceolatis 3-5 mm. longis, externis brevioribus. *Flosculi* flavi; ligulati pauci, inconspicui, 3.75 mm. longi, subtrilobi; tubulosi 3.75 mm. longi.

Above Zindjanab, Sahand Range, 26-27.6.29, Gilliat-Smith 2504.

The species here described has a very distinct appearance from the segmentation of the leaves. Its comparison with *A. cuneatiloba* Boiss. et Buhse is made with some reservation. This latter species was described in Buhse's *Aufzaehlung* 117 (1860) where it is figured in tab. xii. The ligulate florets are described as "citrinis" in the original description. Boissier [Fl. Or. ii. 257 (1872)] describes the ligulate florets as "ochroleuci" and therefore places the species in the subsection *Millefoliatae*. The florets of our species were certainly a very distinct (even bright) yellow and on the basis of Boissier's key should be placed in the subsection *Filipendulinae*.

A. Santolina L. Sp. Pl. 896 (1753).

West of Lake Urmia, 5.26, flowers bright or dark yellow, Nos. 1597, 1598; near Tabriz, 5.28, No. 2428.

Distrib. N. Afr. and E. Medit. Region.

Very young specimens, No. 1369, from near Tabriz, 11.4.26, also probably belong to this species.

A. setacea W. et K. Pl. rar. Hung. i. 82, t. 80 (1802).

Yam, 8.27, flowers white, No. 2007; 24.6.28, No. 2317.

Distrib. Cent. Eur. and Medit. Region.

A. tenuifolia Lam. Dict. i. 26 (1783). *A. albicaulis* C. A. Mey. Verz. 76 (1831); Boiss. Flor. Or. iii. 270 (1875).

Near Tabriz, 6.26, flowers rather pale yellow, No. 1731; 11.6.27, No. 1938.

Distrib. Armenia, N. Persia.

A. vermicularis Trin. in Mem. Acad. Petersb. vi. 494, t. 13 (1818); Boiss. Flor. Or. iii. 266 (1875).

Valley of Livan, 9.25, flowers bright yellow, No. 1294; Band, 25.5.28, No. 2312.

Distrib. Armenia, N. Persia.

The material under No. 1294 is intermediate between the type and the var. *muschensis* sensu Boiss. Flor. Or. iii. 266 (1875).

Acroptilon Picris DC. Prodr. vi. 662 (1837).

Weed in gardens, Tabriz, 6.26, flowers pink or white, No. 1640; 7.26, Nos. 1699, 1718; 9.6.27, No. 1951. Flowers in June and July but is short flowered.

Distrib. Orient, Cent. Asia.

Anthemis candidissima Willd. ex Spreng. Syst. iii. 593 (1826).

Tabriz, roadsides and cornfields, 5.27, white ray, yellow disc, No. 1940; near Tabriz, 5.29, No. 2564.

Distrib. Armenia, Caucasus, N. Persia.

A. tinctoria L. Sp. Pl. 896 (1753).

Yam, 8.27, ray and disc yellow, No. 2049.

Distrib. E.N. Temp. Region.

Artemisia austriaca Jacq. Flor. Austr. i. 61 (1773).

Yam, 8.28, flowers pale yellow when fully out, No. 2454.

Distrib. E.N. Temp. Region.

A. monogyna W. et K. Pl. rar. Hung. i. 77, t. 75 (1802).

A. fragrans Willd. Sp. Pl. iii. 1835 (1804) var?

East of Tabriz, 29.10.27, No. 2182.

Distrib. E.N. Temp. Region.

A. Tournefortiana Reichb. Ic. Exot. i. 6, t. 5 (1827).

Garden and wayside weed, near Tabriz, 21.9.25, flowers greenish, No. 1305; Tabriz, garden weed, 9.27, No. 2154; cultivated at Kew from Tabriz seeds, 13.10.28.

Distrib. Armenia, Kurdistan, Persia, ? Afghanistan.

Carduus onopordioides Fisch. ex M. Bieb. Flor. Taur.-Cauc. iii. 552 (1819).

Hills south of Tabriz, 5.6.27, Nos. 1945, 1946 (with red and white florets respectively); near Tabriz, 6.29, No. 2567.

Distrib. Caucasus, N. Persia.

C. pycnocephalus L. Sp. Pl. ed. 2. 1151 (1763) var. *albidus* Boiss. Flor. Or. iii. 521 (1875).

Near Tabriz, a weed in garden, cultivated at Kew from Tabriz seed as 48/27, 29.6.28.

Distrib. Medit. Region.

***Carthamus oxyacantha* M. Bieb.** Casp. App. 198, No. 67 (1800) et Flor. Taur.-Cauc. ii. 283 (1808).

In gardens and cornfields and on hills south of Tabriz, 7.26, flowers bright yellow, No. 1720; 7.27, No. 1944. Cultivated at Kew from Tabriz seed, 14.8.28.

Distrib. Caucasus, Iraq, Persia, Afghanistan, Turkestan, Cent. Asia, N. India.

XLIV.—MISCELLANEOUS NOTES.

The Director has been elected a Corresponding Member of the "Sociedad Argentina de Ciencias Naturales."

Presentation of a Fern Herbarium.—The valuable herbarium of Siamese and Malayan ferns belonging to the late Dr. Eryl Smith has recently been presented to Kew by her husband, Dr. A. Malcolm Smith (*K.B.* 1930, p. 175). The greater part of the herbarium consists of Siamese specimens which were largely collected by Dr. Eryl Smith herself or by her native collectors, though a certain number of duplicates from Dr. Kerr's collection are also included. The remainder of the herbarium may be divided into two parts, namely, collections from Indo-China, British Malaya and the Dutch East Indies and a miscellaneous series collected by Miss Mary D. Glynn (Dr. Eryl Smith's sister), in Queensland, Tasmania, New Zealand and East Africa.

The collection is unique as far as Siamese ferns are concerned and is a most valuable addition to the fern collection at Kew. Few areas have been worked so well for Pteridophyta and few are represented by so many specimens in the Kew Herbarium. All the material is well collected and preserved, and the information on the labels is, in most cases, singularly complete.

The Flora of South Australia.*—Not many years after the "Flora Australiensis" was completed it was evident that in order to provide for our rapidly increasing knowledge of the flora of Australia a new handbook or handbooks would be necessary. These could conveniently take the form of regional "floras" dealing with the plants of a single State, the production of a new edition of *Flora Australiensis* being scarcely feasible. Handbooks of this kind, for both Queensland and New South Wales, were published many years ago, but they were not based on original work to anything like the same extent as is Mr. Black's South Australian Flora. Indeed, at

*Flora of South Australia. By J. M. Black (Orchidaceae by R. S. Rogers, M.D.). Issued by the British Science Guild (South Australian Branch) and printed at Adelaide by the Government Printer, North Terrace, 1922-1929; pp. 746, figs. 337. Price 20s., in parts as published.

the time Bentham wrote his great work, the plant life of South Australia was little known.

Mr. Black has now devoted many years study to the plants of the State and the publication of the present book is but the consummation of his life's endeavour. The earlier parts of the work have been reviewed previously (*K.B.* 1922, p. 254; 1924, p. 303). Parts 3 and 4, which complete the work, include the families in Engler & Gilg's Syllabus from Meliaceae to Compositae together with additions and emendations to the preceding parts. Of the book as a whole, those who have used it can speak with whole-hearted appreciation. The keys to the genera and species are clear, the descriptions adequate and the illustrations and general format excellent. With regard to the taxonomy there will naturally be differences of opinion here and there, but on the whole Mr. Black, working without any possibility of examining many of the type specimens, may be warmly congratulated. One would like to have seen collectors' numbers cited, bearing in mind the many species not included in the "Flora Australiensis," but it is impossible to include everything. Even as it is the book contains over 700 pages with descriptions of nearly 2500 species. Mr. Black's Flora will remain the standard work on South Australian plants for many years to come, and may also be used with advantage when studying the plants of adjacent parts of neighbouring States.

Principles of Tropical Agriculture.*—This work, the senior author of which is an acknowledged authority on present day agriculture in the Tropics, strikes a new note among text-books on tropical agriculture in that it is the general principles involved and methods adopted in agricultural operations in the Tropics around which discussion centres, without reference to particular crops. In the first part of the book, the various factors involved in crop production, according to the widely varying conditions to be found in the Tropics, are dealt with. A special feature is the careful treatment devoted to the all-important question of soils. The sections dealing with soil-related topics such as drainage, irrigation, manures and soil improvement generally are particularly informative and up-to-date. In the second part of the book, dealing with agricultural practice, one of the most interesting chapters is that devoted to the economics of crop production in the Tropics. Views as to the role of agricultural departments in the Tropics are expressed and what the authors consider should be the various functions of the ideal agricultural department are dealt with in detail.

The appearance of a book of this nature on tropical agriculture at the present time is particularly appropriate, owing to the interest which is now taken in developing the Tropics.

*Principles of Tropical Agriculture. H. A. Tempany and G. E. Mann. Published under the auspices of The Incorporated Society of Planters, Malaya, Kuala Lumpur, F.M.S. pp. xxiii 328, ill. 25. Price not stated.

Rock Garden and Alpine Plants.*—This work comes from the pen of Mr. Henry Correvon, the renowned pioneer of rock gardens and alpine plants and perhaps the greatest living authority on them. The book of about 560 pages comprises twelve chapters, and includes eight colour plates, some half-tone photographs and diagrams, a foreword by Mr. Leonard Barron the editor, an interesting preface by the Author, and a fair index.

There is a vast amount of information collected together in this small book, and the chapters on Hardy Cacti, Terrestrial Orchids, and the culture of Alpines in pans of Sphagnum are especially interesting and instructive: these, together with the story in the first chapter of the author's travels in England and America, and his struggles in the early days to popularise his beloved plants and to interest others in their culture, give one new enthusiasm with every reading. There are chapters on the Acclimatisation and Cultivation of Mountain Plants, Plants in the Mountains, Limestone-soil and Granitic-soil Plants, the Wall Garden, the Fernery, the Conservation of the Alpine Flora, and the Rockery, with excellent illustrations on the construction of the latter. The alphabetical list of plants, though only 384 pages in extent, contains a very large number of names and descriptions of plants suitable for the rock garden, wall garden, etc. This is attained by the author's clever use of abbreviations; although this list would not aid one in identifying a plant with certainty, it provides data which would be of much value were one faced with a plant of which little else than the country of origin was known. In some instances the author still retains the old generic names, for instance *Orobis*, which is now generally separated into *Lathyrus* and *Vicia*; *Phyllodoce empetrifolia*, *P. Breweri* and *P. caerulea* appear under *Menziesia*. *Weldenia candida* is described as having rose-coloured flowers: the plant at Kew has flowers of a pure waxy white; whilst one does not doubt that there are rose-coloured forms they are indeed treasures still to be sought. The colour plates are somewhat crude and not very life-like, but the half-tone photographs are very good, though chiefly of rock and wall gardens in America.

Although making the above criticism, one finished reading with a feeling of time well spent, for the volume is unique in being written by a collector, as well as a cultivator of plants who has struggled with them for over half a century. The wonderful nursery at Floraire is evidence of the success which has attended the author's efforts.

A. E.

*Rock Garden and Alpine Plants, by Henry Correvon. Macmillan & Co., Ltd., London, 1930, pp. xiv + 544, coloured plates and photographs. Price 25s.

BULLETIN OF MISCELLANEOUS INFORMATION No. 9 1930 ROYAL BOTANIC GARDENS, KEW

XLV.—NANDI COFFEE. A. A. BULLOCK.

Through various correspondence which has recently reached Kew attention has been drawn to a paper by Mr. W. J. Dowson,* where *Coffea nandiensis* is stated to be the only native coffee found in Kenya Colony. In view of the possible widespread use of this name in East Africa it is desirable to point out that this is only a manuscript name, synonymous with *C. eugenioides* Spencer Moore which antedates it, and to outline the history of the plant as far as known.

In 1919, Mr. W. J. Dowson, Government Mycologist at Nairobi, sent specimens of native coffee to Kew for determination, and it was decided that these represented a new species. The material, however, was not complete, and it was not possible to describe the plant until further specimens were received. In 1921, complete material was sent from Kenya, and Mr. Dowson suggested in his letter that the name *C. nandiensis*, from the locality in which it grew, would be appropriate. This was agreed to, and the name became current in Kenya. Owing, however, to pressure of work, the specimens were laid aside and the name was not published.

Still further specimens of this coffee were received in 1921, this time from Uganda, and these were determined as *Coffea eugenioides* S. Moore, a species published in 1907 in the Journal of Botany.†

Recently enquiries as to the place of publication of *C. nandiensis* and the name of the author, have necessitated the re-opening of the question and the examination of the correspondence, and after careful comparison of the type specimen of *C. eugenioides* at the British Museum (Natural History), it has been established beyond doubt that *C. nandiensis* and *C. eugenioides* Spencer Moore are conspecific. In addition, it is clear from the original correspondence that the erroneous decision of 1919 was due to *C. eugenioides* Spencer Moore having been overlooked.

In the original publication of *C. eugenioides* only a single specimen was cited. A list of the specimens now existing in the Kew Herbarium is given below.

Coffea eugenioides S. Moore in Journ. Bot. 45: 43 (1907).—*C. nandiensis* Dowson ex Hutch. ms. in Herb. Kew; Dowson in Ann. Appl. Biol. 8: 88, 89 (1921), nomen.

*W. J. Dowson in Ann. Appl. Biol. 8: 88 (1921), "Problems of Economic Biology in East Africa, 4, Coffee."
†Vol. 45, p. 43 (1907).

UGANDA PROTECTORATE. Forest near Mpanga, Toro, *Bagshawe* 1076 (type in Mus. Brit.); Mukono, *Dummer* 1244; Mulange, *Dummer* 4409; Kangaje Forest, *Maitland* 130A; Ibanda, Ruwenzori, *Maitland* 933; Bumoni, Mt. Elgon, *Snowden* 858. Cultivated specimens:—Government Plantation, Kampala, originally from Nandi, *Snowden* 730; Mukono, *Snowden* 729.

KENYA COLONY. Nandi and Kakumega Forests, *Battiscombe* 659; Nandi and Nyanza Basin Forests, *Moon* 569; Kakumega Forest, *Adams* 1176; Nasai Reserve, *Dowson* 718, 720. Cultivated specimens:—Government Farm, Nairobi (infected with *Hemileia vastatrix*), *Dowson* s.n.

This species is known locally as "Nandi" or "Mukono Coffee," from the district names where it is commonly found. It is, in its native habitat, a shade-loving plant, and is to be found on the banks of most rivers in the interior of Kenya and Uganda in dense shade, at altitudes varying from 4000-6000 ft. above sea level. Here it assumes a very straggling habit, and attains a height of 20 ft. Under cultural conditions, however, it becomes a low, compact shrub, almost conical in shape; the leaves become much smaller, and although the flowers appear to be unchanged, the fruits are smaller. It is unlikely that "Nandi" coffee will prove commercially valuable; apart from the small size of the "parchment," the beverage produced by this species is of inferior quality, and, in addition, the plant is very susceptible to the rust fungus *Hemileia vastatrix* B. & Br.

Improvement in every respect could no doubt be effected by selection, but while *C. robusta* and *C. arabica* can be relied upon to produce good coffee in East Africa, the claims of *C. eugenoides* for expensive experimental culture are slight.

XLVI.—ACACIA TORTILIS AND ACACIA SPIROCARPA. J. BURTT DAVY.

Acacia tortilis Hayne is one of the gum-yielding trees of N. Africa, ranging across the continent from Timbuktu to the Anglo-Egyptian Sudan. From *A. spirocarpa* it is usually recognisable by the narrower, glabrous pod, larger leaflets and glabrous branchlets, but material collected recently by Mr. G. Aylmer, Research Officer of the Anglo-Egyptian Sudan Forest Service, shows that intermediate forms occur which combine the characters of both species. Whether these are hybrids remains to be proved. It seems possible, on the other hand, that we may be dealing with an "aggregate" species which at its centre of dispersal (presumably the eastern Sudan or adjacent Abyssinia) shows a general tendency to variation in the indumentum and in pod measurements (in the same way that *A. arabica* tends to vary), and that the strain which has migrated westwards (*A. tortilis*) has retained the glabrous character, while the one which has travelled southwards (*A. spirocarpa*) has remained pubescent.

Whether we are dealing with two species which have hybridised, or with an "aggregate" species showing tendency to segregation in different geographical areas, it seems desirable from the forestry point of view to retain the two extreme forms as "species," and to name the intermediates as "varieties." This treatment facilitates the work of the Forest Officer.

Schweinfurth has, already, named a var. *b. minor* of *A. spirocarpa*. He named, also, a var. *a. major*, but by this he appears to have indicated the typical form, thus treating *A. spirocarpa* as an aggregate species composed of the two varieties, *major* and *minor*. To those who adhere to the binomial system of nomenclature, the name *A. spirocarpa* var. *major* Schweinf. thus becomes a synonym of typical *A. spirocarpa* Hochst.

In addition to *A. spirocarpa* var. *minor* there is a form, collected by Mr. Aylmer, which is intermediate in character, having more or less the indumentum of *A. spirocarpa*, and the narrow pod and longer leaflets of *A. tortilis*. This we propose to call *A. tortilis* var. *pubescens*.

After removing these intermediates into the rank of varieties, the two species *A. spirocarpa* and *A. tortilis* are left with the characters indicated in the following clavis:

Leaflets 1-3 mm. long, less than 1 mm. broad, 7-15 jugate; pinnae 4-10-jugate: rhachis of leaves distinctly hirsute with whitish hairs: pod pubescent, turgid, broad (7-9 mm. broad when mature), often minutely dotted with blackish or reddish glands: branchlets greyish tomentose, often somewhat light chestnut-brown and indistinctly and finely striate beneath the indumentum

1. *spirocarpa*

Leaflets 3-6 mm. long, often 1 mm. broad or more, 8-12-jugate; pinnae 2-6-jugate: pod glabrous, narrowly linear, flat, 5-7 mm. broad when mature: branchlets glabrous or glabrescent, often dark purplish brown, distinctly and more coarsely striate than in *A. spirocarpa* 2. *tortilis*

A. spirocarpa Hochst. in A. Rich. Tent. Fl. Abyss. 1: 239 (1847): *A. spirocarpa* var. *major* Schweinf. in Linnaea 35: 323, t. 5. Abyssinia, *Schimper* 502! 612! 658! (co-types) 1747! *Schweinfurth* 1085! 1691! *Beccari* 87! Eritrea, *Chiovenda* 165! Nubia: Otao, H. H. Johnston 3!

Anglo-Egyptian Sudan: between Atbara and the Red Sea, *Schweinfurth* 1973! 1975! (form with narrow pods, 5 mm. broad). Arabia: Aden, Goldmore Valley, *Barbey* 63!

Tanganyika Terr.: Mpwapwa, *Hornby* 58! Kyimbila Dist. (Tukuyu country), *Stolz* 1674! Locality? *Busse* 277! Dodoma, *Burtt* 998! 1644! *Greenway* 772! Kondoa Iranga, *Burtt* 1319! Usambara, Nyika *Taubert* 2405! Doda, *Taubert* 2932!

Native names: "Mugunga" (Tang.); Mwalaganza (Kigo).

Schimper No. 1747, named *A. spirocarpa* by Hochstetter (but questioned by him as, possibly, a variety of *A. seyal*) is not cited

by Richard; it has the broad pod of *A. spirocarpa*, which is tomentellose.

Var. **minor** Schweinf. Pinnae 4-5-jugate; leaflets 10: capitula very small: pods small (5 cm. long, 4-seeded), narrow (4 mm. broad), in the type specimen hirsute with spreading whitish hairs.—Anglo-Egyptian Sudan: Gebel Uaratab, near Suakin, Schweinfurth 1966! (type).

Pods of a form collected by Greenway in Tanganyika Terr., (772b), clothed with stiff spreading white hairs 3-5 mm. long, may belong here, but leaves are not available for comparison.

A. tortilis (Forsk.) Hayne, Arnzeig. Gewasche 10: t. 31 (1827); *Mimosa tortilis* Forsk?—Forsk. *Mimosa tortilis* "must be either *A. spirocarpa* or *A. tortilis*" but as Bentham states (Mimoseae, p. 505) the characters given by Forskal are "insufficient for determination." Hayne cites Forskal's description and Ehrenberg's specimens.

Arabia, prope Haes, Forskal (type of *Mimosa tortilis*). Anglo-Egyptian Sudan, Libyan and Nubian Deserts and Dongola: Syene (Assouan), Ehrenberg s.n. Sieber! (types of *Acacia tortilis*). Egypt: Raddi s.n. !; between Kosser and Ras-Benass, Schweinfurth 1985! W. Africa: French Sudan, Chevalier 1186! Senegambia (collector?) 499! in Herb. Kew; Heudelot s.n. Nigeria, Northern Provinces (collector? s.n., in Herb. Kew).

Native name: Kindil (N. Nigeria).

Var. **pubescens** Aylmer, var. nov.—Differs from the type in the pubescent to glabrescent branchlets, spines, rhachis and pods. Pinnae 4-5 jugate; leaflets 8-13 pairs, sparsely ciliate, 3 mm. long and 1 mm. broad: peduncle 2-2.5 cm. long, slender, pubescent, with involucre near the middle; heads cream-coloured.—Medium-sized tree, slash green; bark brown. Flowering 25 Nov. 1929 (Aylmer).

Anglo-Egyptian Sudan: Khartoum, in clay soil near the river, G. Aylmer 7; Khartoum, kilo. 8 on Medani railway, 16 Aug. 1928, G. Aylmer x8! (type in Herb. Kew); Darmont Isl. on the Nile, Letourneux 257! Blue Nile near Wad Medani, flowering Nov. 1900, Muriel S/9.

A form intermediate between *A. tortilis* Hayne and *A. spirocarpa* Hochst., differing from the latter in the narrow rather torulose pod, fewer pinnae, larger leaflets, and less pubescent branchlets.

Native name: Seyal (Arabic).

F. v. Mueller states (Select Extra-tropical Plants, ed. 9, p. 14) that "the Sahara gum arabic is derived from" *Acacia tortilis*. Mr. Aylmer informs me, however, that though this a gum-yielding species, it is not one of the sources of the commercial gum collected in the Sudan.

The material cited in this note has been studied in the herbarium of the Royal Botanic Gardens, Kew, through the courtesy of the Director.

XLVII.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXIX.

Casearia calva Craib [Samydaceae]; a *C. glomerata* Roxb. pedicellis glabris recedit.

Arbor circa 10 m. alta (ex Kerr); ramuli iuventute sicco fusci, angulati, inconspicue puberuli, demum cortice cinereo-brunneo obtecti, striati, lenticellati. *Folia* anguste oblonga, oblongo-lanceolata, vel oblongo-oblongata, apice obtuse acuminata, basi inaequilateralia, latere altero cuneata, altero late cuneata vel rotundata, usque ad 25 cm. longa et 6.5 cm. lata, rigide chartacea, glabra, sicco brunnescentia, nervis lateralibus utrinque circa 12 supra conspicuis vel subconspicuis subtus prominentibus, rete subtus subprominulo, margine subintegra, anguste cartilaginea, parum recurva, petiolo 8-16 mm. longo supra canaliculato sicco fusco glabro suffulta; stipulae deciduae, subdeltoideae, obtusae, 2 mm. longae, glabrae. *Flores* virides (ex Kerr), e ligno annotino orti, tuberculis mediocribus parum obliquis; pedicelli supra articulationem circa 6 mm. longi, glabri. *Receptaculum* breve. *Calycis* segmenta 5, elliptica vel ovato-elliptica, apice rotundata, saltem interiora margine membranacea, ad 4 mm. longa et 3 mm. lata. *Stamina* 8, filamentis 2 mm. longis, antheris paulo ultra 0.5 mm. longis; staminodia 8, filamentis dimidio breviora, apice pilosa. *Pistillum* glabrum, stamina paulo superans, ovario in stylum brevem angustato, stigmate capitato.

Chawm Tawng, Mè Ya, 1000 m., evergreen forest, Kerr 5365.

Casearia oblonga Craib [Samydaceae]; a *C. Kurzii* C. B. Clarke pedicellis brevioribus, a *C. vareca* Roxb. pedicellis supra articulationem haud glabris inter alia recedit.

Arbor circa 6 m. alta (ex Kerr); ramuli iuventute fusci, parum angulati, subsparse pubescentes, mox straminei, annotini brunneo-straminei, puberuli, lenticellati. *Folia* oblonga vel suboblonga, apice saepissime subitius acuminata, obtusa, basi cuneata vel cuneato-rotundata, haud rarius inaequilateralia, latere altero cuneata, altero cuneato-rotundata, ad 13 cm. longa, 5 cm. lata, coriaceo-chartacea, sicco saepissime supra fusciscentia, subtus pallidiora, supra parce puberula, subtus ad costam nervosque laterales pubescentia, aliter parce pubescentia, costa supra parum impressa subtus prominente, nervis lateralibus utrinque circa 7 intra marginem anastomosantibus supra conspicuis vel parum impressis subtus prominentibus, nervis transversis numerosis subhorizontalibus inter se plus minusve parallelis supra argute subprominulis subtus prominulis, margine recurva, distanter denticulata, petiolo subgracili circa 1 cm. longo sicco fusco breviter pubescente supra canaliculato suffulta; stipulae parvae, deciduae. *Flores* in fasciculos axillares dispositi, pedicellis 4 mm. longis sicco fuscis supra articulationem subadpresse pubescentibus suffulti. *Receptaculum* paulo ultra 1 mm. longum, dorso subadpresse pubescens. *Calycis* segmenta 4 vel 5, saepissime plus

*Continued from K.B. 1930, p. 327.

minusve elliptica, apice rotundata, usque ad 2.5 mm. longa et 2 mm. lata, sicco fusca, saltem exteriora dorso praesertim medium versus adpresse pubescentia. *Stamina* 6, filamentis 1.5 mm. longis parce subrigide pilosis, antheris parvis; staminodia 6, circa 1 mm. longa, filamentis similia nisi paulo crassiora, similiter pilosa. *Pistillum* pilis paucis albis erectis instructum; ovarium stylo subaequilongum, circa 1 mm. longum, placentis duabus.

Chumpawn, Siep Yuan, 10 m., evergreen forest, *Kerr* 16246.

Casearia pallida Craib [Samydaceae]; a *C. andamanica* King ramulis pallidis, foliis tenuioribus basi latioribus, nervis lateralibus magis numerosis recedit.

Arbor circa 15 m. alta (ex *Kerr*); ramuli glabri, primo compressi, sulcati, sicco iuventute fusci, mox straminei vel substraminei, demum teretes, cortice cinereo obtecti, lenticellis haud conspicuis. *Folia* saepissime oblonga, rarius ovato-oblonga, apice acuminata, basi parum inaequilateralia, latere altero cuneata vel late cuneata, altero late cuneata vel rotundata, 13–25 cm. longa, 5.5–8 cm. lata, chartacea, iuventute pilis brevibus adpressis instructa, matura glabra, sicco pallide viridia vel pallide brunneo-viridia, costa supra plana vel parum elevata subtus prominente, nervis lateralibus utrinque 12–15 intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervulis rete pagina utraque subprominulum efficientibus, margine subdistanter denticulato-crenulata, anguste cartilaginea, parum recurva, petiolo circa 1.5 cm. longo glabro supra canaliculato suffulta; stipulae deciduae, late deltoideae, obtusae, circa 2 mm. longae et latae, brunneae. *Fructus* luteus (ex *Kerr*), e tuberculis axillaribus in ramulis defoliatis ortus, pedicello recto vel parum curvato prorsus directo circa 12 mm. longo basi articulato stramineo suffultus, basi calycis segmentis 5 plus minusve persistentibus reflexis subellipticis obtusis 4 mm. longis 3 mm. latis glabris et staminodiis paucis pilosis instructus, ambitu oblongus, apice angustatus, circa 4.5 cm. longus et 2 cm. diametro, valvis tribus; semina 6 mm. longa, arillo subcarnoso apice longe fimbriato tecta.

Songkla, Ban Prakawp, 50 m., light evergreen forest, *Kerr* 15855.

Adenia angustisepala Craib [Passifloraceae-Adenieae]; ab *A. lineari* Craib et *A. parvifolia* Gagnep. calycis segmentis angustis elongatis, ab illa receptaculi tubo brevioris, disci glandulis haud linearibus, ab hac antheris haud apiculatis inter alia recedit.

Caules herbacei, sicco brunnei vel saepius pallidi, glabri, striati, inflorescentiae rhachi in cirrhum producta scandentes. *Folia* oblonga, oblongo-lanceolata, vel oblongo-oblancheolata, apice acute acuminata, basi rotundata vel truncata, 4.5–8.5 cm. longa 1.8–3 cm. lata, chartacea vel rigide chartacea, sicco brunnea vel luteo-viridia, glabra, nervis lateralibus utrinque 5–7 supra conspicuis subtus prominulis bene intra marginem anastomosantibus, reticulatione

subtus plus minusve prominula, integra, ima basi glandulosa, petiolo 4–6 mm. longo pallido anguste peltatim affixo suffulta. *Pedunculus* communis axillaris, 2–3 cm. longus, glaber, apice cymam paucifloram et cirrhum gerens; pedicelli circa 5 mm. longi, glabri, fere ad medium articulati, basi parvi-bracteati. *Receptaculum* circa 3 mm. longum. *Calycis* segmenta 5, linearia, obtusa, 1 cm. longa, 1.5 mm. lata, glabra. *Petala* 5, spatulata, circa 5 mm. longa et 1.25 mm. lata, glabra, nervis tribus paulo infra apicem prominenter coniunctis. *Antherae* lineares, 3.5 mm. longae, haud apiculatae, loculis basi inter se liberis. *Disci* glandulae parvae.

Kaw Tao, c. 10 m., open evergreen forest on rocky ground, *Kerr* 12812.

Adenia linearis Craib [Passifloraceae-Adenieae]; ab *A. nicobarica* King foliis conspicue angustioribus, fructu minore breviter stipitato ab *A. parvifolia* Gagnep. disci glandulis linearibus, antheris haud apiculatis recedit.

Caules herbacei, sicco primo subfusci, mox pallide virides, glabri, striati, inflorescentiae rhachi in cirrhum producta scandentes. *Folia* anguste oblonga vel oblongo-oblancheolata, apice acute acuminata vel subacuminata, basi rotundata, 7–10 cm. longa, 1.7–3 cm. lata, chartacea vel rigide chartacea, sicco supra viridia, subtus luteo-viridia vel pagina utraque interdum lutescentia, glabra, nervis lateralibus utrinque 5–6 bene intra marginem anastomosantibus supra plus minusve conspicuis subtus subprominentibus paucis aliis tantum paulo minus conspicuis interiectis, nervulis rete laxum subtus subprominulum efficientibus, integra, ima basi glandulosa, petiolo 7–13 mm. longo supra canaliculato anguste peltatim affixo suffulta. *Pedunculus* communis axillaris, 2–2.5 cm. longus, glaber, apice cymam paucifloram solitariam vel cymas duas laterales gerens, rhachi in cirrhum producta; pedicelli circa 5 mm. longi, infra medium articulati, basi bractea lineari circa 1 mm. longa instructi. *Receptaculi* tubus 3 mm. longus. *Calycis* segmenta 5, oblongo-ligulata, apice rotundata, 6 mm. longa, 1.75 mm. lata, glabra. *Petala* 5, oblongo-oblancheolata, obtusa, circa 4 mm. longa et 1.5 mm. lata, glabra, apicem versus pauci-denticulata, nervis tribus prominentibus infra apicem arcuatim coniunctis. *Disci* glandulae 5, lineares, apice recurvae, circa 1.25 mm. longae et 0.25 mm. latae. *Antherae* lineares, 3.5 mm. longae, haud apiculatae, loculis basi inter se liberis. *Fructus* ruber (ex *Kerr*), stipite circa 5 mm. longo incluso 4.8 cm. longus, valvis tribus.

Satul, 5 m., climbing on bushes in scrub, *Kerr* 13725.

Adenia saxicola Craib [Passifloraceae-Adenieae]; ab *A. pinna-tisecta* Craib floribus brevioribus, petalis basi latioribus, disci glandulis minoribus, antheris brevius mucronatis differt.

Caules herbacei, glabri, sicco striati, pallidi, interdum subglaucci, rarius brunnei, inflorescentiae rhachi in cirrhum producta scandentes. *Folia* alterna, variabilia, oblongo-lanceolata, breviter apiculata,

basi rotundata vel truncata, ad 11 cm. longa et 4 cm. lata, oblongo-quadrata, pauci-lobulata, ad 8 cm. longa et 6.5 cm. lata, vel pinnatim 5-lobata, ad 9 cm. longa et 13 cm. lata, lobis integris saepissime oblanceolatis apice breviter apiculatis usque ad 6 cm. longis et 1.8 cm. latis, chartacea, glabra, sicco supra brunnescentia, subtus glauca, costa supra conspicua subtus prominente, e basi 5-nervia, nervis lateralibus utrinque solitariis paulo supra basem e costa ortis, nervis supra conspicuis subtus prominentibus, nervulis rete laxum pagina utraque vix conspicuum efficientibus, foliis lobatis subtus inter lobos et paulo infra eos glandula solitaria instructis, ima basi ad petioli apicem conspicue glandulosa, petiolo ad 3 cm. longo glabro suffulta. *Inflorescentia* axillaris, pedunculo communi 3-7 cm. longo suffulta, apice ramulos duos floriferos ad 1.5 cm. longos gerens, rhachi in cirrhum producta, pedicellis circa 1 cm. longis paulo infra medium articulatis, bracteis minutis. *Fl. masc.* pallide viridis (ex Kerr). *Receptaculum* circa 3 mm. longum. *Calycis* segmenta 5, lanceolata, subacuta, 8-9 mm. longa, 2.5 mm. lata, glabra. *Petala* 5, oblonga, apice rotundata, 8 mm. longa, 4 mm. lata, breviter unguiculata, conspicue nervosa, anguste fimbriata. *Disci* glandulae parvae, pilosae. *Stamina* 5, filamentis 1.5 mm. longis, antheris 2.25 mm. longis apice mucrone gracile 1.25 mm. longo instructis. *Pistillodium* ad receptaculi tubi basem positum, paululo ultra 1 mm. altum. *Fructus* vix maturus subellipsoideus, stipite circa 4 mm. longo incluso circa 5 cm. longus, ima basi calyce persistente instructus.

Chiengmai, Mè Tùn, 1000 m., trailing over rocks in open forest, Kerr 6226.

Alsomitra plena Craib [Cucurbitaceae-Fevilleae]; a speciebus aliis adhuc descriptis staminodiis bene evolutis recedit.

Herba cirrhis axillaribus saepissime apice bifidis scandens; ramuli pilis brevibus glanduloso-capitatis et paucis aliis paulo longioribus haud glandulosis breviter pubescentes, sicco virides, graciles, sulcati, obtuse angulati. *Folia* ambitu ovata vel subquadrata, basi cordata, ad 7.5 cm. longa et 9 cm. lata, trilobata vel ad basem trisecta, segmentis oblanceolatis apice acute acuminatis medianis pauci-lobulatis lateralibus latere exteriori pauci-lobulatis membranaceis sicco plus minusve viridibus pagina utraque pilis brevibus sparse instructis ciliolatis nervis lateralibus utrinque circa 4 subtus conspicuis, eglandulosa, petiolo ad 2.5 cm. longo indumento ei ramulorum simili instructo suffulta. *Panicula* mascula pedunculo communi ad 1.5 cm. longo incluso ad 15 cm. longa, ramis inferioribus ad 3 cm. longis, indumento ei ramulorum simili instructa; pedicelli graciles, 7 mm. longi, pilis brevibus glanduloso-capitatis puberuli; bractee lineares, 2 mm. longae, similiter puberulae. *Sepala* 5, lanceolata, acuta, 2.5 mm. longa, 0.75 mm. lata, dorso parce breviter pubescentia. *Petala* 5, ovato-rhomboidea, apiculata, 4 mm. longa, 2.75 mm. lata, conspicue nervosa, glabra. *Stamina* 5, filamentis inter se omnino liberis 1 mm. longis, antheris subrotundatis fere

0.75 mm. diametro dorso apicem versus macula fusca notatis. *Fl.* ♀ pedicellis eis masculi similibus suffulti, bracteis etiam similibus vel interdum foliaceis. *Receptaculum* 5 mm. longum, ad ovarium glabrum, supra ovarium tubuloso-productum et ibi dorso parce breviter pubescens. *Calyx* et *corolla* iis floris masculi subsimiles. *Staminodia* ut filamenta sepalis dimidio breviora evoluta. *Styli* 3, inter se liberi, stigmatibus semilunaribus. *Capsula* pallida, subglauca, ambitu oblonga, 4 cm. longa, circa 1 cm. diametro, apice tubuloso-producta, pedicello 1 cm. longo suffulta. *Semina* straminea, apice ala membranacea fere 5 mm. longa instructa, ala exclusa, 5-6 mm. longa, 3 mm. lata, parum compressa, 1 mm. supra basem contracta, ima basi obtusa, lateraliter paucituberculata.

Prachuap, Kao Tao, 10 m., climbing on bushes in scrub, Kerr 16191 (♂), 16191A (♀).

Alsomitra simplex Craib [Cucurbitaceae-Fevilleae]; a speciebus aliis foliis simplicibus adhuc descriptis foliis integris nec angulatis nec crenulatis recedit.

Caules herbacei, scandentes, sicco substraminei, pilis et brevibus glanduloso-capitatis et paulo longioribus non glandulosis tecti, sulcati; cirrhi apice bifidi. *Folia* ovata lateve ovata, apice subacute acuminata, basi altius cordata, usque ad 18 cm. longa et 12.5 cm. lata, membranacea, sicco plus minusve fusciscentia, supra ad costam nervosque breviter pilosa, aliter puberula, subtus indumento simili sed paulo densiore instructa, e basi 5-nervia, nervis e costa ortis utrinque circa 4, omnibus supra conspicuis subtus prominulis intra marginem anastomosantibus, nervulis rete laxum plus minusve conspicuum formantibus, margine integra, ciliolata, petiolo ad 4.5 cm. longo supra canaliculato indumento ei caulium simili instructo suffulta. *Panicula* mascula pedunculo communi circa 3.5 cm. longo incluso 10 cm. longa, indumento ei ramulorum simili tecta, pauciramosa, ramis inferioribus circa 2 cm. longis; flores pallide virides (ex Kerr), pedicellis 4 mm. longis suffulti; bractee parvae, angustae. *Calyx* dorso pilis et glanduloso-capitatis et non glandulosis sparse instructus; segmenta 5, deltoideo-lanceolata, subacuta, paululo ante anthesin 2 mm. longa. *Petala* 5, elliptico-ovata, apiculata, sepalis subaequilonga, glabra, intra medio carinata. *Stamina* 5, inter se omnino libera, filamentis 1 mm. longis, antheris suboblongis circa 0.5 mm. longis.

Betong, 200 m., climbing on trees by stream in evergreen forest, Kerr 7524.

Begonia demissa Craib [Begoniaceae]; inter species floribus minoribus foliis basi aequalibus truncatis vel late cordato-truncatis fere glabris, alabastris elongatis, antheris lineari-oblongis distincta.

Herba inflorescentia inclusa ad 13 cm. alta, rhizomate repente, caule ad 10 cm. longo saepissime apice folia duo opposita gerente. *Folia* et basilaria et caulinarum, deltoidea vel fere oblata, apice obtuse

acuminata vel subacuminata, basi truncata vel cordato-truncata, aequilaterialia, usque ad 9 cm. longa et 8.5 cm. lata, membranacea, sicco viridia vel interdum pallide purpureo-suffusa, supra setis sparsis hic et illic instructa, subtus glabra, e basi 7-nervia, nervis intra marginem ramosis cum ramulis ad marginem currentibus supra conspicuis subtus prominulis, margine irregulariter crenulata vel crenulato-denticulata, sparse setosa, basalia petiolo 4-5.5 cm. longo suffulta, caulinarum saepissime brevius petiolata; stipulae parvae, deltoideae. *Cymae* axillares, pedunculo communi 2.5-5 cm. rarius ad 8 cm. longo suffultae, ad 2.5 cm. longae, glabrae; flos terminalis pedicello 2 cm. longo suffultus; rami laterales ad 2 cm. longi, iterum cymosim furcati; bractae deciduae, vix 0.5 mm. longae. *Floris* ♂ perianthii partes 4; duae exteriores ellipticae, sicco ad 8 mm. longae et 4.5 mm. latae, glabrae vel interdum pilis paucis elongatis instructae; duae interiores elliptico-oblongae, exterioribus subaequilongae, sicco 3 mm. latae, glabrae. *Androecium* 4 mm. altum, filamentis inter se inferne connatis apice liberis, antheris circa 15 secundis oblongis ad 1.75 mm. longis apicem versus breviter dehiscentibus, connectivo breviter obtuse producto. *Floris* ♀ alabastrum iuvenile tantum visum. *Receptaculum* glabrum, inaequaliter 3-alatum. *Ovarium* receptaculo paulo brevius.

Kanburi, Baw Re, *Put* 218.

***Begonia discreta* Craib** [Begoniaceae]; ab affini *B. Putii* Craib foliis maioribus, staminibus magis numerosis, receptaculo glabro, inter alia recedit.

Herba acaulis, tuberosa. *Folia* oblonga, oblongo-ovata, vel subquadrata, apice acuminata, acuta, basi altius cordata, aequilaterialia vel interdum parum inaequilaterialia, 4.5-13 cm. longa, 3.5-9 cm. lata, chartacea, sicco plus minusve brunnescentia, pagina superiore setulis brevibus hic et illic sparse instructa, inferiore ad nervos sparse ferrugineo-pilosa, aliter pilis paucis hic et illic instructa, rarissime fere glabra, nervis e basi radiantibus ad 9, nervis secundariis (e costa ortis) utrinque 3-4, omnibus supra conspicuis vel parum impressis subtus prominentibus, nervis transversis paucis subtus plus minusve conspicuis, petiolo 3-8.5 cm. longo apicem versus parce piloso rarissime subglabro suffulta. *Inflorescentia* pedunculo communi ad 18 cm. longo incluso usque ad 28 cm. longa, bracteis et perianthio exclusis glabra, ramulis inferioribus usque ad 8 cm. longis, ramulis ultimis saepissime 5-7 mm. longis; bractae mediocres, deciduae, margine pilis elongatis glanduloso-capitatis ciliatae; pedicelli sub anthesin 5-10 mm. longi. *Perianthii* floris ♂ segmenta 4; duo exteriora subelliptica, ad 11 mm. longa et 7 mm. lata, dorso pilis paucis elongatis instructa, duo interiora oblongo-oblancoolata, circa 10 mm. longa et 2.5 mm. lata, glabra. *Stamina* circa 12, filamentis basi ad 1 mm. in columnam connatis apice breviter liberis, antheris circa 1 mm. longis, connectivo haud producto. *Perianthium* floris ♀ ei masculi simile sed paulo minus et fere glabrum. *Receptaculum* glabrum, 4 mm. longum, apicem versus inaequaliter 3-alatum, ala

maiore 2 mm. longa pauci-denticulata. *Styli* 3, circa 2 mm. longi, ad medium inter se connati, stigmatibus semilunaribus haud tortis; ovarium 3-loculare, placentis bifidis.

Doi Sutep, 1350 m., on rocks, *Kerr* 3442.

***Begonia festiva* Craib** [Begoniaceae]; species nova caule prostrato, radicante, stipulis foliaceis diu persistentibus, pedunculo communi foliis longiore, floribus inter maiores albis distincta.

Caulis sat crassus, radicans, inferne stipulis marcidis tectus. *Folia* obliqua, inaequilaterialia, latere altero dimidiatim late ovata, altero dimidiatim ovata, ambobus basi auriculatis, auriculis ad 3.5 cm. longis imbricatis, 11-14 cm. longa, 8-10 cm. lata, subcrassa, supra viridia, pilis brevibus subsquamiformibus sparse instructa, subtus pallide viridia, ad nervos pilis similibus instructa, nervis e basi radiantibus 7-9 supra conspicuis subtus prominentibus, margine denticulata, dentibus reflexis, petiolo crasso 7-11 cm. longo rubro-suffuso pilis brevibus saepissime basi incrassatis tecto suffulta; stipulae diu persistentes, foliaceae, inaequilaterialiter subflabelliformes, 1.5 cm. diametro, dorso pilis paucis crassis instructae, supra glabrae, fimbriato-ciliatae. *Inflorescentia* axillaris, folia fere duplo superans, pedunculo communi circa 15 cm. longo incluso ad 30 cm. longa, pedunculo inferne glabro superne cum ramulis pilis brevibus glanduloso-capitatis puberulo viridi inferne et ad nodos rubro-suffuso, pedunculis partialibus 3.5 cm. longis, ultimis circa 5 mm. longis; bractae deciduae, circa 7 mm. longae; pedicelli pallidi, 1.8-2 cm. longi, pilis brevibus glanduloso-capitatis puberuli; flores albi, apice margine interdum rubro-suffusi. *Perianthium* ♂ 4-merum; segmenta duo exteriora obovato-elliptica vel subrotundata, ad 2.2 cm. longa et 2 cm. lata, duo interiora oblongo-oblancoolata, obtusa, 16 mm. longa, 8 mm. lata. *Stamina* lutea, numerosa, filamentis inter se e basi liberis exterioribus circa 1.5 mm. longis, antheris cuneato-oblongis, connectivo supra loculos producto apice truncato. *Perianthium* ♀ 5-merum; segmenta exteriora subelliptica, ad 1.5 cm. longa et 1.3 cm. lata, intimo spatulato-oblongo 8 mm. longo 5 mm. lato, glabra. *Receptaculum* album, hic et illic pilis brevibus glanduloso-capitatis puberulum, inaequaliter 3-alatum, ala maiore margine superiore horizontali apice rotundata 9 mm. longa et lata nervis horizontalibus vix conspicuis, alis minoribus vix 1 mm. longis. *Ovarii* loculi 3, placentis bifidis; styli 3, fere e basi inter se liberi, bilobati, stigmatibus luteis papillosis spiraliter tortis.

Raised at Aberdeen from seed collected by Dr. Kerr on Kao Nawng in Surat at 1000 m.

***Begonia Garrettii* Craib** [Begoniaceae]; herba folia duo altero basali altero ad inflorescentiae basem saepissime gerens, foliis membranaceis pinnatim lobatis vel pinnatisectis lobis vel segmentis lobulatis, fructu iuvenili ambitu oblongo distincta.

Rhizoma repens, apice folium solitarium gerens; caulis 5-17.5 cm. longus, glaber, apice folium solitarium vel rarissime folia duo

opposita et inflorescentiam gerens. *Folia* ambitu ovata vel late ovata, basalia basi alte cordata, 18–32 cm. longa, 16–36 cm. lata, caulinaria basi truncata vel truncato-cordata, 6.5–11 cm. longa, 5.5–11 cm. lata, pinnatim lobata vel pinnatisecta, lobis vel segmentis utrinque 2–3 lobulatis apice angustatis summo apice acutis, membranacea, sicco plus minusve brunnescentia, pagina superiore setulis perpaucis brevibus, inferiore ad nervos pilis paucis longiusculis instructa, basalia petiolo 9–22 cm. longo pilis perpaucis longiusculis instructo vel fere glabro, caulinaria petiolo 1.5–5.5 cm. longo suffulta. *Cymae* et axillares et terminales, sub anthesin pedunculo communi 4.5–8.5 cm. longo glabro suffultae, pedunculo demum ad 16.5 cm. longo apice bracteis duabus stipulis similibus sed minoribus instructo saepissime furcato, pedunculis partialibus ad 2 cm. longis, pedunculis ultimus ubi evolutis circa 1 cm. longis; flores albi, violaceo-rubro-suffusi (ex *Garrett*). *Flos* stamineus pedicello circa 1 cm. longo parce puberulo suffultus. *Perianthii* segmenta 4; duo exteriora elliptica, apice rotundata, 10 mm. longa, 7.5 mm. lata, dorso pilis paucis pallidis instructa, duo interiora obovata, 8 mm. longa, 5 mm. lata, glabra. *Stamina* circa 20, filamentis usque ad 1 mm. longis inter se liberis, antheris 1 mm. longis. *Flos* ♀ pedicello paulo ultra 1 cm. longo, puberulo suffultus. *Perianthii* segmenta 5, iis floris ♂ subsimilia. *Receptaculum* 8 mm. longum, alis tribus inclusis apice 4.5 mm. latum, alis supra ovarium productis subaequalibus apice ad 2 mm. longis. *Ovarium* 6 mm. longum; styli 3, e basi inter se liberi, 2 mm. longi, stigmatibus semilunaribus haud tortis 0.75 mm. longis pilulosis; loculi 3, placentis bilamellatis. *Fructus* fere maturus pedicello 3.5 cm. longo suffultus, alis inclusis 2.2 cm. longus, apice 1.2 cm. latus, alis tribus apice 4 mm. longis horizontaliter nervosis inferne evanidis.

Doi Angka, E. slope ending in Doi Pa Mawn, 1450 m., on rocks, *Garrett* 462.

***Begonia incondita* Craib** [Begoniaceae]; species habitu *B. venustae* King similis sed foliis lobulatis fere glabris, nervulis fere omnibus obscuris, floribus minoribus, antheris multo minoribus inter alia recedit.

Rhizoma usque ad 1 cm. crassum; caulis vix evolutus vel ad 6 cm. longus, unifolius, paucipilosus. *Folia* basalia pauca, obliqua, latere altero dimidiatim late ovata, altero dimidiatim ovata, basi alte oblique vel subaequaliter latius cordata, apice acute acuminata, usque ad 15 cm. longa et 13 cm. lata, membranacea, pagina utraque granulata, supra glabra, subtus primo ad nervos pilis paucis instructa, mox glabra, e basi 7-nervia, nervis supra conspicuis subtus prominentibus, nervulis obscuris, margine lobulata vel sinuato-lobulata, pauci-setoso-denticulata, petiolo ad 27 cm. longo pilis paucis instructo suffulta; folia caulinaria solitaria, basalibus similia nisi paulo minora. *Inflorescentia* terminalis, corymbiformis, pedunculo communi ad 21 cm. longo suffulta, pedunculis partialibus 4–6 cm. longis iterum ramosis cum pedunculo communi pilis divergentibus

subsparsis instructis; pedicelli graciles, circa 2 cm. longi, pilis paucis instructis; flores pallide punicei (ex *Kerr*). *Perianthii* ♂ partes 4; duae exteriores oblongo-ellipticae, 14 mm. longae, 8 mm. latae, dorso pilis paucis elongatis instructae; duae interiores oblongo-oblancoolatae, obtusae, 10 mm. longae, 3.5 mm. latae, glabrae. *Stamina* numerosa, filamentis inter se liberis usque ad 3 mm. longis, antheris oblongo-obtriangularibus 1.25 mm. longis connectivo haud producto. *Floris* ♀ perianthium ei ♂ subsimile. *Receptaculum* 3-alatum, circa 6 mm. longum, alis inclusis apice 4 mm. latum, supra ovarium productum, pilis paucis elongatis instructum. *Styli* 3, inter se liberi, 1.5 mm. longi; stigmata papillosa, apice torta; placentae bilamellatae. *Fructus* 1 cm. longus, alis inclusis 2 cm. latus, inaequaliter 3-alatus, ala maiore 12 mm. longa basi 7 mm. lata obtusa horizontaliter nervosa, alis minoribus 1.5 mm. longis.

Nakawn Sritamarat, Kao Luang, 900 m., on rocks in evergreen forest, *Kerr* 15457.

***Begonia obovoidea* Craib** [Begoniaceae]; species caule erecto, foliis palmatim lobatis, fructu obovoideo, alis tantum paululo ultra 1 mm. latis distincta.

Caulis simplex, erectus, ad 26 cm. altus, ruber (ex *Kerr*), nodis inferioribus radicans, primo pilis brevibus parce instructis, demum glaber. *Folia* omnia caulinaria, ambitu rotundata vel quadrato-rotundata, basi late altius cordata, ad 21 cm. diametro, plus minusve ad medium palmatim 7–9-lobata, lobis lanceolatis vel late lanceolatis acutis circa 8 cm. longis et 3 cm. latis interdum paucilobulatis, membranacea, sicco supra fusco-viridia vel brunnea, subtus pallide brunnea, supra setulis sparsissime instructa, subtus ad nervos parce pilosula, e basi 7-nervia, nervis lateralibus ex iis ortis utrinque 2–3, omnibus supra conspicuis subtus prominentibus, nervulis paucis subtus conspicuis, margine irregulariter sparse denticulata vel subintegra, petiolo circa 17 cm. longo indumento ei caulis simili instructo suffulta. *Cymae* breves, axillares. *Flos* stamineus pedicello 8 mm. longo puberulo suffultus. *Perianthii* segmenta duo exteriora subelliptica, apice rotundata, 7 mm. longa, 5 mm. lata, dorso praesertim inferne pilis brevibus instructa, duo interiora exterioribus parum minora, glabra. *Stamina* numerosa, filamentis inter se liberis interioribus ad 1.5 mm. longis, antheris linearibus 2 mm. longis, connectivo breviter obtuse producto. *Fructus* pedicello 2.5 cm. longo suffultus, ambitu obovatus, 1.6 cm. longus, 1.3 cm. latus, stylis tribus liberis bifidis stigmatibus elongatis tortis coronatus, ferrugineo-puberulus, superne anguste alatus, alis paululo ultra 1 mm. longis.

Ranawng, Nam Chut, 75 m., by stream in evergreen forest, stem edible, *Kerr* 12902.

***Begonia prolixa* Craib** [Begoniaceae]; a *B. venusta* King floribus multo minoribus, a *B. rege* Putz. petiolis multo longioribus haud barbatis recedit.

Herba acaulis; rhizoma repens, stipulis saltem paucis persistentibus instructum. *Folia* obliqua, apice acute acuminata, latere altero dimidiatim subelliptica, basi cordata, altero dimidiatim late ovata, basi alte cordata, ad 16 cm. longa et 11 cm. lata, sicco supra brunnescentia, subtus pallidiora, pagina superiore pilis brevibus ferrugineis iuventute sparse instructa, matura glabra, inferiore ad nervos ferrugineo-piloso-tomentosa, nervis e basi radiantibus saepissime 7 supra conspicuis, subtus prominentibus nervulis paucis pagina utraque subconspicuis, denticulata, dentibus setosis, petiolo 20–25 cm. longo pilis ferrugineis adpressis instructo suffulta; stipulae deltoideo-lanceolatae, apice longius acute attenuatae, circa 1.2 cm. longae, diu persistentes. *Pedunculus* communis efoliatus, sub anthesin 11–18 cm. altus, infrutescens ad 33 cm. altus, indumento ei petiolorum simili primo instructus, pilis demum plus minusve deciduis; pedicelli 10–15 mm. longi, ferrugineo-furfuracei; flores albi (ex *Kerr*). *Floris* ♂ perianthii partes 4; duae exteriores subellipticae, 1.7 cm. longae, 1.1 cm. latae, dorso pilis ferrugineis brevibus sparse instructae. *Stamina* numerosa, filamentis liberis ad 1.75 mm. longis, antheris linearibus filamentis subaequilongis, connectivo obtuse producto. *Floris* ♀ perianthium ei ♂ subsimile. *Receptaculum* circa 6 mm. longum, alis inclusis 2.3 cm. altum, alis valde inaequalibus, maiore oblonga 1.5 cm. longa obtusa, duabus minoribus vix 5 mm. longis. *Styli* 2, stigmatibus spiraliter tortis. *Capsula* 12 mm. longa, alis inclusis 3.5 cm. lata, ala maiore oblonga 2.5 cm. longa 8 mm. lata nervosa, duabus minoribus triangularibus obtusis circa 8 mm. longis.

Pattani, Kao Kalakiri, 600 m., evergreen forest, *Kerr* 14926.

***Begonia pumila* Craib** [Begoniaceae]; species parva ab aliis orientalibus foliis glabris palmatim lobatis, lobis saepissime lobulatis, floris masculi perianthio 4-mero, androphoro evoluto, antheris subsessilibus parvis distincta.

Herba erecta, circa 5 cm. alta, glabra; caulis basi vix 2 mm. diametro, parum flexuosus, inferne vinosus, superne ruber, iuventute parce parvi-squamosus. *Folia* alterna, ambitu saepissime plus minusve oblata, apice obtusa, basi late cordata vel truncata, subpeltata, 1.3–3 cm. longa, 1.5–3.5 cm. lata, viva sat rigida, supra viridia, nitida vel subnitida, subtus pallide viridia, e basi 5-nervia, nervis pagina utraque conspicuis, nervis transversis vix conspicuis, palmatim 5-lobata, vel interdum lobis inferioribus interdum vix distinctis subtrilobata, lobis lobulatis vel sublobulatis, grossius crenato-serrata, petiolo 6–12 mm. longo parce squamoso rubro suffulta; stipulae lanceolatae vel deltoideo-lanceolatae, acutae, circa 2 mm. longae, virides, mox deciduae. *Cymae* terminales; bractae stipulis similes nisi paululo maiores et obtusiores; pedicelli masculi 3–5 mm. longi. *Perianthium* masculum e segmentis 4 ellipticis vel obovato-ellipticis obtusis dorso puniceo-suffusis intra puniceis constitutum, 1 cm. diametro. *Androphorum* bene evolutum, circa 1.5 mm. longum, antheris parvis obtriangularibus

apice truncatis luteis dorso pallide viridi-suffusis subsessilibus. *Perianthium* ♀ 5-merum, aliter ei ♂ simile. *Receptaculum* 4 mm. longum, alis inclusis apice 6 mm. latum, parce glanduloso-puberulum, subaequaliter 3-alatum, alis subtriangularibus bene infra ovarium oreuntibus supra ovarium vix productis. *Styli* 2, circa 1 mm. longi, fere ad medium inter se connati, stigmatibus semilunaribus haud tortis papillosis; ovarium 1.75 mm. longum, 2-loculare, placentis simplicibus. *Fructus* fere maturus 6 mm. longus, apice alis inclusis 7 mm. latus, alis inter se inaequalibus, ala maiore 4 mm. longa, aliis circa 1.5 mm. longis.

Ranawng, Kao Pawta Chongdong, 700–900 m., mossy rocks in evergreen forest, *Kerr* 16757.

Except for ♀ flowers and fruit the description has been drawn up from a plant which flowered at Aberdeen in October of last year.

***Begonia Rabillii* Craib** [Begoniaceae]; species quoad folia peltata *B. Hasskarlii* Zoll. et Mor. similis a qua foliis minoribus, inflorescentia bracteata, floribus masculis maioribus, antheris paucioribus brevioribus inter alia recedit.

Herba acaulis, glabra. *Folia* in speciminibus visis solitaria, ovata, apice obtusa, basi rotundata vel truncato-rotundata, 4–6.7 cm. longa, 3–5.2 cm. lata, chartacea, sicco pagina superiore viridia, squamis parvis rotundatis pallidis sparse instructa, subtus similiter squamosa vel saepissime punctata, pallidiora, nervis e basi radiantibus circa 10 supra subconspicuis vel fere obscuris subtus conspicuis, margine irregulariter crenulata et saepe paulo infra apicem utrinque plus minusve unilobulata, primo parce setulosa, petiolo 4–8 cm. longo 8–15 mm. supra laminae basem peltatim inserto suffulta. *Inflorescentia* solitaria, e basi oriens, pedunculo communi saepe paulo supra basem folium solitarium circa 0.5 cm. longum gerente, ramulis inferioribus ad 6.5 cm. longis basi ad 3.5 cm. nudis; bractae lineari-subulatae, 2 mm. longae, sub anthesin persistentes; pedicelli 8–10 mm. longi; alabastra ambitu ovata, apice obtusa, basi late emarginata vel truncato-emarginata. *Floris* ♂ perianthii partes 4; duae exteriores ambitu subellipticae, sicco 4 mm. longae, 2.75 mm. latae; duae interiores sicco 3.5 mm. longae, 1 mm. latae. *Androecium* 2.5 mm. altum; filamenta basi ad 0.75 mm. inter se in columnam connata, apice ad 0.5 mm. inter se libera; antherae circa 10, ambitu rotundato-ellipticae, apice emarginatae, 0.75 mm. longae, longitudinaliter dehiscentes, connectivo haud producto. *Floris* ♀ perianthium ei ♂ simile. *Receptaculum* inaequaliter 3-alatum, supra ovarium productum, 6 mm. longum, alis inclusis 7 mm. latum, alis membranaceis viridibus, maiore 5 mm. longa. *Styli* tres, 1.25 mm. longi; stigmata semilunaria, haud spiraliter torta, papillosa; ovarium 2.25 mm. longum.

Tung Song, Kao Chem, on rock, *Rabil* 127.

***Begonia rimarum* Craib** [Begoniaceae]; a *B. guttata* Wall. ex DC. et *B. debili* King fructus ala maiore magis angusta et elongata, a *B. socia* Craib foliis subtus glabris vel paucisetulosis recedit.

Herba tuberosa, inflorescentia inclusa ad 22 cm. alta; caulis inferne nudus vel saepissime squamis 1-3 alternis stipuliformibus instructus, flexuosus, 7-9 cm. altus, inferne radicans, glaber vel pilos perpaucos gerens. *Folia* caulinarum, alterna, duo vel interdum tria, inaequilateralia, latere altero dimidiatim ovata vel lanceolato-ovata, basi cordata, altero dimidiatim late ovata, basi alte cordata, 6.5-14.5 cm. longa, 3.5-9 cm. lata, membranacea, viva colore variabilia, viridia vel varie variegata (ex *Kerr*), supra setulas perpaucas gerentia, subtus glabra vel interdum etiam setulis perpaucis instructa, nervis e basi radiantibus 6-8 supra conspicuis subtus prominentibus saepissime furcatis cum ramulis ad marginem currentibus, margine subintegra, distanter setulosa, petiolo 1-11 cm. longo glabro vel pilis perpaucis instructo suffulta; stipulae persistentes, lanceolatae, acutae, ad 1 cm. longae, glabrae. *Inflorescentia* solitaria, terminalis vel etiam axillaris, glabra, pedunculo communi 6-14 cm. longo incluso 11-17 cm. longa, ramis paucis 5-8 cm. longis; bractae deciduae, stipulis similes nisi paulo minores; pedicelli 8-9 mm. longi. *Floris* ♂ perianthii partes 4; duae exteriores ellipticae, 7 mm. longae, 4.5 mm. latae, duae interiores oblongo-spatulatae, 6.5 mm. longae, 3 mm. latae. *Stamina* numerosa, filamentis inferne ad 1.5 mm. in columnam connatis, apice ad 0.75 mm. inter se liberis, antheris obtriangularibus connectivo haud producto. *Fructus* bilocularis, placentis bifidis, inaequaliter trialatus, ala maiore elongato-triangulari obtusa 1.3 cm. longa basi 8 mm. lata, alis minoribus triangularibus obtusis circa 3.5 mm. longis et basi 3.5 mm. latis.

Surat, Ban Nasan, 10 m., crevices of limestone rocks, *Kerr* 13327.

***Begonia saxifragifolia* Craib** [Begoniaceae]; a *B. moulmeinense* C. B. Clarke foliis minoribus magis rotundatis recedit.

Herba tuberosa, caule haud evoluto vel ad 1.7 cm. longo gracili glabro, inflorescentia inclusa 5-10 cm. alta. *Folia* rotundata vel oblato-rotundata, aequilaterialia, basi altius cordata, 0.7-3.5 cm. longa, 0.7-4 cm. lata, membranacea, sicco fusco-viridia vel saltem pagina inferiore rubra, glabra vel interdum pagina inferiore pilis elongatis sparsissime instructa, nervis e basi radiantibus 7 ramosis cum ramis ad marginem currentibus saepissime supra plus minusve conspicuis subtus prominulis, margine in foliis minoribus paucicrenulata, foliis maioribus lobatis, lobis ad 7 mm. longis et latis pauci-lobulatis sparse setosis, petiolo 5-20 mm. longo glabro vel pilis paucis elongatis instructo suffulta; stipulae parvae. *Inflorescentia* pauciflora, pedunculo communi ad 7.5 cm. longo gracili pilis paucis elongatis instructo suffulta; bractae parvae, deciduae; pedicelli 0.5-1.5 cm. longi, graciles, pilis paucis elongatis instructi; flores albi (ex *Kerr*). *Floris* ♂ perianthii partes 4; duae exteriores obovato-ellipticae, 4.5 mm. longae, 2.25 mm. latae, glabrae vel dorso basi pilis paucis elongatis instructae, duae interiores oblongo-spatulatae, 4.5 mm. longae, 1.75 mm. latae, glabrae. *Stamina* circa

20, filamentis basi ad 1 mm. in columnam inter se connatis superne interioribus inter se ad 0.5 mm. liberis, antheris obtriangularibus apice truncatis connectivo supra loculos vix producto. *Floris* ♀ perianthium ei ♂ simile nisi paulo minus. *Receptaculum* 3 mm. longum, alis inclusis 3 mm. latum, inaequaliter 3-alatum. *Ovarium* receptaculo paululo brevius; styli 3, inter se liberi, vix 1 mm. longi; stigmata papillosa, semilunaria, haud torta. *Capsula* 5 mm. longa, alis inclusis 8 mm. lata, inaequaliter trialata, ala maiore 4.5 mm. longa, alis minoribus circa 1 mm. longis.

Ranawng, Kao Talu, 50 m., damp limestone rock, *Kerr* 11804.

***Begonia socia* Craib** [Begoniaceae]; a *B. guttata* Wall. ex A. DC. filamentis multo longioribus, a *B. integrifolia* Dalz. foliis minoribus integris, filamentis inferne in columnam longiorem connatis distinguenda.

Herba tuberosa, inflorescentia inclusa 5.5-15 cm. alta, caule erecto flexuoso parce piloso. *Folia* omnia caulinarum, 1-4, obliqua, apice obtusa vel obtuse subacuminata, latere altero dimidiatim lanceolata, basi cordata, altero dimidiatim late ovata, basi alte cordata, 5-14.5 cm. longa, 3-6.5 cm. lata, membranacea, sicco fusco-viridia, saepe subtus purpureo-suffusa, pagina superiore sparse setosa, inferiore ad nervos nervulosque sparse hirsuta, e basi 5-7-nervia, nervis lateralibus e costa ortis utrinque 3-5 omnibus supra plus minusve conspicuis subtus prominulis, integra, inferiora petiolo ad 8.5 cm. longo, superiora petiolo 4-10 mm. longo parce piloso suffulta; stipulae late lanceolatae, inaequilaterales, 5 mm. longae, parce piloso-ciliatae, membranaceae, persistentes. *Cymae* et axillares et terminales, pedunculo communi 2.5-7 cm. longo medio bibracteato incluso 4-12 cm. longae; bractae deciduae, elliptico-obovatae vel subrotundatae, ad 8 mm. longae et 7 mm. latae, membranaceae, glabrae, integrae; pedicelli sub anthesin circa 12 mm. longi, glabri. *Floris* ♂ perianthium 4-merum; segmenta duo exteriora subelliptica, ad 9 mm. longa et fere 7 mm. lata, glabra, duo interiora oblongo-spatulata, 8 mm. longa, 4 mm. lata, glabra. *Stamina* numerosa, filamentis inferne ad 2.5 mm. in columnam inter se connatis apice ad 0.75 mm. liberis, antheris obtriangularibus circa 0.75 mm. longis, connectivo haud producto. *Perianthium* fl. ♀ ei masculi subsimile sed parum minus et 5-6-merum. *Receptaculum* inaequaliter trialatum, 7 mm. longum, alis inclusis 8 mm. latum, ala maiore receptaculo aequialta 3.5 mm. longa, alis minoribus etiam receptaculo aequilongis sed brevibus. *Styli* 2, circa 1.5 mm. longi, fere e basi liberi, stigmatibus papillosis spiraliter tortis; ovarium 2-loculare, placentis bilamellatis. *Capsula* 1 cm. longa, alis inclusis 1.8 cm. lata, inaequaliter trialata, ala maiore capsulae aequialta, 8 mm. longa, alis minoribus etiam capsulae aequialtis apicem versus circa 4 mm. longis.

Pa Tup, watershed between Mê Tak Mê Wang and Mê Na Hua, Mê Ing, 650 m., *Garrett* 196.

Begonia soluta Craib [Begoniaceae]; species habitu *B. Putii* Craib similis sed floribus maioribus, staminibus magis numerosis, receptaculo glabro, stylis inter se liberis differt.

Herba acaulis. *Folia* subrotundata oblatave, apice rotundata, basi altius cordata, 2-4 cm. longa, 2.5-5 cm. lata, subcarnosa, pagina superiore pilis brevibus sat copiose instructa, inferiore ad nervos pallide ferrugineo-pilosa, aliter glabra vel pilis brevibus instructa, nervis e basi radiantibus circa 9 supra conspicuis subtus prominentibus ad marginem currentibus, margine irregulariter denticulata, petiolo 2.5-8 cm. longo praesertim apicem versus pallide ferrugineo-piloso suffulta. *Flos* ♂ pedicello 10-25 mm. longo subsparse ferrugineo-piloso suffultus; bracteae 5 mm. longae, fimbriatae. *Perianthium* 4-merum; segmenta duo exteriora obovata, apice rotundata, 11-15 mm. longa, 9-12 mm. lata, dorso pilis elongatis plus minusve sparsis instructa; duo interiora oblanceolata vel lineari-oblanceolata, 7-12 mm. longa, circa 2 mm. lata, glabra. *Stamina* numerosa, filamentis basi inter se ad 1 mm. in columnam connatis apice usque ad 1 mm. inter se liberis, antheris circa 0.75 mm. longis, connectivo parum truncato-producto. *Floris* ♀ perianthium ei ♂ simile sed paulo minus et saepissime e partibus 5 constitutum. *Receptaculum* circa 6 mm. longum, 3-alatum, alis ad basem currentibus, maiore fere 3 mm. longa. *Styli* 3, e basi omnino liberi, 1-2 mm. longi, stigmatibus semilunaribus haud tortis.

Kampêngpet, Kao Hua Mot, 900 m., crevices of limestone rocks, flowers pale pink, Kerr 6129.

Begonia subviridis Craib [Begoniaceae]; a *B. Smithiae* Geddes, cui maxime affinis, indumento minus denso, foliis vivis supra viridibus haud fusco-viridibus et haud arcte regulariterque bullatis, floribus subpunicis recedit.

Herba perennis, ad 45 cm. alta, rhizomate crasso caules plures erectos emittente; caules rubri vel subvirides, basi ad 1.5 cm. diametro, pilis divergentibus rubris subdense instructi. *Folia* caulina, obliqua, apice acuminata, basi auriculata, auriculis parum imbricatis, latere altero late ovata, basi auriculata, altero lanceolato-ovata vel ovata, basi auriculato-cordata, circa 21 cm. longa et 16 cm. lata, sat rigida, supra viridia, subtus parum punicea, pagina superiore albo-setulosa, inferiore ad nervos rubro-pilosa, ad nervulos similiter sed brevius pilosa, nervis e basi radiantibus 9-10 supra conspicuis subtus prominentibus furcatis cum ramulis ad marginem currentibus, nervulis supra parum impressis subtus magis numerosis reticulationem prominentem efficientibus, margine ciliata, denticulata, dentibus saepe reflexis, interdum pauci-lobulata, petiolo ad 23 cm. longo basi 1 cm. diametro submolliter brevius rubro-piloso suffulta; stipulae circa 1 cm. longae et 2 cm. latae. *Cymae* et axillares et terminales, pedunculo communi ad 9 cm. longo incluso ad 15 cm. longae, circa 10 cm. diametro, pedunculis partialibus circa 3 cm. longis, ultimis circa 1.5 cm. longis, omnibus pilis rubris saepissime glanduloso-capitatis conspicue vel rarius sparse

instructis; pedicelli usque ad 2 cm. longi, pallidiores, pilis similibus sed brevioribus et sparsioribus instructi; bracteae deciduae, ovato-lanceolatae, circa 13 mm. longae, subpectinato-ciliatae, dorso pilis paucis instructae; flores subpunicis. *Perianthium* floris masc. 4-merum; segmenta duo exteriora late ovata vel oblongo-ovata, obtusa, 2.5 cm. longa, 2 cm. lata, intra glabra, dorso pilis rubris sat validis sparse instructa, duo interiora oblongo-spatulata, apice rotundata, 1.7 cm. longa, 9 mm. lata, glabra. *Androecium* luteum, circa 7 mm. diametro et 6 mm. altum; stamina numerosa, filamentis inter se liberis, antheris apice truncatis vel parum retusis. *Perianthium* fl. fem. ei masc. simile sed 5-merum. *Receptaculum* glabrum vel saepius pilis glanduloso-capitatis sparsissime instructum, 1 cm. longum, inaequaliter tripartitum, alis omnibus 1 cm. altis supra et infra ovarium parum productis, longiore 1.2 cm. longa obtusa latere superiore recta vel parum concava, brevioribus circa 4 mm. longis. *Ovarium* triloculare, placentis bilamellatis; styli 3, bilobati, stigmatibus spiraliter tortis.

Described from a plant cultivated at Aberdeen from seed collected by Dr. Kerr on Kao Luang in Nakawn Sritamarat.

Begonia vagans Craib [Begoniaceae]; species foliis lanceolatis vel deltoideis glabris apice radicanibus, alabastris pilosis, floribus inter minores distincta.

Herba tuberosa, foliis apice radicanibus vagans; caulis tenuis, ad 5.5 cm. longus, glaber. *Folia* lanceolata, deltoideo-lanceolata, vel deltoidea, apice saepe acuminata, basi saepissime subaequaliter cordata, 4-15 cm. longa, 3-8 cm. lata, membranacea, sicco viridia, glabra, e basi 7-nervia, nervis lateralibus e costa ortis utrinque saepissime 2-3, omnibus supra plus minusve conspicuis subtus prominulis, nervulis vix conspicuis, margine irregulariter denticulata, interdum etiam lobulata, inferiora petiolo ad 5 cm. longo glabro suffulta, superiora breviter petiolata vel subsessilia; stipulae lanceolatae, ad 6 mm. longae, glabrae, denticulatae. *Inflorescentia* et axillaris et terminalis, gracilis, pedunculo communi incluso ad 12 cm. longa, ramulis transverse septatis glanduloso-capitatis subsparse instructis; pedicelli 3 mm. longi, glabri; bracteae deciduae. *Floris* ♂ perianthii partes 4; duae exteriores subrotundatae, circa 3.5 mm. diametro dorso pilis crassis instructae; duae interiores circa 1.5 mm. longae et 0.75 mm. latae, glabrae. *Stamina* circa 15, filamentis inferne in columnam circa 1 mm. longam connatis apice brevissime liberis, antheris circa 0.5 mm. longis, connectivo haud producto. *Capsula* viridis, 8 mm. longa, alis inclusis 1.5 cm. diametro, alis inter se subaequalibus 6 mm. longis basi 8 mm. latis tenuibus horizontaliter nervosis.

Kanburi, Sai Yok, Put 1777.

Peucedanum siamicum Craib [Umbelliferae-Peucedaneae]; species foliis pinnatis, pinnis trisectis vel trilobatis, segmentis vel lobis ultimis rotundatis vel obovatis distincta.

Caules setulis brevibus saepissime reflexis sparse instructi, sicco pallide brunnei, longitudinaliter sulcati. *Folia* inferiora bipinnata, petiolo 16–20 cm. longo incluso 27–30 cm. longa, petiolo basi vaginante indumento ei caulis simili instructo; pinnae trisectae vel varie trilobatae, segmentis ultimis rotundatis vel obovatis apice rotundatis vel obtusis ad 5.5 cm. longis et 5 cm. latis subcoriaceis supra ad costam nervosque dense breviter setulosi subtus ad costam nervosque setulosi aliter sparse setulosi nervis lateralibus utrinque 3–4 supra plus minusve conspicuis subtus cum costa prominentibus nervulis subtus paucis prominulis supra rete gracile impressum efficientibus margine crenatis vel serrato-crenatis; *folia* caulinarum parva, simplicia, trilobata vel trifoliolata, petiolo brevi vaginante suffulta, aliter basalibus similia. *Umbellae* compositae, et laterales et terminales, pedunculo circa 3–4 cm. longo suffultae; radii 12, circa 1.5–3 cm. longi, bracteis persistentibus lanceolatis saepe caudato-acuminatis circa 3 mm. longis; umbellae ultimae densae, pedicellis infructescentibus usque ad 3 mm. longis glabrescentibus. *Fructus* compressus, ellipticus, 6.5 mm. longus, ala inclusa 3.5 mm. latus, glaber.

Doi Chiengdao, *Put* 359.

***Heracleum siamicum* Craib** [Umbelliferae-Peucedaneae]; ab affini *H. burmanico* Kurz foliis crassioribus indumento crassiore instructis, umbellis maioribus, receptaculo puberulo inter alia recedit.

Caules rigidi, ad 8 mm. diametro, longitudinaliter sulcati, pilis brevibus albis rigidis reflexis hirsuti. *Folia* basalia haud visa, superiora trisecta petiolo circa 1 cm. longo suffulta; segmenta lanceolato-oblonga, apice acuta, basi cuneata, ad 7 cm. longa et 2.7 cm. lata, sat rigida, sicco subtus pallidiora, supra ad costam nervosque laterales setulis paucis brevibus instructa, subtus ad costam nervos nervulosque breviter albo-setosa, nervis lateralibus utrinque circa 6 cum costa supra conspicuis vel parum impressis subtus prominentibus intra marginem furcatis cum ramulis ad marginem currentibus, margine crassius dentato-serrata et saepissime etiam lobulata. *Umbellae* compositae, et laterales et terminales, pedunculo communi cauli simile sub anthesin circa 5 cm. longo paululo post anthesin usque ad 15 cm. longo suffultae; radii 23, sub anthesin circa 2 cm., post anthesin ad 7 cm. longi, breviter hirsuti; bractee ad eorum bases cito deciduae, lineari-lanceolatae, acutae, circa 5 mm. longae; umbellulae primo congestae, vix 1 cm. diametro, mox ad 2.5 cm. diametro; pedicelli sub anthesin breves, paulo post anthesin usque ad 1 cm. longi, breviter hirsuti; bractee deciduae; flores haud radiantes. *Receptaculum* puberulum. *Calycis* segmenta oblonga, obtusa, circa 0.5 mm. longa, puberula. *Petala* 2 mm. longa, apiculata, intra medio carinata, dorso puberula. *Filamenta* vix 2 mm. longa, antheris 1 mm. longis.

Doi Chiengdao, *Put* 342.

***Schefflera cuneata* Craib** [Araliaceae-Hedereae]; inter species indochinenses foliis digitatis, fructu globoso distincta.

Frutex volubilis (ex Noe); ramuli primo stellato-furfuracei, mox glabri, cortice stramineo vel substramineo obtecti, lenticellis sparsis conspicuis. *Folia* digitata, petiolo 12–15 cm. longo striato glabro basi caulem amplectente suffulta; stipulae deciduae; foliola 7, oblongo-elliptica vel elliptica, apice obtuse acuminata vel subacuminata, basi cuneata vel late cuneata et saepe parum inaequilateralis, 7–13 cm. longa, 3–5.5 cm. lata, sicco olivacea vel fusciscentia, matura glabra, costa supra prominula subtus prominente, nervis lateralibus utrinque 6–8 supra subprominulis subtus prominulis intra marginem anastomosantibus, nervulis rete pagina utraque subprominulum efficientibus, margine integra, parum recurva; petioluli inter se parum inaequales, 1.5–2.8 cm. longi. *Panicula* terminalis, usque ad 19 cm. longa et 16 cm. lata, ramis lateralibus usque ad 15 sed saepius paucioribus ramulos ultimos infructescentes circa 5 mm. longos circa 15 gerentibus; pedicelli infructescentes circa 4 mm. longi, cum rhachi et ramulis stellato-furfuracei. *Receptaculum* breve. *Calyx* truncatus. *Petala* 6–7, lanceolato-deltoides, 2.25 mm. longa, 1.25 mm. lata. *Stamina* petalis isomera, filamentis 1.5 mm. longis, antheris circa 1 mm. longis. *Fructus* globosus vel depresso-globosus, ad 5.5 mm. diametro, 7–8-sulcatus, iugis obtusis, apice stigmatibus 7–8 sessilibus instructus, loculis 7–8.

Chantabun, Kao Petcha Kut, 600 m., Noe 80.

***Schefflera oblonga* Craib** [Araliaceae-Hedereae]; a *S. singalange* R. Viguier ovarii loculis paucioribus, a *S. petiolosa* Harms foliolis integris inter alia recedit.

Folia digitata, petiolo 25–45 cm. longo glabro sicco primo subfusco mox stramineo striato suffulta; foliola 8, saepissime oblonga elliptica, rarius oblongo-lanceolata vel oblongo-oblancheolata, apice obtuse acuminata, basi cuneata vel late cuneata, 15–25 cm. longa, 5.5–11.8 cm. lata, chartacea vel rigide chartacea, sicco plus minusve olivacea vel fusca, pagina superiore glabra, inferiore praesertim apud costam pilis paucis brevibus stellatis instructa vel interdum fere glabra, costa supra prominula subtus prominente, nervis lateralibus utrinque 8–10 intra marginem anastomosantibus supra conspicuis vel fere subprominulis subtus prominentibus, nervulis rete gracile supra conspicuum subtus prominulum efficientibus, margine integra, parum recurva, petiolulo 2.5–9.5 cm. longo petiolis simili suffulta. *Umbellae* racemosim dispositae; racemi pedunculo communi 6–8 cm. longo incluso 22–26 cm. longi, rhachi cum pedunculo pilis brevibus stellatis squamiformibus pallidis instructa; umbellarum pedunculus sub fructu 10–14 mm. longus, indumento simili instructus; pedicelli infructescentes circa 5 mm. longi, glabrescentes. *Fructus* ambitu oblongus vel late oblongus, circa 6 mm. longus et 4–5 mm. latus, longitudinaliter altius 5-sulcatus.

Chantabun, Kao Sabap, *Put* 897.

***Schefflera simulans* Craib** [Araliaceae-Hedereae]; a *S. affine* Ridl., cui facie similis, stylosum columna conspicua recedit.

Frutex epiphyticus (ex *Kerr*); ramuli primo fusci, mox cortice stramineo oblecti, glabri, lenticellis conspicuis. *Folia* digitata, petiolo 6.5–9 cm. longo striato suffulta; stipulae inter se connatae, circa 1 cm. longae; foliola 5–7, saepissime oblongo-oblancoolata, acute acuminata, basi cuneata et saepe parum inaequilaterialia, 7–11 cm. longa, 2–3.7 cm. lata, rigide chartacea vel fere subcoriacea, sicco olivacea vel fusco-olivacea, matura glabra, costa supra subprominente subtus prominente, nervis lateralibus utrinque 7–9 intra marginem anastomosantibus supra argute subprominulis subtus prominulis, margine integra, recurva; petioluli inter se inaequales, 1.5–3.5 cm. longi. *Panicula* terminalis, circa 10 cm. longa, 15–20 cm. diametro, sessilis, parce stellato-furfuracea, mox glabra, ramis tribus ramulos ultimos 5–7 ad 2 cm. longos saepissime oppositos gerentibus; umbellae circa 10-florae; pedicelli ad 8 mm. longi; bractaeae deciduae. *Receptaculum* 1.75 mm. longum, sulcatum. *Calyx* brevis, undulatus. *Petala* 6–7, elongato-delloidea, 3 mm. longa, 2 mm. lata. *Stamina* petalis isomera, filamentis fere 5 mm. longis superne angustatis, antheris 2 mm. longis ad 1.25 mm. latis. *Styli* in columnam fere 1 mm. longam connati; ovarium 6–7-loculare.

Nakawn Sritamarat, Kao Luang, 1600 m., evergreen forest, *Kerr* 15514.

***Brassaiopsis calcarea* Craib** [Araliaceae-Hedereae]; a *B. aculeata* Seem. ramulis aculeis brevibus sed validis densius instructis recedit.

Arbuscula circa 5 m. alta (ex *Kerr*); ramuli annotini ad 1.5 cm. diametro, glabri vel saepissime pilis stellatis squamiformibus sparse instructi, stramineo-corticati, aculeis validis saepissime rectis ad 8 mm. longis sat dense armati. *Folia* sub anthesin haud evoluta. *Inflorescentia* terminalis, interdum ex umbella solitaria pedunculo communi 10 cm. longo bracteato constituta, saepissime ramulis lateralibus e bractearum axillis evolutis ex umbellis racemosim dispositis constituta, ad 15 cm. longa et 20 cm. diametro, ramis lateralibus bracteatibus umbellam solitariam terminalem gerentibus, probabiliter interdum bracteis his fertilibus e panicula constituta, primo pilis pallidis stellatis densius tecta; bractaeae duriusculae, sub anthesin persistentes, plus minusve ovatae, iis rhachidis ad 1 cm. longis, ramulorum superioribus 3–5 mm. longis; pedicelli ad 7 mm. longi, pallide tomentelli, basi bracteis oblongis circa 1.5 mm. longis et 1 mm. latis et bracteolis subulatis paulo longioribus instructi. *Receptaculum* 1.5 mm. longum, pallide tomentellum. *Calyx* segmenta circa 0.75 mm. longa, angusta vel interdum lanceolata, decidua. *Petala* 5, oblongo-ovata vel oblongo-lanceolata, 3.5 mm. longa, 1.75 mm. lata, ante anthesin dorso superne pallide tomentella. *Stamina* 5, filamentis glabris superne angustatis 3.5 mm. longis, antheris versatilibus ambitu oblongis 1.75 mm. longis. *Discus* conicus, 2 mm. altus. *Ovarium* inferum, 2-loculare, loculis uniovulatis; styli inter se connati, 0.75 mm. longi.

Kanburi, Wangka, 200 m., limestone rocks, *Kerr* 10456.

***Arthrophyllum ferrugineum* Craib** [Araliaceae-Hedereae]; ab *A. ovalifolio* Miq., cui probabiliter maxime affinis, inflorescentiae indumento ferrugineo inter alia distinguendum.

Arbor circa 10 m. alta (ex *Kerr*); ramuli iuventute evidenter densius ferrugineo-tomentelli, mox parce ferrugineo-furfuracei, striati, straminei vel fusco-straminei, circa 6 mm. diametro. *Folia* inferiora pinnata, petiolo 13–30 cm. longo incluso 56–150 cm. longa, petiolo cum rhachi terete striatulo mox parce ferrugineo-furfuraceo demum glabro; foliola utrinque 11–16, opposita, oblongo-lanceolata oblongave, apice obtuse acuminata, basi inaequilaterialia, latere altero cuneata lateve cuneata, altero rotundata truncatave, interdum cordata, usque ad 16 cm. longa et 5.5 cm. lata, chartacea vel rigide chartacea, sicco subviridia vel plus minusve fuscuscentia, saepe subtus brunnescentia, matura supra glabra, subtus parce breviter ferrugineo-furfuracea, vel fere glabra, costa supra conspicua vel saepe prominula subtus prominente, nervis lateralibus utrinque circa 7 paucis aliis tantum paulo minus validis interiectis supra conspicuis saepe parum impressis subtus prominentibus, nervulis paucis supra saepe parum impressis subtus subprominulis, margine integra, parum recurva, petiolulo ad 7 mm. longo suffulta; folia apud inflorescentiam unifoliolata, saepe subopposita, subelliptica, circa 4 cm. longa et 2.3 cm. lata, petiolo ad 1 cm. longo suffulta. *Inflorescentiae* ramuli 10–11, saepissime ad apices ramulorum subumbellatim dispositi, 6–24 cm. longi, breviores folia 2–3 parva vel squamiformia et umbellam gerentes, longiores folia unifoliolata pauca supra delineata, saepe umbellas paucas laterales, et apice umbellas 6–11 umbellatim dispositas pedunculo communi 1–3 cm. longo medio bibracteato suffultas gerentes; pedicelli subglabri, paululo post anthesin circa 1 cm. longi; bractaeae parvae, cum pedunculo breviter ferrugineo-tomentellae. *Receptaculum* breve, subglabrum. *Calyx* brevis, breviter denticulatus vel sublobulatus. *Petala* 5, delloideo-oblonga, 2 mm. longa, 1.5 mm. lata, carnosae, glabra. *Stamina* 5, filamentis paululo ultra 1 mm. longis, antheris obtusis, loculis inter se basi liberis. *Discus* carnosus, sulcatus. *Ovarium* uniloculare.

Songkla, Ban Prakawp, 100 m., by stream in evergreen forest, *Kerr* 15858.

***Arthrophyllum lucens* Craib** [Araliaceae-Hedereae]; ab *A. diversifolio* Blume foliolis supra nitidis, nervis lateralibus magis numerosis recedit.

Arbor circa 7 m. alta (ex *Kerr*); ramuli brunneo-straminei vel fusco-straminei, striati, glabri, lenticellis parvis sparsis. *Folia* inferiora pinnata, petiolo 10–16 cm. longo cum rhachi striato brunneo vel fusco-stramineo suffulta; foliola utrinque 5, oblongo-lanceolata vel oblongo-ovata, basi inaequilaterialia, rotundata vel latere altero rotundata, altero cuneata, usque ad 13 cm. longa et 4.8 cm. lata, chartacea vel rigide chartacea, matura glabra, supra sicco fusca, nitida, subtus brunnea vel brunneo-viridia, costa supra

prominula subtus prominente, nervis lateralibus utrinque 10–12 supra conspicuis haud rarius prominulis subtus prominentibus, nervulis rete laxum subtus subconspicuum supra subprominulum interdum parum impressum efficientibus, margine integra, anguste cartilaginea, recurva, petiolulo circa 5 mm. longo suffulta; folia apud inflorescentiam e foliolis paucioribus similiter constituta vel saepe unifoliolata, foliolis iis supra delineatis similibus. *Umbellae* fructuum ramulis per 9–10 ad apices ramulorum subumbellatim dispositis ad 10 cm. longis medio folia dua unifoliolata gerentibus gestae, pedunculis usque ad 3 cm. longis suffultae. *Fructus* oblique subellipsoideus, 7 mm. longus, 6 mm. diametro, disco et stylis persistentibus apice coronatus.

Songkla, Saba Yoi, under 50 m., scrub, *Kerr* 14801.

Arthrophyllum meliifolium *Craib* [Araliaceae-Hedereae]; ab *A. diversifolio* Blume foliolis crassioribus basi rotundatis, nervis lateralibus magis numerosis inferioribus haud obliquis, pedunculis pedicellisque magis robustis, floribus maioribus, ab *A. ovalifolio* Miq. nervis lateralibus magis numerosis minus conspicuis, receptaculo haud glabro recedit.

Arbor circa 4 m. alta, caule infra inflorescentiam simplice (ex *Kerr*). *Folia* inferiora pinnata, petiolo ad 15 cm. longo incluso ad 58 cm. longa, petiolo cum rhachi striato stramineo vel fusco-stramineo glabro; foliola utrinque 5–7, opposita, oblonga vel ovato-oblonga, basi parum inaequilateralia, rotundata, ad 14 cm. longa et 6 cm. lata, rigide chartacea, sicco supra saepissime subolivacea, subtus pallide viridia vel parum lutescentia, matura glabra, costa supra subprominente subtus prominente, nervis lateralibus utrinque circa 10 paucis aliis tantum paulo minus validis additis pagina utraque prominulis, nervulis pagina utraque plus minusve conspicuis sed vix reticulatis, margine integra, anguste cartilaginea et recurva, petiolulo ad 8 mm. longo suffulta; folia apud inflorescentiam inferiora pinnata foliolis paucioribus vel unifoliolata, suprema unifoliolata, foliolis iis supra delineatis similibus nisi paulo minoribus. *Inflorescentiae* ramuli umbellas gerentes solitarii, simplices vel pauciramosi, ex axillis inferioribus orti et ad rami apicem per 13–15 subumbellatim dispositi, 4–7 cm. longi, glabrescentes, paululo supra medium bibracteati; pedicelli glabrescentes, circa 7 mm. longi; bracteae ad pedicelli bases parvae, deciduae. *Receptaculum* 2 mm. longum, pallide ferrugineo-furfuraceum. *Calyx* brevis, undulatus vel sublobulatus. *Petala* 5, oblongo-deltoides, 3 mm. longa, 2 mm. lata, sat crassa, intra medio superne carinata. *Stamina* 5, filamentis 2.5 mm. longis, antheris ante anthesin incurvis. *Discus* crassus. *Ovarium* uniloculare.

Sichon, under 50 m., sandy ground, *Kerr* 15668.

Trevesia tomentella *Craib* [Araliaceae-Panaceae]; a *T. palmata* Vis. alabastris obtuse acuminatis ferrugineo-tomentellis recedit.

Frutex circa 2 m. altus (ex *Kerr*), armatus. *Folia* alterna, palmatim lobata, ad 46 cm. longa, lobis 7–9 plus minusve lanceolatis vel oblanceolatis basem versus parum angustatis usque ad 35 cm. longis et 10 cm. latis, iuventute ferrugineo-tomentella, matura supra glabra, subtus parce ferrugineo-furfuracea, nervis primariis pagina utraque prominentibus, nervis lateralibus utrinque circa 10 pagina utraque minus prominentibus, nervulis paucis plus minusve conspicuis, margine serrata, petiolo ad 40 cm. longo iuventute ferrugineo-tomentello maturo valido striato praesertim inferne aculeis brevibus copiose armato suffulta; stipulae circa 2 cm. longae. *Umbellae* racemosim dispositae, pedunculo ad 15 cm. longo suffultae; bracteae parvae; pedicelli usque ad 1.5 cm. longi, primo dense ferrugineo-tomentelli, demum plus minusve glabrescentes; alabastra etiam ferrugineo-tomentella. *Receptaculum* circa 2.5 mm. longum. *Calyx* tubus circa 1.5 mm. longus, lobi irregulares, saepissime lanceolati vel deltoidei, ad 1.5 mm. longi. *Petala* 7–8, carnosa, valvata, ante anthesin 5 mm. longa. *Stamina* 7–8, filamentis brevibus, antheris oblongis 2 mm. longis, loculis inter se parum inaequalibus apice basique inter se liberis. *Styli* in columnam brevem robustam omnino connati; ovarii loculi petalis isomeri.

Puket, Katu, 50 m., evergreen forest, *Kerr* 17470.

Trevesia valida *Craib* [Araliaceae-Panaceae]; columna stylare breve robusta a *T. palmata* Vis. diversa et cum *T. cheiranthia* O. Kze. congruens, ab hac foliorum lobis haud pseudopetiolutis inter alia recedit.

Arbor ad 4 m. alta, caule simplice (ex *Kerr*) armato iuventute ferrugineo-tomentello. *Folia* alterna, palmatim lobata, ad 32 cm. longa, lobis 9 late oblanceolatis apice angustatis basem versus paulo angustatis ad 21 cm. longis medio circa 8 cm. basi circa 3 cm. latis, iuventute ferrugineo-tomentella, matura supra glabra vel subglabra, subtus parce breviter ferrugineo-furfuracea, pallide brunnea, nervis primariis pagina utraque prominentibus, nervis lateralibus utrinque circa 8 pagina utraque prominulis, nervulis paucis plus minusve conspicuis, margine crenato-serrata, petiolo ad 65 cm. longo primo ferrugineo-tomentello maturo glabro subvalido striato inferne parce breviter aculeato suffulta; stipulae ad 2.5 cm. longae. *Inflorescentia* ad 70 cm. longa (ex *Kerr*), umbellis pedunculo usque ad 15 cm. longo suffultis; bracteae parvae; pedicelli circa 1 cm. longi, ferrugineo-tomentelli; alabastra obtuse acuminata vel subacuminata, primo ferrugineo-tomentella. *Receptaculum* circa 2.5 mm. longum. *Calyx* brevis, truncatus vel subdenticulatus, ciliolatus. *Petala* 7. *Stamina* 7, antherarum loculis inter se parum inaequalibus et apice et basi inter se liberis. *Columna* stylaris robusta; ovarii loculi 6–7.

Batang Sta, 100 m., evergreen forest, *Kerr* 7335.

Scheffleropsis subintegra *Craib* [Araliaceae-Pterandreae]; species foliolis integris vel subintegris, staminibus ovariique loculis magis numerosis distinguenda.

Arbuscula circa 7 m. alta (ex *Kerr*) ; ramuli primo pilis stellatis squamiformibus tecti, demum glabri, cortice stramineo obtecti, lenticellis vix conspicuis rotundatis. *Folia* alterna, digitata, petiolo 16–23 cm. longo striato furfuraceo suffulta ; stipulae inter se connatae, inferne petiolo adnatae, superne liberae, circa 1.5 cm. longae, dorso furfuraceae, margine primo ciliatae ; foliola 8–9, oblongo-obovata, apice breviter obtuse cuspidato-acuminata, basi cuneata, interdum parum inaequilateralia, 7.5–14 cm. longa, 3.5–6.7 cm. lata, subcoriaceo-chartacea, sicco brunnescentia vel fuscescentia, matura glabra, nervis lateralibus utrinque 7–9, paucis aliis tantum paulo minus conspicuis interiectis, intra marginem anastomosantibus pagina utraque plus minusve conspicuis, nervulis vix conspicuis, margine integra vel obsolete denticulata, parum recurva, petiolulo 2.5–6 cm. longo glabro supra apice et basi canaliculato medio anguste argute canaliculato suffulta. *Inflorescentia* apices versus ramulorum evoluta, e racemis paucis umbellas gerentibus constituta ; racemi, pedunculo communi 8.5–11 cm. longo incluso, 17–21 cm. longi, umbellas saepissime 5 gerentes ; umbellarum pedunculi communes 2–3.7 cm. longi ; pedicelli 1 cm. longi, haud articulati ; bracteae deciduae ; pedunculi et pedicelli pilis paucis parvis stellatis instructi vel subglabri ; alabastra ambitu obovata vel quadrato-obovata, ad 8 mm. longa, glabra. *Receptaculum* ad 3 mm. longum, apice usque ad 7 mm. diametro. *Calyx* truncatus, tubo circa 0.25 mm. longo. *Corolla* ut videtur calyptratim decidua. *Stamina* 20, filamentis 2.25 mm. longis, antheris oblongis 3.25 mm. longis, loculis inter se parum inaequalibus apice et basi inter se liberis. *Styli* in columnam validam 2 mm. longam longitudinaliter sulcatam apice concavam omnino connati ; ovarii loculi 15, loculo quoque uniovulato.

Trang, Kao Sung, 800 m., evergreen forest, *Kerr* 15231.

***Alangium oblongum* Craib** [Alangiaceae] ; ab *A. ebenaceo* Griff. ex C. B. Clarke foliis tenuioribus, nervis lateralibus paucioribus inter alia recedit.

Arbor circa 30 m. alta (ex *Kerr*) ; ramuli iuventute breviter adpresse furfuracei, sicco fusci, cito glabri, cortice pallide brunneo vel cinereo obtecti, lenticellis parvis prominulis haud numerosis. *Folia* alterna, saepissime oblonga vel suboblonga, apice obtuse acuminata vel subacuminata, haud rarius obtusa vel fere rotundata, basi cuneata, 8–18 cm. longa, 4–7 cm. lata, rigide chartacea, sicco viridia vel subolivacea, iuventute densius adpresse furfuracea, cito pagina utraque glabra, nervis lateralibus utrinque 8–10 cum costa supra prominulis subtus prominentibus, inferioribus sat obliquis, saltem superioribus intra marginem anastomosantibus, nervis transversis pagina utraque subprominulis, margine integra, parum recurva, petiolo 1–1.5 cm. longo primo densius adpresse furfuraceo cito glabro suffulta. *Cymae* axillares vel infra folia ortae, petiolo aequilongae vel eo dimidio longiores, fere e basi ramosae vel pedunculo communi ad 1 cm. longo suffultae, pedunculo cum ramulis sicco

fusco breviter sparse furfuraceo, 2–5-florae ; flores albi, fragrantissimi (ex *Kerr*) ; pedicelli 4–8 mm. longi, summo apice articulati ; bracteae deciduae. *Receptaculum* 3 mm. longum, longitudinaliter corrugatum, dense griseo-puberulum. *Calycis* tubus 1 mm. longus, apice undulatus. *Petala* 6, linearia, acuta, 2 cm. longa, basi 2.5 mm. lata, valvata, dorso dense griseo-puberula, intra basi glabra, aliter adpresse puberula. *Stamina* 6, filamentis 8 mm. longis basi glabris dorso densius breviter adpresse pubescentibus intra apice dense pilosis, antheris 9 mm. longis glabris. *Discus* carnosus, 2 mm. altus, styli basem cingens. *Stylus* staminibus paulo brevior, basi teres, glaber, superne paulo sulcatus, puberulus ; stigma clavatum, 4-sulcatum, iugis corrugatis ; ovarium uniloculare.

Ranawng, Kampuan, 50 m., evergreen forest, *Kerr* 17028.

LVIII.—ON THE FLORA OF THE NEARER EAST: VIII.*

A CONTRIBUTION TO OUR KNOWLEDGE OF THE FLORA OF AZERBAIDJAN, N. PERSIA. B. GILLIAT-SMITH AND W. B. TURRILL : III.

COMPOSITAE (continued).

***Centaurea albonitens* Turrill** sp. nov. ; a *C. gigantea* Sch. Bip. foliis pagina utraque minute papilloso-asperulis, involucri phyllis appendice scariosa lanceolata in spinam brevior attenuata differt.

Herba erecta, leviter ramosa, caule 5–7 mm. diametro glabro vel fere glabro albo-nitente ramis monocephalitis. *Folia* integra, pagina utraque infra praecipue minute papilloso-asperula, pallide virentia, nervis prominente reticulatis, inferiora elliptico-lanceolata, lamina apice gradatim leviter attenuata acuta basi cuneata in petiolum decurrente 1.9 dm. longa 7 cm. lata, petiolo 5.5 cm. longo, albonitentia ; caulina oblonga vel oblongo-repanda, circiter 1.3 dm. longa, 4–5 cm. lata, sessilia, saepe valde decurrentia, suprema breviora angustioraque. *Capitula* terminalia, 4.5 cm. longa (flosculus inclusis), 3 cm. diametro ; involucri phylla pallide virentia, ovata, media usque ad 1.7 cm. longa (appendice exclusa), 1.3 cm. lata, appendice scariosa 1–1.2 cm. longa plus minusve pectinatim ciliata apice in spinam 1–2 mm. longam attenuata, intimis lanceolatis 3.7 cm. longis apice minute scariosis. *Floscula* lutea, 3.7 cm. longa, lobis linearibus 7–8 mm. longis. *Achenia* glabra ; pappus 1.3 cm. longus, nitens.

Plain west of Tabriz, 23.6.29, No. 2568. Flowers citron-coloured.

The affinity of this interesting species seems quite clear. The *Flaviflorae* species of the *Cynaroideae* subsection of the section *Acrocentron* are not numerous. Of the 7 species described in Boissier's *Flora Orientalis* iii. 672–674 (1875) the nearest to our plant is undoubtedly *C. gigantea* Sch. Bip. ex. Boiss. l.c. 672. This is only known from "in apricis lapidosis ad pagum Gara Kurdistaniae prope Mossul (Ky. 349)," and two sheets of the type number are represented

*Continued from *K.B.* 1930, p. 398.

at Kew. The shining stems, and to a less extent leaves also, and the shorter apical spines to the phyllary appendages distinguish *C. albonitens* from *C. gigantea*. *C. regia* Boiss. and the more recently described *C. imperialis* Bornm. have rose-coloured florets.

C. depressa M. Bieb. Flor. Taur.-Cauc. ii. 346 (1808).

Valley of Livan, 9.25, florets blue with reddish purple corollatubes, No. 1287; near Tabriz, 5.26, No. 1513; cornfields near Tabriz, 5.26, No. 1577; cultivated at Kew from Tabriz seed, as K.659, 10.7.28. Flowers from mid-May onwards.

Distrib. Asia Minor, Armenia, Transcaucasus, Persia, Baluchistan, Afghanistan.

C. Glehnii Trautv. in Acta Hort. Petrop. iv. 382 (1876), var. **purpurea** Trautv. l.c.

Mishou Dag, 12.7.28, No. 2422; 5.8.29, No. 2597.

Distrib. (of species and var.) Armenia.

C. iberica Trev. ex Spreng. Syst. iii. 406 (1826).

Around Tabriz, 8-9.25, flowers white or pink, No. 1297; near Tabriz, 5.27, No. 2045; cultivated at Kew from Tabriz seed as K.661, 3.10.28. Flowers naturally from mid-May throughout the summer.

Distrib. Balkan Peninsula and Orient.

C. moschata L. Sp. Pl. 909 (1753).

Between Marand and Djulfa, 20.5.28, cream flowers with rosy tinge, No. 2311; plain west of Tabriz, 23.6.29, No. 2566.

Distrib. Caucasus, Armenia, Persia, Turkestan, Baluchistan, Afghanistan.

C. pergamacea DC. Prodr. vi. 569 (1837).

Plain south-west of Urmia, 20.5.26, No. 1562.

Distrib. E. Asia Minor, Syria, Persia.

C. pulchella Ledeb. Ic. Plant. Alt. i. 22, t. 93 (1829).

Hills south of Tabriz, 14.6.27, flowers white or pink, No. 1851.

Distrib. Asia Minor, Armenia, Caucasus, Persia, Turkestan, Cent. Asia.

C. solstitialis L. Sp. Pl. 917 (1753).

Yam, 11.9.28, flowers yellow, No. 2455.

Distrib. Cent. Eur. and Medit. Region.

C. Urvillei DC. Prodr. vi. 592 (1837).

Sir, 27.5.28, flowers mauve, pink, or purple, No. 2309.

Distrib. Asia Minor, Armenia, W. Persia.

C. deinacantha Boiss. et Hausskn. in Boiss Flor. Or. iii. 665 (1875) is probably not distinct from this species.

C. virgata Lam. Dict. i. 670 (1785), var. **squarrosa** Boiss. Flor. Or. iii. 651 (1875).

Heights above Livan, 8-9.25, flowers pink or red, No. 1277; near Tabriz, 6.26, No. 1713; 6.26, No. 1764 (approaching the type, sensu Boissier); 4.6.27, No. 1950; Yam, under Mishou Dag, 7.8.27, No. 1998.

Distrib. (of species and var.) Orient, Cent. Asia.

Chamaemelum disciforme Vis. Flor. Dalm. ii. 85 (1847).

Weed in garden near Tabriz, 1.5.27, yellow disc, no rays, No. 1878. Flowers from the first half of May to July.

Distrib. E. Asia Minor, Armenia, Transcaucasus.

C. praecox Vis. Flor. Dalm. ii. 86 (1847).

Hills south of Tabriz, 5.5.26, white rays and yellow disc, No. 1478; near Tabriz, 5.27, No. 1941.

Distrib. Asia Minor, Syria, Iraq, Caucasus, N. Persia.

Chardinia orientalis Hayek in Ann. Hofmus. Wien. XX. 424 (1907). *C. xeranthemoides* Desf. Mém. Mus. Paris iii. 456, t. 21 (1817).

Hills south of Tabriz, 5.26, flowers pink, No. 1435; Mishou Dag, 22.5.27, No. 1792; hills south of Tabriz, 6.27, No. 1947.

Distrib. Asia Minor, Syria, Armenia, Iraq, Persia, Afghanistan, Turkestan.

Chartolepis lyrata Boiss. et Hausskn. in Flor. Or. iii. 696 (1875).

Yam, under Mishou Dag, 7.8.27, No. 1997. In flower from mid- or late July; flowers bright yellow.

Distrib. Persia.

Chondrilla juncea L. Sp. Pl. 796 (1753).

Hills south of Tabriz, 7.8.27, flowers yellow, No. 2005. Also seen at Yam.

Distrib. E.N. Temp. Region.

Chrysanthemum coronarium L. Sp. Pl. 890 (1753).

Cultivated in a garden at Tabriz, 15.6.26, flowers yellow, No. 1754.

Distrib. Medit. Region.

C. Parthenium Bernh. Syst. Verz. Erf. 145 (1800).

Matricaria Parthenium L. Sp. Pl. 890 (1753).

Weed in garden, Tabriz, 5.6.26, white rays, No. 1704.

Distrib. Eur. and east to Caucasus.

C. sinensis Sab. in Trans. Linn. Soc. xiv. 145 (1825). var. *floribus omnibus ligulatis*.

Cult. in garden of British Consulate, Tabriz, 10.11.27, No. 2210.

Distrib. Cultivated in many parts of the world.

Cichorium Intybus L. Sp. Pl. 813 (1753), var. **glabratum** Gren. et Godr. Flor. Fr. ii. 286 (1850).

Weed in garden, Tabriz, 21.7.26, flowers blue, No. 1756.

Distrib. (of species) E.N. Temp. Region.

(of var.) very common in the south and east of the distributional range of the species.

Two specimens, collected as garden weeds, Tabriz, 14.6.27, No. 2047 and 6.28, No. 2420, belong to this species but have not been matched with any varietal descriptions. Their characters are: *Planta tota plus minusve hispida. Folia caulina haud vel distincte lobata marginibus dentatis. Inflorescentia ramosa, capitulis et sessilibus et pedunculatis instructa.*

Cirsium apiculatum DC. Prodr. vi. 642 (1837). *C. libanoticum* DC. l.c. 647 (1837).

Mishou Dagh, 7.28, No. 2461. Flowers pink to purple from July onwards.

Distrib. Syria, Persia.

C. arvense Scop. Flor. Carn. ed. 2, ii. 126 (1772), var. **incanum** Ledeb. Flor. Ross. ii. 735 (1846).

Near Tabriz, 12.7.28, flowers purple, No. 2425.

Distrib. (of species) E.N. Temp. Region.

(of var.) here and there in the species area.

C. echinus Hand.-Maz. in Ann. Hofmus. Wien xxiii. 197 (1909). *C. scleranthum* M. Bieb. Flor. Taur.-Cauc. 559 (1819).

Mishou Dagh, 8.28, No. 2421.

Distrib. N. Asia Minor, Armenia, Caucasus, N. Persia.

C. Haussknechtii Boiss. Flor. Or. iii. 535 (1875).

Summit of Mishou Dagh, 8.28, No. 2464; high up on Mishou Dagh, 2.9.29, flowers pink, No. 2632 (somewhat less cano-tomentose than usual).

Distrib. W. Persia.

C. rhizocephalum C. A. Mey. Verz. Pflanz. Cauc. 70 (1831).

Yam, 13.9.28, flowers pink, white, or mauve, No. 2460.

Distrib. Asia Minor east to Afghanistan.

C. strigosum Boiss. Flor. Or. iii. 536 (1875) var (?).

Dik Dash, 8.29, No. 2645.

Distrib. Caucasus.

The material available makes it difficult to decide with certainty on the status of the above plant. It has glabrous stems and one capitulum measuring 4 cm. long (including the florets) and the pericline 2 cm. in diameter.

C. Szovitsii Boiss. Flor. Or. iii. 527 (1875).

Between Yam and Seivan, 8.28, flowers pink, No. 2453; Yam and also east of Seivan, 8.28, No. 2463.

Distrib. Transcaucasus, Armenia, Azerbaidjan.

C. yamense Turrill in Kew. Bull. 1929, 228.

Yam, 7.8.27, No. 2001; 8.2.28, flowers pink, No. 2452.

Flowers in July and August and said to be the "kangar" of which the young underground shoots are eaten in the spring and called "artichoke" by the European colony.

Endemic.

C. yamense Turrill, var. **arachnoideum** Turrill l.c. 229.

Yam, 8.28, flowers pink, No. 2462; Mishou Dagh, 2.9.29, No. 2626.

Endemic.

Cnicus benedictus L. Sp. Pl. 826 (1753).

Hills south of Tabriz, 29.4.27, flowers yellow, No. 1876; cultivated at Kew from Tabriz seed, 50/27, 10.7.28. Flowers from end of April to July.

Distrib. Medit. Region.

Coreopsis Atkinsoniana Dougl. in Lindl. Bot. Reg. t. 1376 (1830).

Tabriz, cultivated in a garden, 6.26, No. 1759. Locally known as "Ashrafi."

Distrib. N. America.

Cousinia compacta Turrill in Kew Bull. 1929, 229.

Near Tabriz, 6.26, flowers pink or purple, No. 1755; 25.6.27, No. 1956.

Endemic.

C. cynaroides C. A. Mey. Verz. Pflanz. Cauc. 230 (1831).

Near Tabriz, 21.7.26, No. 1753; 25.6.27, No. 1955. Flowers white or cream-white, scented.

Distrib. Caucasus, Armenia, N. Persia.

C. grandis C. A. Mey. in DC. Prodr. vi. 557 (1836) var. **minor** Bornm. in Verh. Zool.-Bot. Ges. Wien lx. 139 (1910).

Dik Dash, Yam, 28.8.27, No. 2103; near Tabriz, 8.28, No. 2367.

Distrib. (of species and var.) Azerbaidjan.

C. Kotschyi Boiss. Diagn. Ser. I. vi. 120 (1845).

Hills south of Tabriz, 6.29, No. 2549.

Distrib. Persia.

C. microcephala C. A. Mey. ex DC. Prodr. vi. 552 (1837), var. **glabrescens** Turrill var. nov.

Folia caulina in pagina superiore glabra vel glabrescentia. Capitula elongato-ovoidea, 1.5 cm. longa (flosculis exceptis), 9 mm. diametro, involucri phyllis, laevissime araneosis.

Dik Dash, Yam, 8.29, flowers yellow, No. 2615.

Distrib. (of species) Azerbaidjan.

The affinity of this plant is not in doubt, though its exact status is uncertain from the material available. It is related to both *C. ramosissima* DC. and *C. microcephala* C. A. Mey. From the former it is distinguished by its larger capitula and from the latter (e descriptione) by the glabrous or almost glabrous upper surface of the cauline leaves and the only slightly araneose pericline.

C. tabrisiana Bunge Mem. Acad. Imp. Sci. Petersb. ix. No. 2.16 (1865).

Near Tabriz, 19.6.26, No. 1737; 26.6.27, No., 1957. Flowers yellow with red anthers.

Distrib. Azerbaidjan.

C. urmiensis Bornm. Verh. Zool.-Bot. Ges. Wien lx. 135 (1910).

Near Tabriz, 22.6.27, No. 1958.

Distrib. Azerbaidjan.

Crepis foetida L. Sp. Pl. 807 (1753), var. **rhoadifolia** Boiss. Flor. Or. iii. 851 (1875).

Tabriz, 21.7.26, flowers yellow, No. 1760; 8.27, No. 1990.

Distrib. (of var.) Balkan Peninsula, Asia Minor, Syria, Caucasus, Crimea, N. Persia.

Crupina crupinastrum Vis. Flor. Dalm. ii. 42, t. 51, f. 3 (1847).

Near Tabriz, 26.5.26, flowers pink, No. 1596.

Distrib. Medit. Region.

C. vulgaris Cass. Dict. Sci. Nat. xii, 68 (1818).

Hills south of Tabriz, 5.6.27, flowers pink, No. 1949; cultivated at Kew from seeds collected near Tabriz, 29.6.28.

Distrib. Medit. Region and Cent. Asia.

Echinops descendens Hand.-Maz. in Ann. Nat. Hofmus. xxvii. 439 (1913).

Hills south of Tabriz, 2.6.27, flowers dirty white, No. 1952; 6.28, No. 2358.

Distrib. Military zone between Iraq and Syria.

This very interesting plant agrees well with the original description. It is a species of the section *Oligolepis* Bunge and is allied to *E. leucographis* Bunge, *E. Haussknechtii* Boiss., and *E. polygamus* Bunge. Handel-Mazzetti compares it with *E. Haussknechtii*, a species I have not seen, but it is probably most nearly related to *E. polygamus*. The following differential diagnosis has been prepared: species ab *E. leucographo* foliis pagina inferiore costa praecipue glandulis numerosioribus instructis, involucri squamis omnino glabris minus valde spinescentibus intimis basi in tubo et 5-angulatis et 5-sulcatis connatis differt; ab *E. polygamo* Bunge foliis pagina superiore indumento arachnoideo in nervis denso caeterum parco vel nullo haud aequabili penicillis longioribus recedit. The species is decidedly intermediate in the sum of its characters between *E. polygamus* and *E. leucographus*. Handel-Mazzetti collected the plant from "Brachacker am brackischen See El Chattunije zwischen dem mittleren Chabur und dem Dschebel Sindschar 14/VII. 1900 (nr. 1647). Steinige Steppe zwischen Gharra und Sfaijan am NW.—Fuss des Dschebel Abd el Asis." This area is now just beyond the north-western boundary of Iraq. The two species with which it is here compared are both Persian from between Ispahan and Teheran.

E. persicus Stev. ex. Fisch. Cat. Hort. Gorenk. ed. 37 (1812) nomen nudum; Boiss. Flor. Or. iii. 440 (1875).

Mishou Dag and fields at Yam, 8.9.29, inflorescence grey-blue to blue, stems always white, No. 2643.

Distrib. Caucasus, Afghanistan.

E. viscosus DC. Prodr. vi. 525 (1837).

Dik Dash, Yam, 28.8.27, inflorescence sky-blue, stems brown, No. 2101; 8.29, No. 2614.

Distrib. Sicily, southern Balkan Peninsula, Asia Minor, Syria, Palestine, Armenia, N. Persia.

Erigeron orientalis Boiss. Diagn. Ser. II. iii. 7 (1856).

Above Zindjanab, Sahand Range, 25-27.6.29, No. 2519; Mishou Dag, 9.29, No. 2623.

Distrib. E. Asia Minor, Armenia, Caucasus, N. Persia.

Gaillardia aristata Pursh. Flor. Am. Sept. ii. 573 (1814) vars.

Tabriz, cultivated in garden, 18.7.27, Nos. 1992, 1993. Locally known as "Zilf-afshān."

Distrib. N. America.

Garhadiolus Hedypnois Jaub. et Spach Ill. iii. 119 t. 284 (1847-50).

Yam, weed in millet fields, 13.9.28, flowers pale yellow, No. 2458.

Distrib. Asia Minor, Syria, Iraq, Persia, Baluchistan, Caucasus, N. India.

Gundelia Tournefortii L. Sp. Pl. 814 (1753).

Urmia district, 5.26, florets mauve, No. 1527; plain under Mt. Sir, Yam, and Dik Dash hill, 24.6.28, No. 2310.

Distrib. Asia Minor, Syria, Palestine, Iraq, Armenia, Persia.

Helichrysum arenarium DC. Flor. Fr. iv. 132 (1805), var. **stenophyllum** Boiss. Flor. Or. iii. 235 (1857).

Gardens to the north-east of Tabriz, 6.27, generally yellow, No. 1933; hills south of Tabriz, 11.6.28, No. 2293 (specimen young and with just a tinge of pink in some of the phyllaries).

Distrib. (of species) Cent. Eur., Caucasus, N. Persia, Cent. Asia. (of var.) Caucasus, Azerbaidjan.

H. armenium DC. Prodr. vi. 183 (1837).

Yam, 8.27, No. 2009; Mishou Dag, 8.28, flowers yellow, No. 2423.

Distrib. E. Asia Minor, Iraq, Persia.

The long indumentum is less obvious and the minute sessile glands are more obvious in No. 2423 than in No. 2009.

H. Eichwaldii Boiss. et Buhse Aufz. 121, t. vi., f. 3 (1860).

Near Tabriz, 6.7.26, flowers from ruby-red to every shade of pink verging to yellow, No. 1652; 6.26, No. 1735; gardens to the north-east of Tabriz, 6.27, No. 1934; near Tabriz, 11.6.27, Nos. 1935, 1936; hills south of Tabriz, 11.6.28, No. 2294 (young).

Distrib. Caucasus, N. Persia.

H. glandulosum Ledeb. Flor. Ross. ii. 605 (1846).

Mt. Sir, Urmia district, 27.5.28, flowers bright yellow, No. 2292.
Distrib. Caucasus, N. Persia.

The whole plant is very aromatic and glandular and after gathering it the hands smell, not unpleasantly, for the rest of the day, even after washing with soap.

Hieracium sabaudum L. Sp. Pl. 804 (1753) s.l. (det. A. R. Horwood).

Mishou Dag, 5.8.29, flowers yellow, No. 2595.
Distrib. Cent. and W. Eur. east to N. Persia.

Inula britannica L. Sp. Pl. 882 (1753).

Mishou Dag, 7.8.27, flowers yellow, No. 2000.
Distrib. E.N. Temp. Region.

I. oculus-Christi L. Sp. Pl. 881 (1753).

Mishou Dag, 12.7.28, flowers yellow, No. 2424; 5.8.29, No. 2591.
Distrib. Cent. Eur., Orient.

I. thapsoides DC. Prodr. V. 464 (1836), sensu Boiss. Flor. Or. iii. 190 (1875).

Mishou Dag, 7.8.27, flowers yellow, No. 1999.
Distrib. Asia Minor, Caucasus, N. Persia.

Jurinea leptoloba DC. Prodr. vi. 675 (1837).

Near Tabriz, 6.26, No. 1749; 18.6.27, No. 1948. Cultivated at Kew from Tabriz seed, as K. 661, 3.10.28. Flowers June and July, creamy white sometimes with a pink tinge.
Distrib. Azerbaidjan.

J. pulchella DC. Prodr. vi. 676 (1837).

Yam, 9.9.28, flowers pink-white, No. 2456.
Distrib. Azerbaidjan.

The species is local round Yam but does not occur near Tabriz, where its place is taken by *J. leptoloba*.

J. macrocephala DC. Prodr. vi. 674 (1837).

Hills south of Tabriz, 7.27, No. 1942. Flowers very strongly and sweetly scented, often pink but sometimes white.
Distrib. N. and W. Persia.

J. macrocephala DC., var. **glabrescens** Turrill var. nov. ; a planta *Aucher-Eloy* 3505 caulibus foliisque glabrescentibus haud tomentosis canis foliis in marginibus et pagina inferiore praecipue-asperulis recedit. Floribus albis.

Hills south of Tabriz, 7.27, No. 1943.

Koelpinia linearis Pall. Reise iii. 755, t. Ll. fig. 2 (1776).

Near Tabriz, 14.5.27, flowers yellow, No. 1801; 6.27, No. 1879; weed in new garden south-east of Tabriz, 5.6.28, No. 2318.
Distrib. Medit. Region, east to Cent. Asia and N. India.

Lactuca orientalis Boiss. Flor. Or. iii. 819 (1875).

Valley of Livan, 9.25, flowers pale yellow, No. 1282; Yam, 7.8.27, No. 2002.

Distrib. Orient and Cent. Asia.

The species also occurs on the hills south of Tabriz and is often used to make brooms. Flowers normally in July and August.

L. Scariola L. Sp. Pl. ed. 2. 1119 (1764), var. **integrifolia** Bischoff Beitr. z. Fl. Deutschl. u. Schweiz 189 (1851).

Garden weed, near Tabriz, 7-8.27, flowers yellow, No. 2048; 8.27, Nos. 2110, 2152.

Distrib. (of species) E.N. Temp. Region.
(of var.) here and there with the species.

L. undulata Ledeb. Flor. Alt. iv. 156 (1833).

Near Tabriz, 25.6.26, flowers yellow, No. 1710.

Distrib. Armenia, Persia, Arabia, Turkestan, Cent. Asia, Baluchistan, N. India.

Leontodon asperimus Boiss. Flor. Or. iii. 730 (1875).

Hills south of Tabriz, 19.6.27, flowers yellow, No. 1939.

Distrib. Epirus, Thessaly, Asia Minor, Syria, Iraq, Caucasus, N. Persia, Turcomania.

L. hastilis L. Sp. Pl. ed. 2. 1123 (1764).

Stream under Mishou Dag, 8.29, flowers yellow, No. 2611.
Distrib. Eur. and Medit. Region.

Leucanthemum maximum DC. Prodr. vi. 46 (1837).

Tabriz, cultivated in gardens, 21.7.26, rays white, disc yellow, No. 1757.
Distrib. Pyrenees.

L. vulgare Lam. Flor. Fr. ii. 137 (1778).

Tabriz, cultivated in garden, 5.26, rays white, disc yellow, No. 1758.
Distrib. E.N. Temp. Region.

Microlonchus oligochaetus Boiss. Flor. Or. iii. 701 (1875).

Hills south of Tabriz, 6.26, No. 1750; 4.6.27, No. 1877. Also found near Urmia. Flowers from early July through the summer, pink and sometimes white. Prostrate in its desert form.
Distrib. Armenia, N. Persia.

Onopordon Acanthium L. Sp. Pl. 827 (1753).

Garden weed, Tabriz, 7.29, flowers purple, No. 2547; 8.29, No. 2644. Also found at Yam.
Distrib. E.N. Temp. Region.

O. heteracanthum C. A. Mey. Verz. Pfl. Cauc. 68 (1831).

Hills south of Tabriz, 7.26, flowers red or purple, No. 1774; 7.27, No. 1953.
Distrib. Transcaucasia, N. Persia.

Flowers purple, July and August.

O. heteracanthum C. A. Mey., var. **ortholepis** Bornm. in Bull. Herb. Boiss. Ser. 2, vii. 222 (1907).

Hills south of Tabriz, 7.27, No. 1954.

Distrib. (of var.) N. Persia.

The "variety" is probably a young stage of development only.

Phaeopappus leuzeoides Boiss. Diagn. Ser. I. vi. 124 (1845).

Yam, weed in an arable field left fallow, 24.6.28, No. 2345. Flowers yellow.

Distrib. Persia, Armenia.

P. leuzeoides Boiss., var. **Szovitsii** Boiss. Flor. Or. iii. 597 (1875).

Yam, weed in arable field left fallow, 24.6.28, flowers yellow, No. 2346.

Distrib. (of var.) Persia, Armenia.

Phagnalon Kotschyi Sch. Bip. ex Boiss. Flor. Or. iii. 221 (1875).

Mishou Dagh, cracks in rocks, 5.8.29, No. 2596.

Distrib. Syria, Kurdistan.

Picnomon acarna Cass. Dict. Sci. Nat. xl. 188 (1826).

Dik Dash, Yam, 28.8.27, flowers pink, No. 2102; cultivated at Kew from Yam seeds, 14.8.28.

Distrib. Medit Region.

Picridium dichotomum Fisch. et Mey. in DC. Prodr. vii. 183 (1838).

Dik Dash, Yam, 21.8.27, flowers golden yellow, No. 2099; 8.28, No. 2457.

Distrib. Asia Minor, Armenia, Caucasus, Iraq, N. Persia.

Picris strigosa M. Bieb. Flor. Taur.-Cauc. ii. 250 (1808).

Dik Dash, Yam, 9.29, flowers yellow, No. 2625.

Distrib. Asia Minor, Syria, Iraq, Caucasus, Persia.

Pterotheca obovata Boiss. et Noë in Boiss. Diagn. Ser. II. iii. 98 (1856).

Near Tabriz, 5.26, Nos. 1491, 1616, 1687; 11.6.26, No. 1678; 24.6.26, No. 1697; 29.5.27, No. 2044. Cultivated at Kew from Tabriz seed as K.431. The yellow flowers close between 11 a.m. and noon for the rest of the day.

Distrib. S. Russia, E. Asia Minor, Caucasus, Armenia, Iraq, Persia, Baluchistan, Turkestan, Afghanistan.

For a note on the nomenclature of this species see *Kew Bull.* 1929, 229.

Pyrethrum Balsamita Willd., var. **tanacetoides** Boiss. Flor. Or. iii. 345 (1875).

Tabriz, weed in garden, 6.27, flowers yellow, No. 2108. Locally known as "Etr-Shāh," i.e. Attar of Kings, a name also given to other plants.

Distrib. (of species and var.) Armenia, E. Asia Minor, N. Persia.

Pyrethrum Gilliatii Turritt in Kew Bull. 1929, 228.

Hills to the south of Tabriz, 29.5.27, flowers yellow, No. 1937; 6.28, No. 2319. Earlier specimens of dwarfer habit, presumably from the same locality and received as Nos. 1688 and 1731, belong to this species. Flowers from end of May through June and July. Endemic.

Scorzonera armeniaca Boiss. Flor. Or. iii. 760 (1875).

Weed in gardens, Tabriz, 7.27, flowers yellow, No. 1880.

Distrib. Armenia, W. Persia.

S. cinerea Boiss. Diagn. Ser. I. xi. 44 (1849).

Mishou Dagh, 5.8.29, flowers yellow, No. 2594; Dik Dash, Yam, 9.29, No. 2648.

Distrib. E. Asia Minor, Transcaucasus, N. Persia.

S. lanata M. Bieb. Flor. Taur.-Cauc. ii. 237 (1808).

Hills north of Tabriz, 24.4.29, flowers yellow, No. 2554.

Distrib. South Balkan Peninsula east to Persia.

S. papposa DC. Prodr. vii. 119 (1838).

Mishou Dagh, 12.7.28, flowers yellow, No. 2426.

Distrib. Palestine, Syria, Iraq, Persia.

S. ramosissima DC. Prodr. vii. 125 (1838).

North-east of Saudj Bulaq, near Urmia, 20.5.26, flowers yellow, No. 1579.

Distrib. Persia.

Scorzonera sp. nov. ?

Mishou Dagh, in tufts on the higher reaches, 19.7.28, flowers yellow, No. 2370.

The material is insufficient for description.

Senecio vernalis W. et K. Pl. rar. Hung. i. 23, t. 24 (1802).

Tabriz, garden weed, 1.4.26, flowers, No. 1345; 4.26, No. 1378; Yam, 8.27, No. 2010.

Distrib. Cent. Eur. and Medit. Region.

Serratula coriacea Fisch. et Mey. in DC. Prodr. vi. 668 (1737).

Dik Dash, Yam, on rocks, 21.8.27, No. 2100.

Distrib. Armenia, N. Persia.

The flowers are pink. The basal leaves turn black on drying. The plant is very tall and the stems almost leafless. It appears to grow exclusively in clefts of rocks with little or no earth visible.

Sonchus oleraceus L. Sp. Pl. 795 (1753).

Weed in garden near Tabriz, 5-6.26, flowers yellow, No. 1643; cultivated at Kew from Tabriz seed as K. 632, 3.8.27.

Distrib. Now practically cosmopolitan.

Tagetes erecta L. Sp. Pl. 887 (1753).

Tabriz, cultivated in a garden, 18.7.27, No. 1991.

Distrib. Mexico.

Taraxacum ceratophorum DC. Prodr. vii. 146 (1838).

North-east of Tabriz, 1927, flowers yellow, No. 1881.

Distrib. N. America, Cent. and N. Eur., Caucasus, Cent. Asia, N. China, but apparently new to Persia.

T. microcephalum Pomel Nouv. mat. 1. Flor. Atlantique 8 (1874) non Schur; Hand.-Mazz. Monogr. Taraxacum 18 (1907).

Stream under Mishou Dagh, 8.9.29, flowers yellow, No. 2621.

Distrib. Asia Minor, Armenia, Syria, Persia, Afghanistan, Algeria, Morocco.

T. syriacum Boiss. Diagn. Ser. II. iii. 96 (1856).

Dik Dash, Yam, 2.8.28, flowers pale yellow, No. 2366.

Distrib. Palestine and Asia Minor east to Afghanistan and Turkestan.

T. Wallichii DC. Prodr. vii. 147 (1838).

Tabriz, garden weed, 4.27, flowers yellow, No. 2046; cultivated at Kew as K. 669, 19.8.29 and 6.9.29.

Distrib. Syria, Iraq, Transcaspia, Afghanistan, Turkestan, Mongolia, N. India, Tibet.

Thevenotia scabra Boiss. Flor. Or. iii. 455 (1875).

Yam, 9.28, flowers pink or purple, No. 2459. Also seen on the hills, south of Tabriz.

Distrib. N. Persia.

Tragopogon collinus DC. Prodr. vii. 115 (1838).

Urmia district, 20.5.26, flowers blue or pink, No. 1521.

Distrib. Armenia, Transcaucasus, Persia.

T. graminifolius DC. Prodr. vii. 114 (1838).

Weed in gardens near Tabriz, 9.25, flowers pale yellow, No. 1302; 4.26, No. 1401; 5.26, Nos. 1617, 1772; cultivated at Kew from Tabriz seeds as K. 430, 18.6.28.

Distrib. Caucasus, N. Persia.

The N. Persian specimens recorded under this name are puzzling. In some of their characters, notably in the presence of some floccose indumentum immediately below the capitulum, they approach *T. persicus* Boiss. which is reduced in the Flor. Or. iii. 751 (1875) to β *stenophyllum* of *T. buphthalmoides* Boiss.

Xanthium spinosum L. Sp. Pl. 987 (1753).

Near Tabriz, garden weed, 8.27, No. 2150.

Distrib. Now nearly cosmopolitan.

Xeranthemum longepapposum Fisch. et Mey. in Nouv. Mém. Nat. Mosc. iv. 337 (1832).

Hills south of Tabriz, 29.6.29, flowers pink, No. 1692; 7.26, No. 1745. Flowers from the end of June.

Distrib. E. Asia Minor, N. Syria, Armenia, Persia.

X. squarrosus Boiss. Diagn. Ser. I. vi. 101 (1845), var. **unicolor** Boiss. Diagn. Ser. I. vi. 101 (1845).

Valley of Livan, 9.25, flowers pink or purple, No. 1279; near Tabriz, 7.26, No. 1746; 21.8.27, No. 2109; Dik Dash, Yam, 9.29, No. 2609; cultivated at Kew from Tabriz seed, 14.8.28. Flowers from June and for the rest of the season.

Distrib. (of species) Asia Minor, Iraq, Syria, Armenia, Caucasus, N. Persia.

(of var.) over much of the species area.

If Boissier [Flor. Or. iii. 445 (1875)] is correct in considering *X. Annettae* Kal. in Bull. Soc. Imp. Nat. Mosc. vii. 194 (1834) to be a *forma pygmaea* of this, the trivial *Annettae* has to be adopted for the species. From the description, and figure also, without seeing a type specimen or material from the original localities, I am not certain and prefer to retain the well authenticated name given by Boissier.

Zinnia elegans Jacq. Coll. (v.) Suppl. 152 (1796).

Tabriz, cultivated, 8.7.27, No. 1995.

Distrib. Mexico.

CAMPANULACEAE.

Campanula Beauverdiana Formin in Mon. du Jard. Bot. de Tiflis i. 12 (1905).

Urmia district, Mt. Sir, 21.5.26, flowers a rather light blue, No. 1563; 27.5.28, No. 2261.

Distrib. N. Persia.

C. Gilliatii Milne-Redhead et Turrill, sp. nov.; a *C. stricta* L. habitu naniore foliis spathulato-orbiculatis, et pedunculis multo brevioribus distinguitur.

Planta perennis, caulibus nanis e radice lignosa apice 1 cm. diametro valde ramosis pulvinum densum lignosum formantibus, ramis 8 cm. longis vel saepius brevioribus densissime foliatis senioribus foliorum basibus persistentibus obtectis. *Folia* radicalia spathulato-orbiculata, rosulata; lamina usque ad 1.1 cm. longa, et 1 cm. lata, apice rotundata, basi in petiolum cuneatim vel subabrupte attenuata, margine 3- vel 4-dentata in quoque latere pilis brevibus perpaucis instructa, pagina utraque glabra, pallide viridia; petiolus alatus basique usque ad 1 cm. longus, superne 2.5 mm. latus, medio 1.5 mm. latus, infimus 3 mm. latus, ad 1.5 mm. supra basin ciliatus, superne dentibus minutis circiter 6 instructus; caulina obovato-cuneata, apice tridentata, 0.5 cm. longa, 3 mm. lata, glabra, sessilia. *Rami floriferi* usque ad 3.3 cm. longi, graciles, uniflori (an semper?). *Calycis lobi* triangulari-ovati, subacuti, 5 mm. longi, 4 mm. lati, margine valde ciliati, appendices brevissimi, vix 1 mm. longi. *Corolla* 1.6 cm. longa. *Antherae* lineares, 4.25 mm. longae, 0.75 mm. latae, apice connectivo minute capitulato paeditae; filamentum 1 mm. longum. *Stylus* 11 mm. longus, ramis tribus, 2 mm. longis includentibus papilloso-puberulus. *Receptaculum* glabrum, 3.5 mm. altum, 4 mm. diametro.

Mishou Dagh, August 1929, Gilliat-Smith 2646.

C. glomerata L. Sp. Pl. 166 (1753).

Above Zindjanab, Sahand Range, 26.6.27, flowers dark blue, No. 2502; Mishou Dag, 19.7.28, No. 2372; 5.8.29, No. 2602.
Distrib. E.N. Temp. Region.

C. involucrata Auch. in DC. Prodr. vii. 467 (1838).

Urmia district, 5.26, flowers violet-blue, No. 1535; Mt. Sir, Urmia district, 6.28, No. 2260.
Distrib. Asia Minor, Armenia, N. Persia.

C. propinqua Fisch. et Mey. Ind. Sem. Hort. Petrop. ii. 32 (1836).

North-east of Sandj Bulaq, 5.26, flowers blue, No. 1608; Kushtchi Gadugi Pass, north of Urmia, 21.5.28, No. 2262.
Distrib. E. Asia Minor, Armenia, N. Persia.

Some specimens referred by Boissier and other authors to this species belong to another, probably to *C. strigosa* Russ.

C. propinqua Fisch. et Mey., var. **parviflora** Turrill in Kew Bull. 1929, 229.

Yam, Dik Dash, 8.28, flowers blue, No. 2465.
Distrib. (of var.) Endemic.

C. rapunculoides L. Sp. Pl. 165 (1753).

Weed in gardens, Tabriz, 6.7.26, flowers blue, No. 1666; 9.6.27, No. 2075; near Tabriz, 6.27, No. 2121 (var. vel forma?).
Distrib. Eur., Asia Minor, Caucasus, Armenia, N. Persia.

No. 2121 is represented by a poor specimen, possibly abnormal. The calyx segments tend not to reflex or spread in the flower.

C. sclerotricha Boiss. Diagn. Ser. I. xi. 66 (1849).

Mishou Dag, waterfall ravine, 13.9.29, flowers blue, No. 2642.
Distrib. N. and W. Persia, Kurdistan.

C. simplex Stev. in Mem. Soc. Nat. Mosc. iii. 225 (1812). *C. Stevenii* M. Bieb. Flor. Taur.-Cauc. 138 (1819).

Above Zindjanab, Sahand Range, 25-27.6.29, flowers blue, No. 2522.

Distrib. Asia Minor, Armenia, Caucasus, N. Persia, Cent. Asia.

C. stricta L. Sp. Pl. ed. 2. 238 (1764), var. **muricata** Trautv. in Acta Hort. Petrop. ii. 563 (1873).

Mishou Dag, 19.7.28, flowers dark blue, No. 2371; 5.8.29, No. 2601.

Distrib. (of species) Asia Minor, Syria, Armenia, N. Persia.
(of var.) Armenia, Kurdistan, N. Persia.

Michauxia laevigata Vent. Jard. Cels. 81, t. 81 (1800).

Valley of Livan, cream coloured flowers, a very tall and robust plant up to 9 feet in height, 9.25, No. 1289; Yam and Seivan, 24.6.28, No. 2354; basal leaves, Yam, 7.28, No. 2432.

Distrib. N. Persia, Armenia.

Grows on rocks of dried-up river beds. Normally in flower at end of June and in July.

Podanthum pulchellum Boiss. Flor. Or. iii. 947 (1875).

Hills south of Tabriz, flowers blue, 11.6.28, and Yam, 24.6.28, No. 2308.

Distrib. N. Persia.

PLUMBAGINACEAE.

Acantholimon bracteatum Boiss. Diagn. Ser. I. vii. 70 (1846).

South east of Lake Urmia, 5.26, flowers pink-purple, No. 1590; Urmia district, 5.29, No. 2635.

Distrib. Armenia, N. Persia.

A. Gilliatii Turrill, sp. nov.; ab *A. tenuifloro* Boiss. foliis leviter latoribus rhachide minute hispidulo-puberula differt.

Suffrutex caespitoso-erectus, ramis 5-6. cm. longis inferne foliis vestustis vestitis. *Folia* anguste linearia, acerosa, haud subulato-triquetra, apice acuminato-spinosa, 1.7 cm. longa, 1 mm. vel fere 1 mm. lata, vetusta subpatula sed haud reversim imbricata, margine scabridula, lamina glauco-viride punctata, vagina pallide fulva. *Inflorescentia* foliis multo longiora, usque ad 1.5 dm. longa, in spicam tenue interdum ramosam subaxillam multispiculatam elongata, rhachide leviter flexuosa minute hispidula-puberula; bracteae late scarioso-marginatae, externa triangulari-ovata apice acuminato-spinosa 5 mm. longa 3 mm. lata, interioribus elliptico-oblongis 7 mm. longis 3 mm. latis leviter vel vix carinatis nervo medio in mucronem 0.5-0.75 mm. longum abrupte excurrentem. *Calyx* 1.1 cm. longus, tubo piloso, limbo albo nervis atrorubro-purpureis exceptis. *Corolla* 1.3 cm. longa. *Stamina* 8 mm. longa. *Gynaecium* 8 mm. longum.

Hills south of Tabriz, 27.6.28, flowers pink, No. 2349.

Some difficulty has been experienced in determining the affinity of this species but it appears to be related to *A. tenuiflorum* Boiss. so far as can be judged from published descriptions and the scanty material at Kew. *A. tenuiflorum* is known only from eastern Transcaucasia, prov. Elisabethpol (see Kuznetsov in Flor. Cauc. Crit. iv. 181-183 (1902)).

A. sahendicum Boiss. et Buhse Aufz. 183 (1860).

Heights above Livan, 9.25, corollas deep red, No. 1276; Mishou Dag, 19.7.28, No. 2377; 30.8.28, No. 2473; 5.8.29, No. 2523.

Distrib. Azerbaidjan.

The colour of the calyces is sometimes white with dark red-purple veins and sometimes the whole is suffused with red.

A. tragacanthinum Boiss. Diagn. Ser. I. vii. 81 (1846).

Hills south of Tabriz, 5-6.26, flowers pink, No. 1631; 6.27, Nos. 2069, 2070; 6.29, No. 2542; Sahand, end of June 1929, No. 2541.

Distrib. N. Persia.

It is doubtful if this species and *A. scorpius* Boiss. are really distinguishable. They have been united by Girard, in Ann. Sci. Nat. Sér. III. ii. 332 (1844), under the name *Statice Spachii*.

A. venustum Boiss. Diagn. Ser. I. vii. 80 (1846).

South-east of Lake Urmia, 25.5.26, flowers pink-purple, very showy, No. 1585; hills south of Tabriz, 5.29, No. 2543.

Distrib. Asia Minor, Iraq, Persia.

There is a fluctuation in the colour of the leaves, amount or absence of indumentum on the inflorescence rhachis, and in the prominence of the calyx nerves.

Acantholimon yamense Turrill, sp. nov.; ab *A. aceroso* Boiss. foliis brevioribus angustioribus tenuioribusque, inflorescentiis tenuioribus praecipue distinguitur.

Suffrutex dumoso-erineus, ramis vetustis elongatis foliorum basibus vestitis. *Folia* acerosissima, triquetria, haud planotriquetria, apice spinoso-acuminata, basi vaginata, circiter 2.3 cm. longa vagina 5 mm. longa exclusa, 0.5-0.75 mm. lata, margine minutissime scabridula, lamina glauco-viride punctata, vaginis brunneis. *Inflorescentia* foliis longior, in spicam tenuem subclaxam multispiculatam elongata, rhachide flexuosa glabra vel fere glabra haud scabra; bractae late scarioso-marginatae, externa late triangulari-ovata apice acuminato-spinosa 5 mm. longa 4 mm. lata viride rubro-purpurea suffusa, interioribus oblongis carinatis apice vix vel breviter abrupteque spinosis 7 mm. longis 3.5 mm. latis dorso atrorubro-purpureis. *Calyx* 1.2 cm. longus, inferne leviter pilosus, albus, nervis atrorubro-purpureis haud puberulis exceptis. *Corolla* 1.4 cm. longa vel longior. *Stamina* 1.1 cm. longa. *Gynaecium* 9 mm. longum.

Yam, 24.6.28, grows in huge compact cushions, flowers mauve to pink, No. 2348.

The taxonomic difficulties of the group of species or subspecies centred round *A. acerosum* Boiss. are considered by N. Kuznetsoff in the *Flora Caucasica Critica* iv. pp. 184 seq. (1902) without however overcoming them. The present species is markedly distinct from the true *A. acerosum* (Willd.) Boiss. from Asia Minor as represented by a good series of specimens at Kew, and since it does not fit the description of any other published species it has had to be described as new.

Limonium carnosum O. Kuntze Revis. Gen. Pl. 395 (1891). *Statice carnosus* Boiss. in DC. Prodr. xii. 663 (1848).

Hills north of Tabriz, 29.9.29, flowers a beautiful mauve or lilac, No. 2629.

Distrib. Azerbaidjan.

PRIMULACEAE.

Anagallis foemina Mill. Gard. Dict. ed. viii. (1768).

Near Tabriz, 8.27, flowers blue, No. 2122.

Distrib. Now nearly cosmopolitan.

Androsace maxima L. Sp. Pl. 141 (1753).

Near Tabriz, 9.4.26, flowers white often with a pink tinge, No. 1360; in garden, Tabriz, 4.27, No. 2073.

Distrib. E.N. Temp. Region.

A. maxima L., var. **flavida** Gilliat-Smith var. nov.; floribus flavidis.

Near Tabriz, 20.3.26, No. 1326; 9.4.26, No. 1359; 4.27, No. 2074. Pale yellow flowers with no tinge of pink. Flowers a little earlier than the white-flowered plants both on the hills and as a garden weed.

Glaux maritima L. Sp. Pl. 207 (1753).

Urmia district, on the plain between the lake and the town of Urmia, 5.26, No. 1530.

Distrib. N. Temp. Region.

Primula auriculata Lam. Illustr. gen. I. 429 n. 193 (1791).

Yam, 22.5.27, in a damp field, flowers pink, No. 2072; near Tabriz, flowers along mountain brooks, 20.8.27, No. 2081; under Mishou Dagh, damp meadows, 9.28, No. 2483 (forma autumnalis, showing secondary flowering after having been eaten by sheep. The plant grows up again and flowers without peduncles).

Distrib. Bithynian Olympus through Asia Minor and the Caucasus, thence to north-west and south Persia.

It is well-known that this species shows many combinations of apparently fluctuating characters. The plants under the numbers quoted are not exactly the same. Thus No. 2072 has slightly shorter corollas and relatively longer calyx lobes and flowers about three months earlier than No. 2081. After a careful examination of the rich material of the species at Kew and of the relevant literature I am unable to give even varietal names to the different collections.

Phytogeographically the species is of interest as being one of those original types which extends westwards to the Bithynian Olympus but has not reached, so far as is known, the Balkan Peninsula.

OLEACEAE.

Fraxinus oxycarpa Willd. Sp. Pl. iv. 1100 (1806). *F. oxyphylla* M. Bieb. Flor. Taur.-Cauc. ii. 450 (1808); Boiss. Flor. Or. iv. 40 (1879).

Hills south of Tabriz, Zindjanab torrent, 27.6.29, No. 2572. Turki "Kush dili" = bird's tongue.

Distrib. Medit. Region.

Syringa persica L. Sp. Pl. 9 (1753).

Tabriz, 10.5.26 (in flower), flowers mauve, No. 1493; 6.26, No. 1703 (in fruit).

Distrib. Caucasus, N. Persia.

S. vulgaris L. Sp. Pl. 9 (1753).

Tabriz, 10.5.26, No. 1494 (in flower); 6.26, No. 1701 (in fruit).

Distrib. S.E. Cent. Eur. and widely cultivated.

S. persica L. × S. vulgaris L.

Tabriz, 10.5.26, No. 1492 (in flower); 6.26, No. 1702 (in fruit).
The lilacs are known locally as "Yasmīn," i.e. Jasmine.

ASCLEPIADACEAE.

Cynanchum acutum L. Sp. Pl. 212 (1753).

Weed in garden, Tabriz, 8.26, No. 1722.
Distrib. E.N. Temp. Region.

GENTIANACEAE.

Centaureum turcicum Ronn. in Mitt. Naturw. Ver. Steiermark lii. 320 (1916).

Yam, 21.8.27, No. 2082; under Mishou Dagħ, 10.9.28, flowers red or pink, No. 2471.

Distrib. Balkan Penins., N. Asia Minor.

Gentiana ciliata L. Sp. Pl. 231 (1753).

Mishou Dagħ, 8.27, flowers blue, No. 2131; Mishou Dagħ, 10.9.28, No. 2470.

Distrib. Cent. Eur., Asia Minor, Armenia, Caucasus, Transcaucasus.

BORRAGINACEAE.

Alkanna orientalis Boiss. Diagn. Ser. I. iv. 46 (1844).

Valley of Livan, chiefly in dry places and also in the driest places on the hills south of Tabriz, smells like cowslips and the plant is sticky and glandular, 8-9.25, flowers bright yellow, No. 1293; hills south of Tabriz, 1.6.28, No. 2302. Flowers from the early spring to May and again in the autumn.

Distrib. S. Balkan Penins., and Orient.

Anchusa italica Retz. Obs. i. 12 (1779).

Near Tabriz, also at Yam, 22.5.26, No. 1629. Grows to a large size and is very showy.

Distrib. Cent. Eur., Medit. Region, Cent. Asia.

A. orientalis Reichb. f. Ic. Flor. Germ. 63, t. 109 (1858).

Valley of Livan, 9.25, flowers blue, No. 1284; garden and cornfield weed near Tabriz, 4.26, No. 1390; near Tabriz, 5.26, No. 1489, Nos. 1624, 1642 (white-flowered); 27.3.27, No. 2058; cultivated at Kew from Tabriz seed as K.435 and 34/28.

Distrib. Medit. Region and Cent. Asia.

Arnebia decumbens Coss. et Kral. in Bull. Soc. Bot. Fr. iv. 398, 402 (1857).

Hills south of Tabriz, 5.5.28, flowers pale yellow, No. 2252 (very young); 11.6.28, No. 2292; near Tabriz, 7.28, No. 2434.

Distrib. Palestine, Syria, Armenia, Iraq, Caucasus, Egypt, Arabia, Persia, N. Afr., Cent. Asia.

Bornmüller in Herb. Kew has a forma *parviflora*, which may be the same as No. 2252. The root contains a purple dye.

A. linearifolia DC. Prodr. x. 95 (1846).

Hills south of Tabriz, 5.26, flowers pale yellow, No. 1603 (very young); Urmia, 25.5.28, No. 2251.

Distrib. Egypt, Arabia, Syria, Armenia, Persia, Baluchistan.

Asperugo procumbens L. Sp. Pl. 138 (1753).

In cornfields near Tabriz, 4.26, flowers dark blue, No. 1388; garden weed near Tabriz, 29.4.26, No. 1449.

Distrib. E.N. Temp. Region.

Bilegnum medium Turrill in Kew Bull. 1929, 232.

Urmia district, 21.5.26, No. 1542.

Endemic.

Borrago officinalis L. Sp. Pl. 137 (1753).

Near Tabriz, cultivated, 7.26, No. 1667.

Distrib. Medit. Basin, and a ruderal in Cent. Eur.

Caccinia Rauwolfii C. Koch in Linnaea xvii. 303 (1843).

Near Zandjan, 3.5.28, and hills west of Tabriz, 1.5.28, No. 2264. Also on the hills north of Tabriz, flowers pink.

Distrib. Caucasus, Persia.

Root sometimes as thick as a man's thigh and as long as his leg, often forked. Used medicinally and known locally as "Tchilledagħ."

Cerinth minor L. Sp. Pl. 137 (1753), var. **hispida Turrill** in Kew Bull. 1924, 355.

Yam, 21.8.27, No. 2135; 22.5.27, No. 1860.

Distrib. (of species) Cent. Eur. and Medit. Region.

(of var.) E. Medit. Basin and Orient.

Echium italicum L. Sp. Pl. 139 (1753), sensu Boiss. Flor. Or. iv. 205 (1879).

Yam, 24.6.28, pale blue to pinkish, No. 2337.

Distrib. Medit. Region and Cent. Eur.

Heliotropium dolosum De Not. Repert. Flor. Ligur. in Mem. Acc. Tor. ix. 318 (1848).

Near Tabriz, 9.25, flowers white, No. 1308; weed in garden, near Tabriz, 6.27, No. 2126.

Distrib. E. Medit. Basin, Orient, Cent. Asia.

For a note on the nomenclature of this and the next species see *Kew Bull.* 1929, 230.

H. ellipticum Ledeb. in Eichw. Pl. nov. Casp.-Cauc. 10, t. iv. (1831-33).

Hills to the south of Tabriz, 11.6.27, flowers white, No. 2060; near Tabriz, 4.6.27, No. 2127; 6.28, No. 2433.

Distrib. Medit. Region to Cent. Asia.

Lappula barbata Gürke in Engl. u. Prantl Naturl. Pflanzenfam. iv. 3a, 107 (1893).

Near Tabriz, garden weed, 2.5.26, No. 1470 ; near Tabriz, 5.26, No. 1546. Also on roadsides at Yam and round Lake Urmia. Flowers *Myosotis*-colour.

Distrib. S.E. Eur., Asia Minor, Armenia, Transcaucasus, Syria, N. Persia, Cent. Asia.

L. echinophora *O. Kuntze* in Act. Hort. Petrop. x. 214 (1887).

Weed in garden near Tabriz, 26.4.26, No. 1418 ; 16.5.26, No. 1507 ; south of Maragha, 5.26, No. 1607 ; weed in a garden, south of Tabriz, 5.28, No. 2255. Also seen south-east of Lake Urmia. Flowers very dark blue.

Distrib. Asia Minor, Transcaucasus, Persia, Turkestan, Cent. Asia.

Lappula sp. ?

Hills north of Tabriz, 28.4.29, No. 2553. Too young for determination.

Lithospermum arvense *L.* Sp. Pl. 132 (1753).

Near Tabriz, garden weed, 4.26, No. 1382 ; garden in hills south of Tabriz, 29.4.26, No. 1429 ; 26.3.27, No. 2059 ; Urmia, 29.5.28, No. 2256.

Distrib. E.N. Temp. Region.

Flowers often pink, not blue, though the pink turns blue in drying, more usually white. The nutlets remain brown, rarely becoming white.

Moltkia caerulea *Lehm.* in Neue Schr. Naturf. Ges. Halle iii. II. 6 (1817).

Hills south of Tabriz, 4.26, No. 1450 ; 2.5.26, No. 1468 ; 20.4.27, No. 2061. Flowers rather dark blue, from mid-April to the end of May and beginning of June.

Distrib. Asia Minor, Syria, Armenia, N. Persia.

Myosotis silvatica *Hoffm.* Deutschl. Flor. ed. 1, 61 (1791) ; ed. 2, 85 (1800).

Mishou Dag, 22.5.27, No. 1791.

Distrib. E.N. Temp. Region.

Nonnea melanocarpa *Boiss.* Diagn. Ser. I. xi. 96 (1849).

Garden in hills south of Tabriz, 11.5.27, flowers purple-black, No. 1442 (?) ; near Tabriz, 11.5.27, No. 1861 ; garden weed and hills south of Tabriz, 4.28, No. 2254.

Distrib. Palestine, Syria, Persia.

No. 1442 is somewhat doubtfully identified, it may be a hybrid between this species and *N. picta* Fisch. et Mey.

N. picta *Fisch. et Mey.* Ind. Sem. Hort. Petrop. ii. 43 (1836).

Garden in hills south of Tabriz, 29.4.26, flowers dark pink, No. 1443 ; hills south of Tabriz, 6.5.27, No. 1835. Flowers normally from early May to July.

Distrib. Orient, Cent. Asia.

Onosma bilabiatum *Boiss. et Buhse* Aufz. 153 (1860). *O. elwendicum* Wettst. in Denk. Math.-Naturw. Cl. k. Akad. Wiss. I. 28 (1885).

South-east of Lake Urmia, 26.5.26, flowers pale yellow, No. 1589 ; Shor Dara (Dere), 22.5.27, Nos. 1833, 1834 ; Dik Dash, Yam, 21.8.27, No. 2096 ; hills south of Tabriz, 6.28, No. 2350 ; Yam, 25.7.29, No. 2581.

Distrib. N. Persia.

One additional specimen, No. 2351, from Yam, 6.28, may be a hybrid between this species and *O. sericeum*.

O. microspermum *Stev.* in Bull. Soc. Imp. Nat. 1838, 305, Boiss. Flor. Or. iv. 191 (1879).

Heights above Livan, also hills south of Tabriz, flowers bright yellow, 8-9.25, No. 1275 ; near Tabriz, 12.5.27, No. 1832 ; hills north of Tabriz, 24.4.29, No. 2559.

Distrib. Armenia, Caucasus, Kurdistan, Persia.

O. petiolatum *Turrill* in Kew Bull. 1929, 234.

Yam, 19.7.28, flowers yellow, No. 2435.

Endemic.

O. sericeum *Willd.* Sp. Pl. i. 774 (1798).

Urmia district, 5.26, No. 1543 ; near Tabriz, 5.26, flowers yellow, No. 1595.

Distrib. N. and E. Asia Minor, Armenia, Caucasus, N. Persia.

O. flavum Boiss. is probably not specifically distinct.

Paracaryum undulatum *Boiss.* Diagn. Ser. I. xi. 129 (1849).

Hills south of Tabriz, 5.26, No. 1685 ; 12.5.27, No. 1836. Flowers from mid-May to July in varying shades of dark pink and purple.

Distrib. N. Persia.

Rindera (Cyphomattia) lanata *Gürke*, var. *canescens* *Kuznetsoff* in Trav. Mus. Bot. Acad. Imp. St. Petersb. vii. 48 (1910).

Urmia district, 20.5.26, No. 2531 ; Mishou Dag, 5.27, No. 1859 (very young) ; Band, 25.5.28, and Sir, 27.5.28, No. 2257 ; above Zindjanab, Sahand Range, 26.6.29, No. 2508.

Distrib. Asia Minor, N. Syria, Iraq, Armenia, Persia.

Rochelia disperma *Hochr.* in Ann. Conserv. et Jard. Bot. Genève vii.-viii. 195 (1904). *R. stellulata* *Reichb.* in Flora vii. 243 (1824).

Garden in hills south of Tabriz, 5.26, Nos. 1428, 1545. Flowers *Myosotis*-blue.

Distrib. S.E. Eur., Medit. Region, Cent. Asia.

CONVOLVULACEAE.

Convolvulus arvensis *L.* Sp. Pl. 153 (1753).

Yam, 8.27, No. 2023 ; Tabriz, garden weed, 7.27, No. 2064.

Distrib. Now practically cosmopolitan.

C. commutatus Boiss. Diagn. Ser. I. xi. 81 (1849).

East of Lake Urmia, 5.26, flowers white with a pink tinge, No. 1594; hills north of Tabriz, 15.5.27, No. 2062 (forma vel var.); 5.29, No. 2546.

Distrib. Iraq, Armenia, N. Persia.

For a note on this species see *Kew Bull.* 1929, 230.

Cuscuta approximata Bab. in Ann. & Mag. Nat. Hist. xiii. 253 (1844).

Near Tabriz, 18.7.27, flowers white, No. 1988; weed in garden near Tabriz, 7.28, No. 2431.

Distrib. Medit. Region and Cent. Asia.

SOLANACEAE.

Hyoscyamus niger L. Sp. Pl. 179 (1753).

Yam, 5.27, No. 2115. Also seen near Urmia 1926.

Distrib. E.N. Temp. Region.

H. pusillus L. Sp. Pl. 180 (1753).

Near Tabriz, 16.5.26, flowers clear yellow, No. 1505; 10.5.26, No. 1683; near Zandjan, 3.5.28, No. 2253.

Distrib. Orient and Cent. Asia.

H. reticulatus L. Sp. Pl. ed. 2. 257 (1762).

Near Tabriz, 4.26, Nos. 1386, 1387; 29.4.26, No. 1458; 25.4.27, No. 2114.

Distrib. Asia Minor, Armenia, Iraq, Transcaucasus, Persia.

Flowers from end of April to July. The flowers in the bud are often the colour of *H. niger* but later become a beautiful purple or vary from pink to purple or are even a dirty cream. No. 1386 has the floral parts in sixes. The long thick silvery indumentum of young plants glistens marvellously in the sun.

Lycium ruthenicum Murr. in Comm. Götting. 1779, 9, t. 2 (1780).

Near Tabriz, in waste places, cemeteries, and gardens, 8.25 (fruiting), No. 1300; 6.26, No. 1712; 22.6.27, No. 2042. Fruit black and globular, flowers light violet.

Distrib. S. Russia, Transcaucasus, N. Persia, Turkestan, Cent. Asia.

Solanum Dulcamara L. Sp. Pl. 186 (1753), var. **indivisum** Boiss. Flor. Or. iv. 285 (1879).

Near Tabriz, 8.27, flowers violet, No. 2124.

Distrib. (of species) E.N. Temp. Region.

(of var.) here and there with the species, especially in the Orient.

S. nigrum L. Sp. Pl. 186 (1753), var. **humile** Boiss. Flor. Or. iv. 284 (1879).

Weed in garden, near Tabriz, 8.27, No. 2123a. Fruits orange-yellow coloured, flowers white.

Distrib. (of species) nearly cosmopolitan.

(of var.) Medit. Region.

SCROPHULARIACEAE.

Bunaea trifida C. A. Mey. Verz. Pfl. Cauc. 109 (1831).

Urmia district, 5.26, No. 1524; hills to the north of Tabriz, 15.5.28, and Mt. Sir, 27.5.28, No. 2328; above Zindjanab, Sahand Range, 25-27.6.29, No. 2512.

Distrib. Asia Minor, Armenia, Persia.

Celsia persica C. A. Mey. Verz. Pfl. Cauc. iii (1831).

Hills south of Tabriz, 5.26, No. 1682. Flowers primrose-yellow from the end of May till autumn.

Distrib. N. Persia.

Euphrasia pectinata Ten. Flor. Nap. i. Prodr. 36 (1811); Wettst. Monogr. Euphrasia 82 (1896).

Mishou Dag, 8.29, flowers white, No. 2607.

Distrib. Medit. Region.

Linaria dalmatica Mill. Gard. Dict. ed. viii. (1768).

Valley of Livan and heights around, 6.9.25, flowers yellow. No. 1291.

Distrib. S.E. Eur., Balkan Penins., Orient.

L. dalmatica Mill. var. **grandiflora** Boiss. Flor. Or. iv. 376 (1879).

Above Zindjanab, Sahand Range, 25-27.6.29, flowers yellow, No. 2509.

Distrib. (of var.) Orient.

One specimen, No. 2396, near Tabriz, 8.28, is intermediate between the type and var. *grandiflora* Boiss. in the size of its flowers.

L. kurdica Boiss. et Hohen. in Boiss. Diagn. Ser. I. iv. 73 (1844).

Mishou Dag, near the summit, 30.8.28, flowers yellow, No. 2477.

Distrib. E. Asia Minor, Kurdistan, Armenia, N. Persia.

The specimen is rather a poor one with the fruits somewhat smaller than in authenticated material.

L. lineolata Boiss. Diagn. Ser. I. xii. 42 (1853).

Near Tabriz, 5.6.27, flowers yellow with violet-brown veins, No. 1882; hills to the south of Tabriz, 5.6.27, No. 2030.

Distrib. Persia.

L. lineolata Boiss., var. **latifolia** Turrill var. nov.; a planta vulgare foliis usque ad 4.5 cm. longis et 1.1 cm. latis differt.

Yam, 8.27, No. 2014; Sir, 27.5.28, No. 2329.

This broad-leaved variety is in foliage characters quite distinct from the common examples of this species. It recalls some of the varieties of *L. genistifolia* Mill. but has the violet reticulate venation of the corolla described as characteristic of *L. lineolata*. It is doubtful if the var. *venosa* Boiss. of *L. genistifolia* is distinct from *L. lineolata*. It was described by Boissier and Reuter as a distinct species—*L. Balansae* in Boiss. Diagn. Ser. II. iii. 163 (1856).

The following floral measurements of the var. *latifolia* may be useful: *Calyx* segments linear, acute, 4-5 mm. long, 1.5 mm. broad, margin slightly ciliate. *Corolla* (without spur) 1.2 cm. long; spur 8 mm. long.

L. persica Chav. Monogr. 173 (1833).

Near Tabriz, 29.5.27, No. 1883; hills south of Tabriz, 5.29, No. 2565. Flowers violet-coloured.

Distrib. Asia Minor, Syria, Armenia, Transcaucasus, N. Persia, Turkestan.

Linaria sp.

Near Tabriz, 6.28, No. 2412.

Odontites Aucheri Boiss. Diagn. Ser. I. iv. 74 (1844).

Yam, 12.7.28, flowers yellow, No. 2397; Mishou Dagh, Yam, 9.28, No. 2476.

Distrib. Asia Minor, Armenia, Syria, Persia.

Pedicularis comosa L. Sp. Pl. 609 (1753), var. **acmodonta** Boiss. Flor. Or. iv. 492 (1879).

Yam, 11.5.28, No. 2327.

Distrib. (of species) E.N. Temp. Region.
(of var.) Orient.

Scrophularia alata Gilib. Flor. lith. i. 127 (1781), var. **pubescens** Turrit var. nov.; foliis cordatis junioribus praecipue pagina utraque inferiore densius pubescentibus distinguitur.

In gardens north-east of Tabriz, 6.27, No. 2031.

Distrib. (of species) Eur., Orient, Cent. Asia.

This variety agrees with the var. *cordata* Boiss. in having the leaf-bases cordate but the definite indumentum is not found in Oriental material at Kew nor mentioned in any varietal description.

S. variegata M. Bieb. Flor. Taur.-Cauc. ii. 78 (1808).

Hills south of Tabriz, 5.26, flowers reddish-brown, No. 1639; 23.6.27, No. 2032; Dik Dash, Yam, 21.8.27, Nos. 2090, 2095; Yam, 11.5.28, No. 2330; hills south of Tabriz (fruit) 6-8.28, No. 2331.

Distrib. Asia Minor, Caucasus, Armenia, Syria, Iraq, Persia.

The species is known to be very polymorphic but it is with some hesitation that the above specimens have all been considered conspecific. It is doubtful if the shape of the staminode is a reliable taxonomic character. No. 2094 and perhaps No. 2330 are best placed under the var. *rupestris* Boiss. Flor. Or. iv. 417 (1879).

Verbascum speciosum Schrad. Hort. Gotting. 22, t. 16 (1809).

Hills to the south of Tabriz, in large colonies, 9.6.27, flowers yellow, No. 2033.

Distrib. Cent. and S.E. Eur., Asia Minor, Armenia, N. Persia.

Veronica anagallis-aquatica L. Sp. Pl. 12 (1753).

Near Tabriz, 21.8.27, flowers blue, No. 2112.

Distrib. E.N. Temp. Region.

V. Biebersteinii Richter in Denkschr. Math.-Nat. Cl. K. Akad. Wiss. 1. 24 (1885). *V. multifida* M. Bieb. vix Linn.

Hills south of Tabriz, 29.4.26, flowers blue, No. 1430; 5.5.29, No. 2558.

Distrib. Asia Minor, Armenia, Caucasus.

V. campylopoda Boiss. Diagn. Ser. i. iv. 80 (1844).

Near Tabriz, 14.4.26, flowers dark blue, No. 1370; garden weed, Tabriz, 4.26, No. 1383; Tabriz, 29.4.26, No. 1456; cultivated at Kew as K. 403, 1927. Flowers in April and May.

Distrib. Asia Minor, Syria, Armenia, Iraq, Persia, Afghanistan, Baluchistan.

V. hederifolia L. Sp. Pl. 13 (1753).

Tabriz, garden weed, 12.3.26, flowers pale lilac-blue, No. 1321; 11.5.27, No. 2038.

Distrib. Eur. and Medit. Region.

V. intercedens Bornum. in Beih. Bot. Centrbl. xxii. 11. 112 (1907)

Band, 2.5.28, No. 2324.

Distrib. Kurdistan.

V. kurdica Benth. in DC. Prodr. x. 473 (1846).

Zindjanab, 6.29, No. 2638.

Distrib. Armenia, Persia.

V. microcarpa Boiss. Diagn. Ser. i. iv. 76 (1844).

Khoi, 21.5.28, and Band, 25.5.28, flowers blue, No. 2325.

Distrib. N. Persia, Armenia.

V. orientalis Mill. Gard. Dict. ed. viii (1768).

Hills south of Tabriz, 21.5.27, flowers blue, No. 2036; Band, 25.5.28, No. 2326.

Distrib. Crimea, Asia Minor, Armenia, Iraq, Persia.

V. orientalis Mill., var. **tenuifolia** Boiss. Diagn. Ser. ii. iii. 167 (1856).

Near Tabriz, 5.26, flowers blue, No. 1736; Mishou Dagh, 22.5.27, No. 2037.

Distrib. (of var.) Crimea, Armenia, Iraq, N. Persia.

Plants with characters intermediate between those of *V. orientalis* Mill. and those of *V. Biebersteinii* Richter, so far as can be judged from the available material, are Nos. 2034, 2035, hills south of Tabriz, 5.27.

V. polita Fries Novit. Flor. Suec. ed. II. 1 (1828).

Tabriz, garden weed, 12.3.26, flowers blue, No. 1322. Flowers all the winter and on to April.

Distrib. E.N. Temp. Region.

V. triphyllos L. Sp. Pl. 14 (1753).

Hills south of Tabriz, 5.5.26, flowers blue, No. 1477.

Distrib. Cent. Eur. and Medit. Region.

OROBANCHACEAE.

Orobanche aegyptiaca Pers. Syn. ii. 181 (1807).

Hills south of Tabriz, 11.25, No. 1310; a very beautiful violet-mauve colour, 9.27, No. 2171.

Distrib. N. Afr., Cyprus, Palestine, east to Persia and N. India.

O. caesia Reichb. Icon. vii. 48, f. 936 (1829).

Tabriz, 8.26, No. 1728.

Distrib. S. Russia, Armenia, to Cent. Asia.

This is probably the β *borealis* Turcz. var. *caucasica* Beck in Verhl. Zool.-Bot. Ges. Wien. lx. 158 (1910) of which I have not succeeded in tracing the original description.

PEDALIACEAE.

Sesamum indicum L. Sp. Pl. 634 (1753).

Near Tabriz, 9.27, flowers white or cream white, No. 2155. Locally known as "Kundjid."

Distrib. Widely cultivated and occurring as an escape from cultivation in the East. Native country unknown, but possibly India.

The capsules are shorter than in most specimens at Kew.

SELAGINACEAE.

Globularia trichosantha Fisch. et Mey. Ind. Sem. Hort. Petrop. v. 36 (1839).

Urmia district, 5.26, sky blue, No. 1539; Sir, Urmia district, 27.5.28, No. 2263. Also seen on Mishou Dag.

Distrib. Asia Minor, Armenia, Syria.

Gymnandra stolonifera C. Koch in Linnaea xvii. 289 (1843).

Yam, roadsides, 11.5.28, flowers blue, No. 2265.

Distrib. Asia Minor, Armenia, Persia, Afghanistan, W. Himalayas.

LABIATAE.

Ajuga chamaecistus Ging. ex Benth. Lab. Gen. et Sp. 698 (1835).

East of Lake Urmia, 5.26, No. 1588.

Distrib. Persia.

A. chia Schreb. Pl. Vert. Unilab. 25 (1774).

North-east of Tabriz, 29.10.27, flowers yellow, No. 2184.

Distrib. S. Balkan Penins. east to Persia.

Calamintha graveolens Benth. DC. Prodr. xii. 231 (1848).

Mishou Dag, 22.5.27, No. 1797, 2053.

Distrib. E. Medit. Region.

Clinopodium vulgare L. Sp. Pl. 587 (1753).

Mishou Dag, waterfall ravine, 13.9.29, flowers red-purple, No. 2641.

Distrib. E.N. Temp. Region.

Dracocephalum Moldavica L. Sp. Pl. 595 (1753).

Tabriz, cultivated in gardens as a pot-herb, 7.28, flowers violet-blue, No. 2407; Tabriz, 7.28, No. 2478.

Distrib. Original home probably the W. Himalayas, now widely spread as a cultivated plant and alien in many parts of the N. Temp. Region.

This plant is said to be called locally by the Persian name of "Badirash-Bu," but this name is applied to all kinds of plants with a smell like "balm." This one certainly smells like *Melissa officinalis*.

Eremostachys laciniata Bunge in Ledeb. Flor. Alt. ii. 416 (1830).

Mt. Sir, Urmia district, 5.26, flowers cream white, No. 1529; hills south of Tabriz, 6.27, No. 1967.

Distrib. Asia Minor, Syria, Palestine, Transcaucasus.

E. macrophylla Montb. et Auch. in Ann. Sci. Nat. Sér. vi. 54 (1836).

Band, Urmia, 25.6.28, flowers cream-yellow, No. 2228; hills north of Tabriz, 15.5.28, No. 2229.

Distrib. E. Asia Minor, Armenia, Iraq, Persia.

E. Tournefortii Jaub. et Spach Ill. Or. v. 12, t. 412 (1853-57).

Near Khoi, 21.5.28, and Sir, Urmia district, 27.5.28, flowers cream-white, No. 2230.

Distrib. Azerbaidjan, Armenia.

The drawing associated with the original description is decidedly inaccurate.

Lallemantia iberica Fisch. et Mey. Ind. Sem. Hort. Petrop. vi. 53 (1840).

Hills to the south of Tabriz, 5.6.27, No. 1798, flowers violet-blue; above Zindjanab, Sahand Range, 25-27.6.29, No. 2503, flowers violet-blue but the plant as tall and big as the cultivated var. *albiflora*; cultivated at Kew from Tabriz seeds as 44b, 29.6.28.

Distrib. Asia Minor, Armenia, N. Persia, Iraq, Palestine.

L. iberica Fisch. et Mey., var. *albiflora* Turill; floribus albis. *L. iberica* f. *albiflora* E. Bordzil in Mem. Soc. Nat. de Kiev xxv. 106 (1915).

Near Tabriz, 6.7.26, No. 1658; cultivated at Tabriz from seeds obtained in the bazaar, in flower 5.28, in fruit 6-7.28, Nos. 2306, 2436.

Distrib. Cultivated in Persia.

This variety is cultivated as a pot-herb and as a medicinal herb for the nutlets. It is known in Turki as "Gara za'ra'k," i.e. "little black seeds." The flowers are white or more rarely a cream colour and only the white or cream flowered plants are cultivated.

Lamium album L. Sp. Pl. 579 (1753).

Above Zindjanab, Sahand Range, 25-27.6.29, No. 2525.

Distrib. E.N. Temp. Region.

L. amplexicaule L. Sp. Pl. 579 (1753).

Near Tabriz, 5.26, No. 1484.

Distrib. E.N. Temp. Region.

Marrubium astracanicum Jacq. Ic. Pl. Rar. i. 11, t. 109 (1781-86).

Urmia district, 21.5.26, flowers light pink or purple, No. 1553.

Distrib. Asia Minor, Armenia, N. Persia.

M. parviflorum Fisch. et Mey. Ind. Sem. Hort. Petrop. i. 33 (1835).

Dik Dash, Yam, 24.6.28, flowers white, No. 2342; Yam, 7.8.29, No. 2545.

Distrib. Asia Minor, Armenia, N. Persia.

M. persicum C. A. Mey. Verz. 95 (1831).

Near Tabriz, 10.6.27, flowers light purple, No. 1872; hills south of Tabriz, 14.6.28, No. 2241.

Distrib. Transcaucasus, N. Persia.

M. propinquum Fisch. et Mey. Ind. Sem. Hort. Petrop. i. 33 (1835).

Near Tabriz, 5.26, flowers light purple, No. 1572; south-east of Tabriz, in a garden, 16.5.28, No. 2239; Tabriz, in a garden, 5.6.28, No. 2240.

Distrib. N. Persia.

Mentha mollissima Borckh. ex Gaertn. Mey. et Scherb. Flor. Wett. ii. 348 (1800).

Yam, 7.8.27, flowers purplish mauve, No. 1960.

Distrib. E.N. Temp. Region.

M. spicata L. Sp. Pl. 576 (1753), α **viridis** L. Sp. Pl. 576 (1753).

Near Tabriz, cultivated in a garden, 7-8.27, flowers purplish mauve, No. 1966.

Distrib. Eur.

The species does not fruit in the Tabriz district but is propagated vegetatively only.

Nepeta heliotropifolia Lam. Dict. i. 711 (1785).

Yam, 11.5.28, No. 2225. Flowers violet-blue, May to June, and fruits July to August.

Distrib. E. Asia Minor, Iraq, N. Persia.

N. longiflora Vent. Jard. Cels. 66, t. 66 (1800).

Yam, 24.6.28, No. 2343.

Distrib. Persia.

N. micrantha Bunge in Ledeb. Flor. Alt. ii. 401 (1830).

Hills south of Tabriz, 5.5.26, flowers pale pinkish violet, No. 1476; near Tabriz, 6.7.26, No. 1674; 5.26, No. 1739; 21.5.27, No. 1873; 7.29, No. 2531; cultivated at Kew from Tabriz seed as K. 440, 21.7.27.

Distrib. Armenia, Persia, Turkestan, Baluchistan.

N. Mussinii Spreng. ex Henck. Adumb. Pl. Hort. Hal. 15 (1806); Boiss. Flor. Or. iv. 660 (1879).

Valley of Livan, 9.25, flowers pale violet-blue, No. 1288; Urmia district, 5.26, No. 1561; near Tabriz, 5.27, No. 1874.

Distrib. Transcaucasus, Armenia, N. Persia.

N. ucranica L. Sp. Pl. 570 (1753).

Band, Urmia, 25.6.28, No. 2227.

Distrib. Transylvania, S. Russia, E. Asia Minor, Caucasus, Armenia, Cent. Asia.

No. 2226 from Band and pass between Khoi and Salmas 21-25.5.28, may be a very young state of this species.

Nepeta sp.

Hills south of Tabriz, along the Zindjanab torrent, 27.6.29, flowers purple-violet, No. 2570.

This appears to represent a new species of the Section *Eunepea*, Subsection *Micronepea*. The material available, however, is insufficient for making a good description.

Ocimum Basilicum L. Sp. Pl. 597 (1753).

Cultivated at Tabriz as a pot-herb, 8.28, flowers white with a pink tinge, No. 2406. Persian and Turki "Reihan."

Distrib. Widely cultivated in the Medit. Region.

Phlomis armeniaca Willd. Sp. Pl. iii. 119 (1801).

North-east of Saudj Bulaq, flowers orange-yellow, very showy, 5.26, No. 1584.

Distrib. Throughout Asia Minor to Armenia, Caucasus, and N. Persia.

This is the narrow-leaved variety or form equivalent, according to the description, to *P. lanceolata* Boiss. Diagn. Ser. i. v. 36 (1844). That it is also the original *armeniaca* of Willdenow becomes evident from his description "foliis omnibus petiolatis lanceolatis."

P. armeniaca Willd., var. **subcordata** Bornm., in Herb. Kew. Iter Pers.-turc. 1657, 1658 (1893).

Near Yam, 8.27, No. 1964.

Distrib. (of var.) Kurdistan, E. Asia Minor.

It is well-known that in leaf-shape plants of *P. armeniaca* sometimes approach *P. orientalis* Mill. Gard. Dict. ed. viii. (1758). I have not been able to trace the publication of Bornmüller's very suitable name in any of his papers, but it is useful for those plants where the leaves, especially or only the lower ones, are slightly cordate.

P. pungens Willd. Sp. Pl. iii. 121 (1801). *P. herba-venti* L. var. *tomentosa* Boiss. Flor. Or. iv. 791 (1879).

Near Tabriz, 21.8.27, flowers purple-pink, No. 2129; Yam, 24.6.28, No. 2339. The seed apparently does not always set.

Distrib. Balkan Penins. eastwards to Persia.

P. tuberosa L. Sp. Pl. 586 (1753).

Top of Dik Dash, Yam, 24.6.28, flowers purplish pink, No. 2341; also seen on Mishou Dagh in August.

Distrib. Cent. Eur. to the Caucasus and Cent. Asia.

Prunella vulgaris L. Sp. Pl. 600 (1753).

Yam, wet grassy fields, 7.28, flowers purple-blue, No. 2376.

Distrib. Now nearly cosmopolitan.

Salvia aethiopis L. Sp. Pl. 27 (1753).

Yam, 7.29, flowers white, No. 2527.

Distrib. Cent. and S. Eur. east to N. Persia.

S. armeniaca Grossheim (?) in Beih. Bot. Centrbl. xlv. 237 (1927). *S. staminea* var. *armeniaca* E. Bordzil, in Trav. du Soc. des Nat. de Kiev xxv. (1915).

Pass between Khoi and Salmas, 21.5.28, flowers white, No. 2235.

Unfortunately neither specimens nor description are available for comparison and the suggested identification is based on the resemblance of our plant to *S. staminea*.

S. ceratophylla L. Sp. Pl. 27 (1753).

Near Tabriz, 27.5.27, flowers white, No. 1865.

Distrib. Asia Minor, Armenia, Syria, Iraq, Persia.

S. (Sect. Aethiopis § Gongrosphaceae) Gilliatii Turrill sp. nov.; a *S. cyanescens* Boiss. et Huet planta tota minus tomentosa, foliis basi gradatim attenuatis, corollae labio superiore majore differt.

Herba perennis usque ad 4.5 dm. alta, caule ascendente pilis crispis et longis et brevibus praedito. *Folia* inferiora anguste elliptica, apice acuta vel subacuta, basi in petiolum 2-3 cm. longum gradatim attenuata, petiolo incluso 10-12 cm. longa, 2-3 cm. lata, utrinque leviter tomentoso-pilosa, glandulis aureis perpaucis instructa, in pagina inferiore costa nervisque prominentibus, superiore costa subprominente nervis impressis saepe plus minusve rugosa, margine irregulariter crenata vel fere lobata; caulina petiolo breviora vel foliis sessilibus. *Inflorescentia* ramosa, laxa, multiflora, verticillastris 2-5-floris, laxa, 2-6 dm. longa, glanduloso-pilosa; bracteae late ovatae apice attenuato-spinosae, 9 mm. longae, 7 mm. latae, longe pilosae. *Calyx* 1.1 cm. longus, lobis 4-5 mm. longis acuminato-spinosis, pilosus, glandulis aureis sessilibus dispersis instructus. *Corolla* 1.8 cm. longa, leviter pilosa et glandulis aureis paucis instructa, labio superiore 8-9 mm. longo, inferiore 9 mm. lato. *Filamenta* glabra. *Stylus* in parte media pilosulus, inferne glaber longe exsertus.

Pass between Khoi and Salmas, 21.5.28, flowers bluish-white with yellowish tinge, No. 2234.

In addition to its relationship to *S. cyanescens* this plant is in certain respects intermediate between *S. sahendica* Boiss. et Buhse and *S. limbata* C. A. Mey. Unfortunately no type specimens of the former are available for comparison but the obvious spreading branching of the inflorescence and its general lax nature seem to prevent our plant being placed under it, though further collecting may indicate that *S. limbata*, *S. sahendica*, and *S. Gilliatii* are all varieties or forms of one polymorphic species.

S. Hydrangea Benth. Lab. Gen. et Species 717 (1835).

Urmia district, 5.26, flowers and bracts purplish-pink, No. 1537; east of Lake Urmia, 5.26, No. 1591; Sir, Urmia, 27.5.28, No. 2231; hills south of Tabriz, 11.6.28, No. 2232. Turki "Issikuttuz." The inflorescence is used in making medicinal tea.

Distrib. N. Persia and Kurdistan.

There is considerable variation in the size of the flowers and the density of the inflorescence, and the series undoubtedly links the species with *S. Sheilii* Boiss. Diagn. Ser. I. vii. 45 (1846).

S. limbata C. A. Mey. Verz. 86 (1831).

Mishou Dagh, 12.7.28, flowers whitish, No. 2402 (var. ? calyce longe papilloso-hirsuto pilis albis vel purpureis instructo, floribus subminoribus); Yam, 20.7.28, No. 2403.

Distrib. N. Persia, Armenia.

S. nemorosa L. Sp. Pl. ed. 2. 35 (1762).

Near Tabriz, 26.5.26, flowers from purple to violet-purple, No. 1656, only as a weed in gardens; cultivated at Kew from Tabriz seed, as K.429, 10.7.28, 14.8.28, and 13.10.28. At Tabriz flowers from end of May onwards.

Distrib. E.N. Temp. Region.

S. officinalis L. Sp. Pl. 23 (1753).

Tabriz, cultivated in a garden, 5.26, flowers violet-blue, No. 1664. It has no local name and is not in use by the natives.

Distrib. Medit. Basin.

S. sahendica Boiss. et Buhse Aufz. 172 (1860).

Near Tabriz, one of the commonest plants on the hills everywhere, 8-9.25, flowers white occasionally with a bluish tinge, No. 1296; 7.26, No. 1696; 7.27, No. 1864 (one sheet with broader, one with narrower leaves); above Zindjanab, Sahand Range, 25-27.6.29, No. 2516 (broader leaves).

Distrib. Azerbaidjan.

The specimens show a range of fluctuation in leaf size and shape. In damper spots at higher altitudes the plant is much taller and a gradual transition is apparent from the plants on the dry hills south of Tabriz to those in more favourable habitats on the Sahand Range,

where the colouring too is different, the leaves being often dark-purple at the apices and margins, the bracts also dark-purple, and the bluish tinge of the corolla more pronounced.

S. spinosa L. Mant. ii. 511 (1771).

Hills south of Tabriz, near Kulidjan, 29.6.28, No. 2353; plain west of Tabriz, 7.29, No. 2526. The calyx enlarges in the fruit and is then often red; the flowers are white.

Distrib. Arabia, Syria, Iraq, Persia.

S. suffruticosa Montb. et Auch. ex Benth. in Ann. Sci. Nat. Sér. II. vi. 39 (1836).

Urmia district, 5.26, No. 1556; plain below Sir, 27.5.28, No. 2233. Flowers yellow.

Distrib. Syria, E. Asia Minor.

S. syriaca L. Syst. ed. x. 854 (1759).

Sir, in masses all over the plain below, 27.5.28, flowers white, No. 2236.

Distrib. Asia Minor, Syria, Iraq, Armenia, N. Persia.

S. Szovitsiana Bunge. Lab. Pers. 43 (1873).

Urmia district, 21.5.26, flowers purple, No. 1538.

Distrib. N. Persia.

S. verticillata L. Sp. Pl. 26 (1753).

Weed in gardens and waste places near Tabriz, 7.26, No. 1672. Flowers pale violet-mauve, from May to August.

Distrib. Cent. and S. Eur., Asia Minor, Armenia, Caucasus, N. Persia.

S. virgata Boiss. Flor. Or. iv. 627 (1879).? Ait. Hort. Kew. i. 39 (1789). *S. campestris* Guldenst. e Bornm. Verh. Zool.-Bot. Ges. Wien lx. 162 (1910).

Yam, 7.8.27, flowers violet-blue, No. 1959.

Distrib. Cent. Eur. and Medit. Region.

Satureia hortensis L. Sp. Pl. 568 (1753).

Tabriz, cultivated in garden, 7-8.27, flowers white, pink tinged, No. 2050. Locally known as "Nāna."

Distrib. E.N Temp. Region.

Scutellaria orientalis L. Sp. Pl. 598 (1753), var. **pinnatifida** Boiss. Flor. Or. iv. 682 (1879).

Western end of Shor Dara (Dere), near Mishou Dag, 22.5.27, flowers bright yellow, seeds pale mauve, No. 1867.

Distrib. (of species) Medit. Region and Cent. Asia.
(of var.) E. Medit. Region.

S. pinnatifida Arth. Hamilt. Monogr. Scutell. 16, t. 2. f. 2 (1832); Boiss. Flor. Or. iv. 683 (1879).

East of Lake Urmia, 5.26, flowers bright yellow, No. 1592; hills south of Tabriz, 5-6.26, No. 1628; 26.5.27, No. 1866.

Distrib. Persia.

S. pinnatifida Arth. Hamilt. var., **mucida** Bornm. Iter Persicum alternum 1902, No. 8058 in Herb. Kew. *S. mucida* Stapf in Denkschr. Math. Nat. Cl. K. Akad. Wiss. I. 48 (1885).

Urmia district, 5.26, corolla with upper lip purplish-brown, lower lip yellow, No. 1557; plain below Sir, 27.5.28, No. 2237.

Distrib. (of var.) N. Persia.

Sideritis montana L. Sp. Pl. 575 (1753).

Valley of Livan, among rocks near torrent, 9.25, No. 1281. Also occurs near Yam and on hills south of Tabriz. The flowers are pure yellow with no brown blotch on any part.

Distrib. S.E. Eur. and Medit. Region.

Stachys fruticulosa M. Bieb. Flor. Taur.-Cauc. ii. 51 (1808).

Hills north of Tabriz, 5.26, No. 1711; 15.7.27, No. 1875; near Band, Urmia district, 25.5.28, No. 2238; Yam, 20.7.28, No. 2399; Mishou Dag, 12.7.28, No. 2405. Flowers in April and May, in white and pink flowered forms.

Distrib. Caucasus and N. Persia.

S. inflata Benth. Lab. Gen. et Species 562 (1834).

Urmia district, 5.26, flowers very showy purple pink, No. 1569; near Tabriz, 5.26, Nos. 1578, 1632, 1698.

Distrib. Caucasus, Iraq, Persia.

S. lavandulifolia Vahl Symb. Bot. i. 42 (1790).

Urmia district, 20.5.26, flowers purple, No. 1559; north-east of Sundj Bulaq, 15.5.26, No. 1580; hills north of Tabriz, 15.5.27, No. 2051. Also seen on Mishou Dag and Sahand. Flowers in late April and early May.

Distrib. Asia Minor, Armenia, Caucasus, Kurdistan, Persia.

The plant is used locally as a remedy for spasms and stomach disorders, the whole inflorescence being used as a tea and sold thus in the bazaars. Its local name is "Mardangüsh" the ü being mispronounced in Turki as ü in German übel. It probably means "men's-ears" or "men's-fingers" ("Mard-angusht").

S. pubescens Ten. Prodr. Flor. Nap. p. xxxiv. (1811-15).

Yam, flowers white, 21.8.27, No. 2207; 7.28, No. 2401; 13.9.28, No. 2479.

Distrib. E. Medit. Basin east to Armenia and N. Persia.

S. setifera C. A. Mey. Verz. 94 (1831).

Near Yam, marshy places, flowers purple, 21.8.27, Nos. 2208, 2209, and fruits 44d (1927); 7-8.28, No. 2404.

Distrib. Asia Minor, Caucasus, Persia, Afghanistan.

Teucrium Chamaedrys L. Sp. Pl. 565 (1753).

Mishou Dagh, rocky places, 2.9.29, flowers purple, No. 2631.
Distrib. E.N. Temp. Region.

T. orientale L. Sp. Pl. 562 (1753).

Valley of Livan, 9.25, No. 1295; near Tabriz, 6.26, No. 1695; 29.5.27, No. 1751; hills south of Tabriz, 5-7.27, No. 2052. Flowers violet and very showy.

Distrib. Asia Minor, Syria, Caucasus, Armenia, N. Persia.

No. 1751 certainly, and the remainder probably, belong to the var. *villosum* Benth. in DC. Prodr. xii. 577 (1848). It is doubtful if the variety is more than an extreme development of a fluctuating series.

T. Polium L. Sp. Pl. 566 (1753) s.l.

Hills south of Tabriz, 7.26, flowers dirty white, No. 1740; Mishou Dagh, 8.27, No. 1963; Dik Dash, Yam, 21.8.27, No. 2097.

Distrib. Medit. Region.

The "varieties" of this species require intensive field and breeding studies to be done on them before their taxonomy is clear. The first number quoted above approaches the var. *angustifolium* Benth. and the other two the var. *lanuginosum* Celak. (as determined by Freyn in Herb. Kew.).

Thymus Kotschyanus Boiss. et Hohen. Diagn. Ser. I. v. 16 (1844).

Yam, 22.5.27, flowers shades of pink, No. 1965; near Tabriz, 5.28, No. 2400 (probably the var. *hirtus* Boiss. et Hohen. l.c. 17); above Zindjanab, Sahand Range, 25-27.6.29, No. 2507; Mishou Dagh, 8.29, No. 2608.

Distrib. Asia Minor east to Persia.

This is a very polymorphic species which has not yet been satisfactorily subdivided.

Ziziphora capitata L. Sp. Pl. 21 (1753).

Very common on plain at foot of Mishou Dagh, 5.8.29, flowers purple violet, No. 2587.

Distrib. Medit. Region.

Z. clinopodioides M. Bieb. Flor. Taur.-Cauc. i. 17 (1808), sensu Boiss. Flor. Or. iv. 585 (1879).

Common all over the hills near Livan, 9.25, various shades of pink, mauve, to nearly white, No. 1283; Mishou Dagh, 7.8.27, No. 1961; hills south of Tabriz, 15.7.27, No. 1962.

Distrib. Asia Minor, Armenia, Caucasus, Kurdistan, Persia, Baluchistan, Afghanistan, Cent. Asia.

This species, in the wide sense, is very polymorphic; several of Boissier's varieties have been raised to specific rank, but the reasons for so doing have not been adequately given. Probably Nos. 1283 and 1962 above should be placed under the var. *rigida* [*Z. rigida* Stapf Bot. Erg. Pol.-Exp. Pers. in Denkschr. Math. Naturw. Cl. K. Akad. Wiss. Wien I. 39 (1885)] and No. 1961 approaches most nearly to the var. *canescens*.

Z. tenuior L. Sp. Pl. 21 (1753).

Near Tabriz, 21.5.27, flowers purplish violet, No. 1876a; near Maragha, 5.26, No. 1602; cultivated at Kew from Tabriz seed, as 44a/27, 29.6.28.

Distrib. Asia Minor, Syria, Armenia, Iraq, Persia, Afghanistan, Baluchistan, Cent. Asia.

PLANTAGINACEAE.

Plantago lanceolata L. Sp. Pl. 113 (1753).

Near Tabriz, weed in garden, 8.27, No. 1987; Yam, 8.27, No. 2024. Turki "Bizousha" the "erkek," i.e. male kind.

Distrib. Now practically cosmopolitan.

P. Loefflingii L. Sp. Pl. 115 (1753).

Tabriz, cultivated from seeds obtained from the bazaars, No. 2305; near Tabriz, 5.28, No. 2430. Cultivated as a medicinal herb under the Turki name "Karni YariKh" i.e. "belly wounding."

Distrib. Medit. Region (discontinuous).

One specimen of No. 2305 is very aberrant in having long styles and silky-pubescent bracts and calyx segments. It is named var. **longistyla** var. nov. a planta vulgare bracteis calycis segmentibusque sericeo-pubescentibus, stylis multo longioribus differt.

P. major L. Sp. Pl. 112 (1753).

Near Tabriz, 7.27, No. 1986. Turki name "Bizousha" the "dishi," i.e. female kind.

Distrib. Now practically cosmopolitan.

ILLECEBRACEAE.

Herniaria glabra L. Sp. Pl. 218 (1753) s.l.

Plain under Mishou Dagh, 25.7.29, flowers yellowish-green, No. 2577.

Distrib. Eur., Caucasus, Syria, Cent. Asia.

H. incana Lam. Encyl. iii. 124 (1789); Boiss. Flor. Or. i. 741 (1867).

Urmia, 27.5.28, flowers yellowish-green, No. 2322.

Distrib. W. Eur. and Medit. Region.

Paronychia kurdica Boiss. Diagn. Ser. I. iii. 10 (1843).

Hills north of Tabriz, 5.27, No. 2133; Urmia, 22.5.28, No. 2259; hills south of Tabriz, 14.6.28, No. 2267.

Distrib. Syria, N. and E. Asia Minor, Armenia, Caucasus, Persia.

AMARANTHACEAE.

Amaranthus Blitum L. Sp. Pl. 990 (1753).

Weed in garden near Tabriz, 2.9.27, Nos. 2159, 2160, 2166.

Distrib. Eur., Medit. Region, India.

A. hypochondriacus L. Sp. Pl. 991 (1753).

Weed in garden near Tabriz, 8.7.27, No. 1996; 7.27, No. 2168.

Distrib. Of N. Amer. origin, now a ruderal in the Medit. Region.

A. retroflexus L. Sp. Pl. 991 (1753).

Weed in garden near Tabriz, 1.9.27, No. 2167.

Distrib. Of N. Amer. origin, now a ruderal in Cent. Eur. and the Medit. Region.

Gomphrena globosa L. Sp. Pl. 224 (1753).

Cultivated in a garden near Tabriz, 7.27, No. 2111. Locally known as "Zibā."

Distrib. Tropics of Old World.

CHENOPODIACEAE.

Anabasis aphylla L. Sp. Pl. 223 (1753).

Near Tabriz, in waste places, starts flowering in August, No. 1298 ; 11.10.25, No. 1306 ; 17.7.27, No. 1985 ; 7.27, No. 2158.

Distrib. S. Russia, Transcaucasus, Persia, Turkestan, Cent. Asia.

Atriplex nitens Schkuhr Handb. iii. 541 (1803) sec. Aschers. u. Graebn. Syn. Mitteleur. Flor. V. i. 117 (1913).

Tabriz, garden weed, 9.27, No. 2165 ; east of Tabriz, 29.10.27, No. 2185 ; cultivated at Kew from Tabriz seed, 13.10.28.

Distrib. Cent. Eur., Crimea, Russia, Asia Minor, Syria, Palestine, Iraq, Caucasus, Transcaucasus, Persia, Cent. Asia.

A. tatarica L. Sp. Pl. 1053 (1753), var. **incisa** Gürke in Richter-Gürke Pl. Eur. ii. 146 (1897).

Near Tabriz, garden weed, 2.9.27, No. 2164.

Distrib. (of species) E.N. Temp. Region.

(of var.) here and there in the species area.

Blitum virgatum L. Sp. Pl. 4 (1753).

Yam, 6.28, No. 2383.

Distrib. E.N. Temp. Region.

Ceratocarpus arenarius L. Sp. Pl. (1753).

Hills south of Tabriz, one of the commonest plants, flowers in early June and fruits in late autumn, No. 2186.

Distrib. Spain, E. Balkan Penins., Cent. and S. Russia, Armenia, Crimea, Transcaucasus, Persia, Turkestan, Afghanistan, Cent. Asia.

Chenopodium album L. Sp. Pl. 219 (1753) s.l.

Tabriz, 11.25, No. 1313.

Distrib. Now cosmopolitan.

A variety (?) with very slender inflorescences.

C. Botrys L. Sp. Pl. 219 (1753).

Hills to the south of Tabriz, 6.28, No. 2378.

Distrib. N. Temp. Region.

C. opulifolium Schrad. in DC. Flor. Fr. vi. 372 (1815).

Near Tabriz, weed in garden, 7.27, No. 2163.

Distrib. Medit. Region.

C. Vulvaria L. Sp. Pl. 220 (1753).

Near Tabriz, weed in garden, 7.27, No. 2162.

Distrib. Eur. and Medit. Region.

Halanthium rariflorum C. Koch in Linnaea xvii. 314 (1843), var. **sanguineum** Turill var. nov. ; ab exemplaribus in Herb. Kew. planta glabra, foliis brevioribus, appendicibus sanguineis vel sucineo-brunneis differt.

Near Tabriz, in fruit, 11.25, No. 1312a ; north-east of Tabriz, among the ruins of an old fort called the Rashdiyeh Fort, in fruit, 10.27, No. 2176 (nomenclatural type of var.).

Distrib. (of species) Armenia, N. Persia.

XLIX.—MISCELLANEOUS NOTES.

His Majesty the King, on the recommendation of the Secretary of State for Scotland, has approved the appointment of Dr. JOHN WALTON, M.A., D.Sc., Lecturer in Botany in the University of Manchester, to be Regius Professor of Botany in the University of Glasgow.

Phenological observations in Britain.*—The Phenological work of the Royal Meteorological Society has been carried on for a long period and the number of observers is now nearly 500. On the botanical side the first date of flowering of fourteen plants has been the subject of most of the co-operative observation. The selected plants are hazel, coltsfoot, wood anemone, blackthorn, garlic hedge-mustard, horse-chestnut, hawthorn, white ox-eye, dog rose, black knapweed, harebell, greater bindweed, devil's bit scabious, and ivy. The results are given in tables, maps showing floral isophenes, or lines of equal flowering dates, and floral isakairs, or lines of equal divergence from the average flowering date. The isophenes and isakairs are obtained from mean values of the actual dates obtained by observation of all (or some) of the plants in the above list. In addition special records and notes are published.

For the season December 1928 to November 1929 inclusive, the ease with which extreme conditions may become masked by combination is well illustrated. Plants are said to afford the most reliable test, and the results are best expressed in the isakair chart based on the eight effective months, December to July. There we find a band of earliness covering much of N. and E. Ireland, and S.W. and E. Scotland. England and Wales are only credited with three or four small patches barely on the early side, from which lateness grows greater and greater towards the E. and S.E., until it exceeds a fortnight late.

The inclusion of black knapweed in the list of plants is open to considerable criticism. Recent research has shown that *Centaurea*

*Report on the Phenological Observations in the British Isles from December, 1928, to November, 1929. Quart. Journ. R. Meteorological Society liv. No. 235 (1930), pp. 207-270, 14 tables, 6 figures (maps and chart in black and white), price 3s.

nigra, in the broad sense, is an extremely polymorphic species, that not only are there many varieties, but that, especially in the south of England, hybrid populations between it and *C. jacea* are not uncommon. Moreover, at the Potterne Research Station and at Kew, earlier and later flowering races have been obtained from wild material, precocity of flowering being, for some races at least, a definitely inherent character. It is stated that the black knapweed has given less satisfactory results than the other species and the reason suggested is that observers have confused it with *C. scabiosa*. If this is so there is little chance that *C. jacea*, *C. nemoralis*, and hybrid populations have been distinguished and the value of the massed records of nearly 500 observers can only be small. It is suggested that either a more suitable species be found to take the place of the black knapweed or that all observers submit complete specimens to Kew so that the observations can be separated into groups based on taxonomically equivalent plants. W. B. T.

Spore Ornamentation of the Russulas.*—This is an interesting contribution to the study of the difficult genus *Russula*, and worthy of careful attention by all students of Agarics. The author claims that with proper use of the microscope, as to which a full introductory account is given, it is possible to distinguish the species and varieties of *Russula* by the characters of the surface-markings of their spores. Macroscopic characters and staining reactions are not neglected, but the spore-markings are said to be remarkably constant, and to afford valuable corroborative evidence, or even to be the decisive character, in doubtful cases. To obtain the correct image it is however necessary to use an immersion lens (the author used an apochromatic objective of N.A.1.2. in conjunction with a compensating ocular of x 25) and an aplanatic-achromatic condenser (N.A. 1.3), with illumination exactly adjusted as to size and distance.

Spore-markings are therefore not characters which are easily available to the field mycologist, but if their careful study will assist in the elucidation of some of the puzzling problems in this genus, Mr. Crawshay will have done a great service. As an instance of possible results, the author has come to the conclusion that *Russula furcata* (Pers.) Fr. is only an abnormal form of *R. cyanoxantha*, and that *R. fragilis* is a variety of *R. emetica*.

In the body of the work 92 species and varieties of *Russula* are described, arranged according to a dichotomous key. Following this are special notes on difficult or doubtful species, and a list of species classified according to the colour of the spore-deposit.

A preface to the book has been written by the distinguished French mycologist, M. Frederic Bataille.

E. M. W.

*Spore Ornamentation of the Russulas, by Richard Crawshay. Baillière, Tindall and Cox, London, 1930. pp. 188, 20 figures in text, 3 coloured plates, and 46 uncoloured plates of spore-drawings. Price 12s. 6d. net.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1930 ROYAL BOTANIC GARDENS, KEW

L.—A NEW GENUS OF IRIDACEAE FROM EAST AFRICA. A. A. BULLOCK.

The fact that the high mountain flora of East Africa is still far from completely known is illustrated by the number of apparently new species which occur in almost every collection from that area received at Kew for determination. Many of the new species have perforce to remain undescribed until revisions are published of the genera concerned. The facies of the present plant, however, is so strikingly different from that of its nearest allies that it was decided to make it the subject of a special investigation.

Specimens of the plant have been received at Kew on two occasions, in each case from Mount Elgon, at about 9000 ft. above sea level. It was first collected by Mr. C. H. Lankester in August, 1921, and was then provisionally named *Antholyza* sp. Exactly eight years later it was collected again by Messrs. Hancock and Soundy during an entomological excursion on the mountain.

No material of the species is incorporated in the British Museum Herbarium, and none was found in the Berlin Herbarium by Miss M. L. Green, who kindly made a search there on my behalf. The plant is not mentioned in the account of the Iridaceae in the new edition of the Pflanzenfamilien, Band 15a, 463-505, by Dr. L. Diels. It was unknown to him, and he suggested that it would probably prove to be a new genus. This view is also endorsed by Mr. N. E. Brown, an acknowledged authority on the family.

The new genus unquestionably belongs to the tribe Ixieae, and seems to be most closely allied to *Gladiolus*, *Antholyza* and *Watsonia*, from all of which it may be distinguished at once by the large coloured bracts which hide the flowers almost completely. Its deeply bifurcate style-arms separate it from *Gladiolus* and *Antholyza*, and the winged seeds from *Watsonia*, from which it differs also in the shape of the style-arm branches.

Oenostachys Bullock, gen. nov. ex affinitate *Gladioli* Linn. *Antholyzae* Linn. et *Watsoniae* Mill., a quibus spatharum valvis coloratis perianthium includentibus differt; a *Gladiolo* et *Antholyza* styli ramis bifurcatis, a priore etiam tubo pro longitudine limbi multo longiore recedit; a *Watsonia* seminibus alatis, styli ramis aliter bifurcatis distincta.

Perianthii tubus arcuatus, parte tertia inferiore cylindricus, duabus partibus superioribus leviter dilatatus; limbi segmenta

exunguiculata, inaequalia, 3 inferiora minora. *Stamina* 3, perianthii tubi partis cylindricae fauce inserta; filamenta filiformia, arcuata; antherae inclusae oblongo-sagittatae. *Ovarium* triloculare; ovula numerosa, superposita; stylus filiformis parte tertia superiore trifidus, ramis bifidis subpatulis, stigmatibus anguste spathulatis. *Capsula* obconica, anguste trialata, loculicide 3-valvis. *Semina* plana, elliptica, late alata, alis spongosis.—*Cormus* tunicatus. *Folia* disticha, ensiformia. *Spica* simplex, spathis persistentibus, valvis exterioribus latissime obovatis perianthium includentibus laete coloratis imbricatis, valvis interioribus multo minoribus oblanceolatis haud coloratis. *Flores* in spathis solitarii, subsessiles.

O. dichroa *Bullock*, sp. nov. unica.

Cormus ignotus, sed (ut videtur e foliorum basibus), verosimiliter tunicis membranaceis reticulatis praeditus. *Folia basalia* 30–50 cm. longa, usque 1.5 cm. lata, nervis prominentibus. *Caulis* teres, usque 5 mm. diametro, 50 cm. altus, folia compluria minora gerens. *Spica* subsecunda, usque 25 cm. longa. *Spathae* valva exterior obovata, circiter 6 cm. longa et 4 cm. lata, subacuta. *Perianthium* 5–6 cm. longum; lobi 3 superiores albi, lobo medio ovato 1 cm. longo, lateralibus lanceolatis; lobi 3 inferiores virides, lanceolati, 7 mm. longi. *Stamina* contigua, perianthii segmento summo plus minus adpressa; filamenta rubra; antherae 1 cm. longae. *Capsula* 1.5 cm. longa, membranacea, reticulata. *Semina* 5–7 mm. longa.

UGANDA PROTECTORATE: Mount Elgon, alt. 9000–10,000 ft., 23 Aug. 1921, C. H. Lankester s.n. (type); Mount Elgon, Alpine Zone, alt. 9000 ft., Aug. 1930, G. L. R. Hancock & W. Soundy 34.

This very striking plant, Mr. Hancock informs me, is very common on Mount Elgon above an altitude of 9000 ft. and it is indeed remarkable that it has not previously been described.

LI.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: III.* ANNONACEAE COLLECTED BY THE OXFORD UNIVERSITY EXPEDITION TO BRITISH GUIANA, 1929. N. Y. SANDWITH.

The Annonaceae of British Guiana have received little attention in recent years except for the description of one or two new species by Safford or by R. E. Fries. Those of Surinam and French Guiana seem to be better worked out, but several species were described by de Candolle in the first volume of the *Systema* from material in Lambert's Herbarium collected in Cayenne by Martin, and at least three of these types could not be found on a recent search in the British Museum Herbarium. On the other hand, several of Aublet's types which Sagot could not find in Paris in 1881 are to be seen at South Kensington. A useful key to the Guiana species of *Duguetia* is given by R. Benoist in *Lecomte, Not. Syst.* iv. 58 (1923).

*Continued from *K.B.* 1930, p. 343.

Meanwhile large quantities of material of this family from British Guiana have been accumulating at Kew, and in several instances there are numerous sheets of unnamed species which appear to be endemic and plentiful in the colony. The numerical importance in the rain-forest of Guiana of this arborescent family was realised by the botanists of the Oxford University Expedition to British Guiana last year. Within a two-mile radius of their camp on the Moraballi Creek, which flows into the right bank of the Essequibo River some ten miles above Bartica, they collected material of fourteen different species of Annonaceae. This representation was only equalled (in the arborescent families) by the Rosaceae, Lecythidaceae and (nearly) by the Sapotaceae, apart from the Leguminosae which, of course, were the dominant family.

These species fall into three groups, defined by their habit. Seven of them were trees of middle-size or even members of the top storey of the forest-type in which they were found; to this group belong the genera *Guatteria*, *Xylopia*, *Unonopsis*, *Rollinia*, and *Annona*. The tallest of these, *Xylopia cinerea*, was 125 ft. high and only 16 inches in diameter; while the smallest, *Xylopia Benthami*, was 45 ft. high and only 5 inches in diameter, but this species is a characteristic member of the wallaba forest, on light dry sandy soil on the top of ridges, where there is plenty of light, and the trees are all lower. Four of these species are described as new, and two of them seem not to have been collected before; both are species of the genus *Xylopia*, the American representatives of which have just been monographed in the *Acta Horti Bergiani* by R. E. Fries. The relative frequency of some of the species of this group in sample plots of the different types of forest will, it is hoped, appear in a subsequent paper on the ecology of the area by Messrs. T. A. W. Davies and P. W. Richards.

The second group is comprised of low shrubs and trees varying from a height of about 8 to 25 feet. This was represented by six species in the genera *Duguetia* (4), *Anaxagorea* and *Cymbopetalum*, of which four are described here for the first time. These small Annonaceous trees are certainly the dominant constituent of the bottom storey of several types of forest, and appear to be abundant and widely distributed in the colony. They provide a welcome relief to the collector who has been accustomed to a largely herbaceous flora, since their flowers and fruits are always within easy reach. It is hoped that notes on their occurrence in different forest-types will be included in the ecological paper referred to above; two of them, *Duguetia inconspicua* and *Cymbopetalum brasiliense* were only once found, but the others—all new species—were very plentiful. The Arawak Indians distinguish each of them by a special name, and use them in preference to any other small tree for poles and fishing-rods.

Finally, a single very remarkable species was found with a scandent habit. It was not a "bush-rope" in the usual sense, but

seemed to be a weak tree with a slanting growth which became scandent and horizontal on approaching the canopy. The beautiful red flowers with wide-spreading outer petals were conspicuous on the forest floor. This species is immediately identified with *Annona haematantha* Miq. of Surinam. Another scandent member of the Annonaceae, in the genus *Guatteria*, is mentioned below as it has been wrongly named for many years; it has been variously described by collectors as a liane, vine, large bush-rope, and "frutex sarmentosus, altissime scandens."

It is to be hoped that future collectors in British Guiana will be stimulated to collect the Annonaceae extensively and carefully in all stages of their development. Numbers of new species must await discovery, and others already known from surrounding countries will probably be found. Few families of trees seem to present a greater variation in the size of the leaf and its acumen, even on the same branchlet; while the degrees of size of the flowers and carpels, dependent upon age, appear most perplexing in the herbarium, when a representative series is not collected from the same tree. This is particularly true of some of the small species, which do not bear many flowers or fruits, and which have rarely been collected.

The species which were collected by the Oxford Expedition are enumerated below, and a few notes are included dealing with other points which have come to light in the course of the investigation: an alphabetical list of the vernacular names is appended.

Uvaria ? spectabilis DC. Syst. 1.484 (1818).

Martin's type specimen in Hb. Lambert has been seen at the British Museum and proves to be *Fusaea longifolia* (Aubl.) Safford. Incidentally, this name antedates *U. spectabilis* A. Chev. ex Hutch. et J. M. Dalz. cum Chipp in Fl. West Trop. Africa, 1. i. 47, 50 (1927); but it is possible that the latter species will be transferred to the genus *Uvariadendron*, see R. E. Fries in Acta Horti Bergiani, Band 10, no. 1. 52 (1930).

Guatteria atra Sandwith, sp. nov.; *G. Ouregou* (Aubl.) Dun. affinis, cortice aterrimo nec cinereo, foliis subtus glaucescentibus, tori fructiferi parte ima conspicua quam parte gynophora convexa latiore, carpellis majoribus differt.

Arbor excelsa, cortice aterrimo, materie flavescente; ramuli summi nigrescentes, apice novello adpresse piloso excepto glabri. *Folia* elliptica vel elliptico-oblonga, apice satis breviter atque late obtuse acuminata, basi in petiolum cuneatim attenuata, 6-20 cm. longa, 2.5-7 cm. lata, rigide chartacea vel subcoriacea, supra nitida siccitate olivaceo-brunnea, subtus opaca glaucescentia glaucedine deterrenti, supra glabra, subtus sub lente sparse obscure adpresse pilosa, novella nondum evoluta sericea, utrinque crebre subtiliter sed haud conspicue reticulata, nervis primariis utroque costae latere circiter 16 arcuantibus subtus prominentibus; petiolus nigrescens supra canaliculatus subalatus, 0.6-1 cm. longus, pilosulus vel

glabrescens. *Inflorescentia* axillaris, 1-2-flora; pedicelli adpresse pilosi, 1.5-2.2 cm. longi, satis crassi, versum apicem ad 2.5 mm. sensim dilatati; bracteolae infra medium pedicellum minutae, amplexantes, conspicue pilosae. *Sepala* triangulari-ovata, 7-8 mm. longa, 6-9 mm. lata, statu vivente viridia, extra dense adpresse pilosa, intus pallide ferrugineo-tomentosa. *Petala* patula, coriacea, oblonga vel obovato-oblonga, obtusa, margine undulata, statu vivente glauco-viridia, siccitate prope basim externam atque secus medium pallide ferrugineo-sericea, ceterum passim basi interna glabra excepta glauco-tomentella; exteriora 1.2 cm. longa, 6 mm. lata; interiora majora, 1.2-1.4 cm. longa, 7.5-8.5 mm. lata. *Torus* fundamento 7-8 mm. diametro, tum cratere extra staminifero intus pistillifero haud alte elevato 4-5 mm. diametro. *Stamina* statu vivente albo-flava, 1.5 mm. longa, filamentis vix distinguendis; pars connectivi apice producta anthera latior, plano-convexa, ut videtur glabra, ad 1 mm. lata. *Pistilla* numerosa, dense conglutinata; ovarium arcuato-ellipsoideum, conspicue pallide ferrugineo-pilosum, fere ad 1.5 mm. longum; stylus clavatus, circiter 1 mm. longus, inferne glaber, stigmate tomentello statu vivente viridi. *Carpella* juniora dense pubescentia, indumento pallide ferrugineo; maturescentia ut videtur 10-20, statu vivente glauco-viridia pubescentia, siccitate nigrescentia atque glabrescentia, obovoidea, apice rotundata obscure submucronata, haud costata, 1 cm. longa, 6-7 mm. diametro, stipite nigrescente sparse pubescente, 1.2-1.7 cm. longo, satis rigido, sursum ad 1.5 mm. incrassato. *Tori fructiferi* fundamentum margine valde corrugato 7-8 mm. diametro; crater intus in globum elevatum 5-6 mm. diametro stipites carpellorum suffulcientem evolutus

BRITISH GUIANA. In mixed forest, Moraballi Creek, Essequibo River, October 9th, 1929, Sandwith 406 (type). A tall tree with very black bark and yellow wood. Sepals green. Petals glaucous-green. Stamens cream. Styles green. Fruit downy, glaucous-green. Vernacular name (Arawak), Black Kuyama.

The species of this genus seem more difficult to define than those of any others which have come under notice in studying the Guiana material of the family; and they will have to be collected more frequently at all stages of their development before they can be properly understood. It is unfortunate that the specimens of *G. Ouregou* Dun. and *G. podocarpa* DC. at the British Museum bear no flowers; on leaf material alone these two species, as well as *G. chrysopetala* Miq., should certainly be treated as conspecific, and there is obviously great variability in the size and number of the carpels, and in the length and thickness of their stipes. The species described here is certainly not identifiable with *G. Ouregou* and its allies.

G. scandens Ducke in Arch. Jard. Bot. Rio de Janeiro, iv. 10. (1925).

This bush-rope, which is widely spread over the Guianas, has for long been passing under the name *G. brevipes* DC., owing to a

mistake of Sagot who identified his no. 11 from the description, *vide sched.* and Ann. Sci. Nat. sér. vi. xi. 139 (1881). *G. brevipes* is one of several species of Annonaceae which were described by de Candolle from material collected in French Guiana by Martin, and apparently existing only in Lambert's Herbarium which is incorporated in the Herbarium of the British Museum. The type of *G. brevipes* proves on examination to bear no resemblance whatever to the present species, having very large leaves which are shining and strongly reticulate on the upper surface. No material agreeing with it has been seen in London. Ducke's description, however, of his Pará plant agrees almost perfectly with the following Guiana specimens.

BRITISH GUIANA. Hooroabea, April, 1887, *Jenman* 3784; without locality, *Hancock*; Corentyne River, *im Thurn*; hill-top on Kabio-Killi sand, Mora-mora-bisi Creek, Corentyne River, April-May, 1918, *Hohenkerk* in Forestry Department record numbers 703, 703A; "Guiana belgica," *Alex. Anderson* (Herb. Mus. Brit.).

SURINAM. *Hostmann* 1053, 1061.

FRENCH GUIANA. Karouany, 1855, *Sagot* 11; Godebert, 1920, *Wachenheim* 71, very poor material but probably this species.

Vernacular names: Yoarno ("fire-sticks sent"), *fide im Thurn*; Karikahuh ("catching fire"), *fide Hohenkerk*. Sir Everard *im Thurn* notes that the wood is used by the Warrau Indians to produce fire by friction.

Duguetia neglecta *Sandwith*, sp. nov.; nulli speciei adhuc descriptae obvie affinis, bracteolis magnis ad *D. bracteosam* Mart., indumento stellato denso lutescente lanato ad *D. Pohlianam* Mart. approximans.

Arbor vel frutex parva, circiter ad 6 m. alta, 2-3 pollices diametro; ramuli summi annotini inferne glabrescentes rubro-fusci facile decorticantes 2-3 mm. diametro, sursum velut ramuli novelli hornotini breves indumento lanato stellato densissimo lutescente vestiti; internodia 1-2.5 cm. longa. *Folia* elliptica, elliptico-lanceolata vel obovato-elliptica, apice insigne longissime saepe subcuspidatim acuminata, acumine angusto tenui vulgo 2-5 cm. longo, basi cuneata, 9-20 cm. longa, 2.5-7 cm. lata, tenuiter chartacea, utrinque nitidula, concoloria, supra costa impressa dense stellato-pilosa lutescente ceterum glabra, subtus costa praesertim dimidio inferiore pilis conspicuis stellatis lutescentibus furfuraceis facile deterrentibus atque ita laxae adhaerentibus induta ut saepe glabrescere videatur, facie nonnunquam etiam sparse minute stellato-pilosula, utrinque praesertim subtus satis reticulata, nervis primariis utroque latere costae usque ad acuminis basim 10-14 circiter 7-12 mm. a margine in nervum communem lateralem valde arcuantem anastomosantibus; petiolus ut ramuli pilis stellatis dense lutescenti-lanatus, 2-5 mm. longus, ad 2.5 mm. crassus. *Inflorescentia* paullo infra-axillaris, ut videtur uniflora; pedunculus 1-2 cm. longus, 2-3 mm. diametro, indumento

ramulorum densissimo lutescente praeditus, sub flore ipso dilatatus; bracteolae binae approximatae circiter in medio pedunculo positae, insigne foliaceae, ovatae, plus minusve longe acuminatae, inaequales, majores 3.5-6 cm. longae, ad 1.7 cm. latae, minores ad 1.4 cm. longae, 6-7 mm. latae, ambae venatione ac indumento foliorum stellato deterrenti praeditae. *Alabastra* trigono-ovoidea, 1.5 cm. longa, 1 cm. diametro, dense lanato-tomentosa. *Sepala* a basi libera magna, petala aequantia vel superantia, ovato-oblonga, subacuta, 2.2-2.5 cm. longa, 1.2-1.4 cm. lata, rigide coriacea, sordide flavo-cinerea, extra densissime pilis stellatis lanato-tomentosa, intus multo minus vestita atque sub indumento purpurascencia. *Petala* subaequalia, albo-flava; exteriora obovato-oblonga, 2.2 cm. longa, 1 cm. lata, siccitate dense cinereo-tomentella, basi intus glabra purpurascencia excepta; interiora obovato-lanceolata, ad 2 cm. longa, ad 0.8 cm. lata, extra ac intus dimidio superiore dense cinereo-tomentella, intus dimidio inferiore fulvo-purpurascencia striata glabrescentia; omnia siccitate extra per medium densius lanata albo-lineata, subcarinata. *Torus* 7 mm. diametro, apice in craterem circulem pistilla subtendentem excavatus. *Stamina* 2.5 mm. longa, apice tori in margine crateris inserta, filamentis brevissimis; pars connectivi producta antherae subaequilata, globoso-ovoidea, conspicue insigne acuminata, fere ad 1 mm. longa, sub lente minutissime pilosula. *Pistilla* in unico flore dissecto circiter 45, glutinosa, in tori cratere posita, circiter 1 cm. longa; ovarium pilosum, 4 mm. longum; stylus glaber, ad 6 mm. longus, apice dilatatus. *Fructus* globosus, 3-4 cm. diametro; carpella sessilia, forma generis typica, matura ad 1.5 cm. longa, striato-angulata, parte inferiore brunnea glabra, vertice rotundato convexo glabro sed siccitate pruinoso circiter 1 cm. diametro, in centro umbilicato subito breviter ad 2 mm. rostrato; semina obovoidea, testa castanea nitente, 9 mm. longa, apice ad 7 mm. diametro.

BRITISH GUIANA. Abundant by the Moraballi Creek, Essequibo River, August 20th, 1929, *Sandwith* 72 (type); Cuyuni River, June 16th, 1907, *F. C. Foote*; near Anandabaru, Kopinang River, 600 m., April, 1926, *Altson* 463; Demerary, 1791, *Alex. Anderson* (Herb. Mus. Brit.).

Vernacular name (Arawak), Yarri-Yarri or Red or Fine-leaved Yarri-Yarri. A small tree, abundant in the lowest storey of the forest. It is used by the Arawaks for poles and fishing-rods.

Duguetia pycnastera *Sandwith*, sp. nov.; *D. neglectae* supra descriptae manifeste affinis, foliis pro rata majoribus atque latioribus magis obovatis, indumento stellato laxo deterrenti subtus haud in costa tantum sed passim distributo, floribus bracteolisque minoribus, characteribus florum compluribus, carpellis minoribus vertice cinereo-tomentellis optime differt.

Arbor vel frutex parva, circiter ad 6 m. alta, 2-3 pollices diametro. *Ramuli* ut in *D. neglecta*, indumento insigni huius speciei etiam densiore et partibus annotinis diutius persistente. *Folia* obovata

vel obovato-elliptica, apice satis abrupte cuspidato-acuminata, acumine tenui 1-3 cm. longo plerumque pro rata quam in *D. neglecta* brevior, basi cuneata vel obliqua uno latere rotundato, 6.5-30 cm. longa, 3-12.5 cm. lata, tenuiter chartacea, utrinque nitidula, concoloria, indumento supra ut in *D. neglecta*, subtus pilis stellatis supra descriptis juventute saltem haud tantum secus costam densissime stipatis sed etiam secus nervos venulasque passim sparsis, aliis minoribus hic illic commixtis, reticulatione omnino ut in *D. neglecta*, sed nervis primariis foliorum aequalis magnitudinis ad marginem propius (saepius 4-8 mm. a margine) anastomosantibus. *Inflorescentia* paullo infra-axillaris, ut videtur uniflora; pedunculus ad 2 cm. longus, ad 2 mm. diametro, indumento ramulorum densissimo lutescente praeditus; bracteolae binae, ut videtur saepius longe sejunctae, foliaceae, lanceolatae, majores in medio pedunculo vel supra positaе, 0.8-3 cm. longae, 1-6 mm. latae, indumento foliorum praeditae, minores infra medium pedunculum vel prope basim positaе, ad 5 mm. longae, 1 mm. latae, dense lanatae. *Alabastra* ovoideo-subglobosa, ad 1.2 cm. longa, 1 cm. diametro, satis dense lanato-tomentosa. *Sepala* a basi libera, petala subaequantia vel superantia, ovato-oblonga, subacuta, 1.6 cm. longa, 8-9 mm. lata, tenuiter coriacea, extra indumento pedunculi stellato-tomentosa, subcarinata vel trinervia, intus indumento cinereo multo minutiore induta. *Petala* statu vivente sordide albo-flavida, subaequalia; exteriora majora ovato-oblonga, versus basim subito contracta, extra minute cinereo-tomentella margine rubro-brunneo glabrescente, intus glabrescentia rubro-brunnea sparse stellata, 1.7 cm. longa, ad 1 cm. lata; interiora obovato-lanceolata, infra medium contracta, indumento simili, ad 1.5 cm. longa, ad 6.5 mm. lata; omnia siccitate extra per medium densius lanata, albo-lineata vel subcarinata. *Torus* 4-5 mm. diametro, apice ut in *D. neglecta* crateriformis, margine ac in cratere ipso insigne stellato-pilosus. *Stamina* minuta ad 1.2 mm. longa, apice tori in margine crateris inserta, filamentis brevissimis; pars connectivi producta anthera latior, convexa umbonata haud acuminata, 0.75 mm. lata, sub lente minutissime pilosula. *Pistilla* in unico flore dissecto 11, glutinosa, in tori cratere posita, 4-5 mm. longa, per totam longitudinem pilosa, apice styli clavato-dilatata. *Fructus* globosus, ut videtur ad 2 cm. diametro; carpella pauca, ut videtur 10-18, obovoideo-prismatica, matura ad 1 cm. longa, striato-angulata, parte inferiore angulis exceptis sub vertice tomentellis brunnea glabra, vertice rotundato convexo insigne dense cinereo-tomentello, 7-8 mm. diametro, in centro subito breviter rostrato; semina obovoidea, testa castanea nitente, ad 6 mm. longa, apice 3-4 mm. diametro.

BRITISH GUIANA. On hill-slope on white sand, Kamwatta Creek, Koirimap River, Pomeroon River, June 25th, 1918, *Hohenkerk* in Forestry Department record number 36A (type); Moraballi Creek, Essequibo River, 1929, *Sandwith* 707; Demerary, 1791, *Alex. Anderson* (Herb. Mus. Brit.).

Vernacular name (Arawak), Yarri-Yarri or Large-leaved Yarri-Yarri. "Flowers dark cream to old ivory colour. Fruit old ivory to brown colour," *Hohenkerk*.

This species grew plentifully with *D. neglecta* by the Moraballi Creek, and the foliage (though larger) and indumentum are so similar to those of *D. neglecta* that the two were dismissed in the field as forms of one species. Fortunately, however, material of both was collected, and on return to Kew they were found to present numerous remarkable distinguishing characters in the flower and fruit, as well as less definite but apparently uniform characters in the leaves and bracteoles. The Arawaks who accompanied the expedition distinguished the two with their usual acumen.

Duguetia Yeshidan *Sandwith*, sp. nov.; *D. calycinae* R. Benoist affinis, sepalis brevioribus, praesertim carpellis maturis apice nunquam applanatis sed semper conico-pyramidalis striatis sensim in rostrum attenuatis differt.

Arbor parva, forsitan potius frutex, ad 6 m. attingens, saepe humilior, 2-3 pollices tantum diametro; ramuli 1.5-5 mm. diametro, teretes, cortice inconspicue sed crebre levissime corrugato, haud sulcato, inferne glabrescentes cinerei ad brunnei, prope apicem fulvi plus minusve dense lepidoti. *Folia* elliptica, elliptico-lanceolata vel obovato-oblonga, apice sensim vel satis abrupte longe conspicue anguste acuminata, acumine 1-3 cm. longo, basi attenuata cuneata vel obliqua uno latere rotundata, magnitudine valde variabili, adulta 15-30 cm. longa, 4.5-11 cm. lata, tenuiter chartacea, utrinque nitida, concoloria, utrinque fere aequaliter sed subtus magis prominenter fortiter intricate reticulata, nervis primariis arcuatis vel saltem adscendentibus utroque costae latere vulgo 16-20, circiter 5-12 mm. a margine in nervum communem arcuantem lateralem anastomosantibus, supra glabra, subtus sparse praesertim costa (foliis nondum evolutis membranaceis multo magis conspicue) sordide albo-lepidota, lepidibus plus minusve fimbriato-laceratis; petiolus brevis crassus, supra profunde canaliculatus, nigrescens, corrugatus, satis dense lepidotus, 1-4 mm. longus, 2-3 mm. diametro. *Inflorescentia* supra-axillaris, 1-2-flora; pedicelli 5-8 mm. longi, 2-4 mm. crassi, sursum dilatati, dense pilis albo-cinereis minutissimis stellatis atque lepidibus majoribus albo-fulvis superpositis obtecti; bracteolae basi pedicelli concavae, forma variabili, triangulari-ovatae vel rotundatae, 2-4 mm. longae, ad 4 mm. latae, extra indumento pedicellorum indutae, intus nigrescentes glabrae. *Sepala* late triangulari-ovata, 7-9 mm. longa, 10-12 mm. lata, extra indumento pedicelli stellato atque lepidoto, intus prope marginem grisea stellato-tomentella ceterum purpurascencia glabra. *Petala* ovata vel late ovato-elliptica, obtusa, exteriora 2.5 cm. longa, 1.5 cm. lata, interiora paullo latiora, 2.5 cm. longa, 1.7 cm. lata, omnia statu vivente sordide albo-flava, siccitate cinerea, densissime stellato-tomentella, haud lepidota, prope basim, praesertim exteriorum intus, glabra. *Torus* circiter 8 mm. diametro. *Stamina*

claviformia, filamentis brevissimis, circiter 2.2 mm. longa, parte connectivi producta loculis latiore minutissime pilosula ad 1 mm. lata. *Pistilla* 3-4 mm. longa, sub lente satis obscure furfuraceo-pubescentia. *Carpella* matura numerosissima in caput globosum muricatum brunneum 3-5 cm. diametro aggregata, parte inferiore glabra brunnea angulato-striata 8-13 mm. longa, 5-11 mm. lata, vertice cinereo-tomentello conico-pyramidato striato in rostrum saepius arcuatum vel subfalcatum attenuato, rostro incluso 5-7 mm. longo, 7-13 mm. diametro; semina obovoidea, 1 cm. longa, 6-7 mm. diametro, testa alba vel stramineo-brunnea nitida.

BRITISH GUIANA. In mixed forest, Moraballi Creek, Essequibo River, August 16th, 1929, *Sandwith* 22 (type); *ibid.*, in morabukea forest, August 13th, *Sandwith* 1; *ibid.*, in mora swamp-forest, Sept. 12th, *Sandwith* 246; Bartica, April 1887, *Jenman* 3602; Cuyounie (Cuyuni?) Creek, *Appun* 387; Kamwatta Creek, Koirimap River, Pomeroon River, June 1918, *Hohenkerk* in Forestry Department record no. 702.

Vernacular name (Arawak), Yeshidan. Creole Name, Armadillo Tree.

Evidently one of the commonest small trees of the lowest storey of the forest.

D. inconspicua *Sagot* in Ann. Sci. Nat. sér. vi. xi. 135 (1881).

Moraballi Creek, Essequibo River, August 30th, 1929, coll. O. W. Richards in *Sandwith* 156. Shrub or low tree, about 7 feet high, only once found in mora swamp. Flowers creamy white, amongst the leaves, with a very narrow, lanceolate, acute facies. Larger petals much longer than the shorter whorl.

Distr. British Guiana, French Guiana (*Sagot* 1906!).

This species belongs to a distinct group of plants with dark, rugose, loosely stellate-hairy uppermost branchlets; leaves very sparsely stellate-hairy, not lepidote, beneath; both sepals and petals stellate-tomentose only, not lepidote; and decidedly narrow flowers. Other members of this group are *D. amplexifolia* R. E. Fries from Surinam, and *D. rostrata* Rusby and *D. pauciflora* Rusby from the mouth of the Orinoco in Venezuela. Unfortunately all these species are represented by a single collection, and the validity of the characters distinguishing some of them is therefore rather uncertain. *Jenman* 4071, collected on the Upper Demerara River in 1887, may be referred provisionally to *D. inconspicua*.

“**D. ? glabra**” *Britton* in Bull. Torrey Bot. Club, xvi. 14 (1889).

For the benefit of future workers on this genus, it may be pointed out that the Bolivian syntype (*Rusby* 1378) of this species in Herb. Kew. belongs to the Moraceae and should be referred to *Pseudolmedia* or some closely allied genus.

Unonopsis glaucopetala R. E. Fries in Bull. Herb. Boiss. Sér. ii. vii. 1004 (1907).

Moraballi Creek, Essequibo River, September 28th, 1929, *Sandwith* 355. Middle-sized tree, 64 feet high, in greenheart-wallaba forest. Flower green in bud; petals biscuit-coloured. *Ibid.*, October 10th, 1929, *Sandwith* 411. Middle-sized tree, 75½ feet high, 8 in. diam., in mixed forest. Fruit green.

Vernacular names (Arawak): Arara; Black Hill Yarri-Yarri.

Distr. Endemic. Other collections recently identified as this very distinct species are C. W. Anderson 389, Issororo, North-west District, August 1909; *Hohenkerk* in Forestry Department record no. 735, Kamwatta Creek, Koirimap River, Pomeroon River, July 1918.

Fries' specific name is relevant to the dried material.

Anaxagorea dolichocarpa *Sprague et Sandwith*, sp. nov.; *A. acuminatae* (Dun.) St. Hil. affinis, foliis magnitudinem multo majorem attingentibus, floribus maturis majoribus, praesertim carpellis maturis multo longius stipitatis differt.

Arbor parva, 4.5-9 m. alta; ramuli summi novelli indumento furfuraceo ferrugineo primo induti, mox ut seniores glabrescentes. *Folia* elliptica, oblonga, obovato-elliptica vel lanceolata, apice sensim vel fere cuspidatim acuminata acumine 0.5-4 cm. longo, basi acute vel obtuse cuneata nonnunquam fere rotundata, magnitudine in eodem exemplo valde variabili, 12-42 cm. longa, 3-12 cm. lata, chartacea, utrinque subopaca sed sub lente passim dense pellucide punctata, supra glabra, subtus sub lente minute ferrugineo-lepidota, nervis primariis costaque subtus prominentibus, rete venularum haud prominulo, nervis primariis in utroque latere costae vulgo 12-16 a sese 1-4 cm. distantibus, laete arcuantibus; petiolus 6-15 mm. longus, ad 3 mm. crassus, supra canaliculatus, ferrugineo-pubescent vel nigrescent glaber. *Inflorescentiae* supra-axillares, semper in ramulis vetustis lignosis positae, 1-2-florae; pedicelli ferrugineo-tomentosi, 5-6 mm. longi, sursum incrassati; bracteolae varie positae, ovatae, concavae, ferrugineo-tomentosae, ad 2.5 mm. longae atque latae. *Flores* maturi inaperti ovoideo-subglobosi, saepe subacuminati, 0.9-1.3 cm. longi, 1-1.3 cm. diametro, ferrugineo-tomentosi. *Sepala* vetustate patula vel reflexa, triangulari-ovata, extra ferrugineo-tomentosa, intus glabra, 7-8 mm. longa, 6-7 mm. lata. *Petala* extra ferrugineo-tomentosa, intus glabrescentia, ovato-lanceolata, subaequalia, matura 1.3-1.5 cm. longa, 6-7 mm. lata, glandulosa odorifera, saepe (praesertim interiora dimidio superiore) valde indurata coriacea. *Torus* convexus, 5-6 mm. diametro. *Stamina* lineari-clavata, 4-5 mm. longa, filamentis ad 1.2 mm. longis; pars connectivi apice producta anthera latior, rotundata vel quadrata, circiter 1 mm. lata; stamina interiora sterilia. *Pistilla* in globo denso 5 mm. longo atque diametro arcte conferta. *Fructus* carpellis circiter 8-12; carpella juniora furfuracea, ferrugineo-tomentosa; matura siccitate pullata glabrescentia, tempore dehiscentiae longe stipitata clavata, stipite incluso 3.5-4.5 cm. longo, parte seminifera 8-10 mm. diametro apice dorsali brevissime

rostrata; semina bina, castanea vel nigrescentia, nitidissima, ellipsoidea, 1.4–1.7 cm. longa, 6.5–9 mm. lata.

BRITISH GUIANA. Bartica, November 1888, *Jenman* 5089 (type); *ibid.*, November 1886, *Jenman* 2511; Moraballi Creek, Essequibo River, in morabukea forest, mixed forest and 'low bush,' August–October, 1929, *Sandwith* 6, 172, 340, 410; Pomeroon River, *Hancock*; Kamwatta Creek, Koirimap River, Pomeroon River, August 14th, 1918, *Hohenkerk* in Forestry Department record no. 35B; Mamura Hill; Aruka River, North-west District, July 1908, *C. W. Anderson* 35; Gravel Creek, Kaituma River, North-west District, October 1908, *C. W. Anderson* 35A; forest in Cariboupari Valley, south of Mt. Kowatipu, Ireng District, April 1926, *Altson* 500.

Vernacular names: Kurihikoyoko (Arawak); Swamp or Black Yarri-Yarri (Arawak), but verification of these is required as they may also be applied to other *Annonaceae*; Murnek-Yek (Patamona), *vide* *Altson*.

Cymbopetalum brasiliense (Vell.) Benth. in Journ. Linn. Soc. v. 69 (1861). *Uvaria brasiliensis* Vell. Fl. Flum. 238 (1825) and v.t. 122 (1827); Mart., Fl. Bras. vol. xiii. pars. i. 39 (1841).

Moraballi Creek, Essequibo River, September 26th, 1929, *Sandwith* 343. Low tree about 10 ft. high, on slope in morabukea forest, only once found. Carpels crimson; seeds black, with orange aril.

Distr. Trinidad, Guiana, Brazil.

Rollinia multiflora Splitg. in Hoen. and De Vriese, Tijdschr. ix. 97 (1842).

Moraballi Creek, Essequibo River, September 19th, 1929, *Sandwith* 301. Middle-sized tree, 60–80 ft. high, in 'low bush.' Leaves glaucous beneath. Buds greenish-brown. Fruit glaucous.

Vernacular name (Arawak), Kuyechi.

Distr. Trinidad, British Guiana, Surinam.

Annona haematantha Miq. in Linnaea xxii. 465 (1849).

Moraballi Creek, Essequibo River, October 7th, 1929, *Sandwith* 392. Scrambling, not coiling, bush-ropes in wallaba forest; also seen in wallaba-mora swamp-forest. Petioles and branchlets reddish-ferrugineous tomentose. Sepals brownish-tomentose. Petals in two series, the outer large and widely-spreading in flower, the inner very small, all a beautiful and striking deep pinkish-red.

Vernacular name (Arawak), Karampai.

The material agrees exactly with the type collection (*Hostmann* 1191) from Surinam, which was noted as "planta scandens flore sanguineo, in sylvis uliginosis." This beautiful species, remarkable both for its habit and for the colour and shape of its open flowers, appears to be allied to *A. acutiflora* Mart. with which Pulle has identified it in his Flora of Surinam; but Martius' species evidently differs specifically in the size of its leaves and the colour of its flowers, as well as in its habit, which is not scandent, and its locality in the

neighbourhood of Rio de Janeiro. No further material of *A. haematantha* has been seen, and it does not appear to have been collected previously in British Guiana.

Distr. British Guiana, Surinam.

Annona symphyocarpa *Sandwith*, sp. nov.; *A. glabrae* L. (*A. palustri* L.) affinis, foliis longius acuminatis, subtus glaucis pilis minimis adpressis satis raris regulariter conspersis, floribus multo minoribus differt.

Arbor mediocris ad 24 m. alta; ramuli summi glabri, siccitate fulvi vel purpurascens, corrugato-sulcati, 2–3 mm. diametro. *Folia* ovata, elliptica vel lanceolata, apice sensim in acumen conspicuum angustum tenue ad 2 cm. longum attenuata, basi rotundata vel exemplis angustioribus obtuse cuneata, 5–18 cm. longa, 2.5–7 cm. lata, satis tenuiter chartacea, supra glabra nitida viridia fortissime ut in *A. glabra* reticulata nervis primariis arcuatis utroque latere costae vulgo 10–15, subtus glauca pilis minimis adpressis satis raris passim regulariter conspersa costa nervisque primariis prominentibus reticulatione immersa satis obscura; petiolus siccitate nigrescens, rugulosus, glaber vel minutissime pilosulus, 0.6–1.8 cm. (vulgo 1–1.5 cm.) longus, 1–2 mm. diametro. *Inflorescentia* infra-axillaris, 1–4-flora; pedicelli 0.7–1.2 cm. longi, rufo-pilosuli, sub fructu juniore ad 2.2 cm. longi atque glabrescentes; bracteolae in medio pedicello parvae, ovatae, pilosulae. *Flores* glandulis obtecti, perodori; alabastra globoso-pyramidata, acuminata, siccitate ad 6 mm. diametro. *Calyx* sinuato-patelliformis obscure vel vix trilobatus, 6–7 mm. diametro, obscure rufo-pilosulus. *Petala* extra adpresse pilosula; 3 exteriora triangulari-cordata, 7 mm. longa atque lata; 3 interiora valvata, ovata, 5 mm. longa, 3.5–4.5 mm. lata. *Torus* circiter 2.2 mm. diametro. *Stamina* 1–1.2 mm. longa, filamentis glabris circiter 0.3 mm. longis, apice connectivi glabro anthera angustiore. *Carpella* ut in *A. glabra* in globum circiter 2 mm. altum 2.5 mm. diametro dense concreta. *Fructus* jam valde immaturus globosus, glaucus, 8–11 mm. diametro, siccitate dense rugulosus; maturus (dissecta fragmenta tantum visa) ut videtur circiter 4 cm. diametro, sublaevis, obscure areolatus.

BRITISH GUIANA. Swampy bank on sandy soil, Pokorero Creek, Kamuni River, Demerara River, April 20th, 1923, *Hohenkerk* in Forestry Department record no. 872 (type). Height 78 ft., with girth 43 in. at 4½ ft. Demerary, 1791, *Alex. Anderson* (Herb. Mus. Brit.); this sheet was recognised as a new species by Safford, who proposed to name it after the collector. In mixed forest, Moraballi Creek, Essequibo River, September 19th, 1929, *Sandwith* 298. Low tree about 40 ft. high, with young glaucous fruits.

The Arawak vernacular for this tree is Doro or Duru, which is also more commonly applied to *Apeiba Petoumo* Aubl.

Xylopia pulcherrima *Sandwith*, sp. nov.; *X. sericeae* St. Hil. affinis, foliis anguste elliptico-oblongis apice cuspidato-acuminatis,

subtus pulchrius sericeis atque pernitentibus, nervis primariis multo magis rectis parallelisque e costa angulo obtusiore excurrentibus, petalis angustioribus, indumento stylorum conspicuo differt.

Arbor silvis densis crescens, circiter 27 m. alta, cortice rubro-brunneo, qua de causa nomen "Red Kuyama" ab incolis datur; ramuli summi teretes, pulli, lenticellati, densissime ferrugineo-tomentosi; internodia 5-15 mm. longa. *Folia* anguste elliptico-oblonga, apice cuspidato-acuminata acumine 3-6 mm. longo, basi rotundata, 4-9 cm. longa, 1.5-2.5 cm. lata, supra glabra olivacea subnitida, subtus pilis arctis adpressis pulcherrime cinereo-argentea sericea pernitentia, praeterea marginibus ipsis conspicue prorsus pilosa, costa supra profunde impressa subtus prominente, reticulatione utrinque obscure prominula, nervis primariis angulo obtuso 100°-120° e costa excurrentibus usque ad furcam rectis fere parallelis; petiolus ferrugineo-tomentosus, supra canaliculatus, 3-5 mm. longus. *Inflorescentia* pauciflora, ut videtur 2-4-flora, omnino sericeo-tomentella, siccitate pallide ferruginea; pedicelli breves, 2-3 mm. longi; alabastra basi globosa, tum cylindrica, obtusa, planta vivente viridi-flava sericea nitentia; bracteolae in medio vel supra medium pedicellum, ovatae, obtusae, ad 1.25 mm. longae, extra sericeae, intus glabrae. *Sepala* inferne connata, triangulari-ovata, 2 mm. longa, 2.5 mm. lata, extra ferrugineo-sericea, intus glabra. *Petala* pulcherrima, flore aperto patulo-stellata, candidissima, exteriora nonnunquam triente inferiore secus medium colore roseo suffusa, omnia utrinque dense tomentella, extra sericea, basi connata, exteriora ad 1.5 cm. longa, ad 2.2 mm. lata, interiora basi dilatata paullo breviora circiter 1 mm. lata. *Stamina* 0.8 mm. longa. *Carpella* 8-10; ovarium pilosum, circuitum 1 mm. altum; stylus 4-5 mm. longus, dimidio superiore dense conspicue retrorse pilosus, inferiore glaber. *Fructus* non visus.

BRITISH GUIANA. In mixed forest, Moraballi Creek, Essequibo River, October 15th, 1929, *Sandwith* 456 (type). Middle-sized tree up to about 90 ft., with small flange buttresses. Bark reddish-brown. Branches ferrugineous-hairy. Leaves greyish-silvery sericeous beneath. Sepals brownish-sericeous. Buds greenish-yellow sericeous. Petals very beautiful, pure white, opening freely, the outer sometimes with a central longitudinal flush of pink in the lower third. Vernacular name (Arawak), Red Kuyama.

The styles of *X. sericea* are glabrous. The leaves of the present species resemble in shape those of *X. nitida* Dun. of French Guiana rather than those of *X. sericea*, which was collected in British Guiana by Schomburgk.

Xylopia cinerea *Sandwith*, sp. nov.; *X. nitidae* Dun. affinis, ramulis novellis sericeis, foliis supra subopacis subtus conspicue sericeis nitentibus, floribus longius pedicellatis, calyce bracteolisque glabris differt.

Arbor excelsa, 37.5 m. alta, 16 poll. diametro, in silvis densis crescens, cortice cinereo, qua de causa nomen "White Kuyama" ab

incolis datur; ramuli summi teretes corrugati cinerei glabrati, versus apicem partis novellae tenuiter arcte adpresse cinereo-sericei; internodia ad 15 mm. longa. *Folia* anguste elliptica, apice breviter acuminata acumine 2-4 mm. longo vel haud acuminata sed acuta vel obtusa, basi attenuata cuneata, 4-8.5 cm. longa, 1.5-2.5 cm. lata, supra glabra viridia subopaca, subtus pilis arctis adpressis argenteo-sericea nitentia, costa supra impressa subtus prominente, reticulatione supra satis conspicue subtus obscurius prominente, nervis primariis angulo obtuso 120°-140° e costa excurrentibus usque ad furcam rectis vel arcuatis; petiolus indumento ramulorum adpresse pubescens, nonnunquam fere glabrescens, supra profunde canaliculatus, 3-5 mm. longus. *Inflorescentiae* infra folia in ramulis annotinis dispositae, pauciflorae, pedicellis vetustate saltem fere glabratis corrugatis cinereis 5-10 mm. longis; bracteolae pedicellos amplectentes, siccitate nigrae, glabrae, circiter 1 mm. longae, 3-4 mm. latae. *Flores* non visae. *Calyx* post florum lapsum 2 mm. longus, 4-5 mm. diametro, cupularis, siccitate niger, glaber, circiter ad medium (juventute verisimiliter minus profunde) trilobatus, lobis latis rotundatis semicircularibus. *Torus* glaber 5-6 mm. diametro. *Monocarpia* (immatura) 15-25, clavata vel acinaciformia, fructu in stipitem circiter 5 mm. longum sensim transeunte, plerumque falcata, planta vivente viridia, siccitate nigra, juventute pubescentia, denique glabrata, 1-2.5 cm. longa, versus apicem 2-2.5 mm. diametro. *Semina* immatura 4-5, brunnea, ellipsoidea, 2-3 mm. longa, 1.2 mm. lata, arillo ad 0.8 mm. alto praedita.

BRITISH GUIANA. In mixed forest, Moraballi Creek, Essequibo River, Nov. 1st, 1929, *Sandwith* 543 (type). Tall tree, 125 ft. high, 16 in. diameter. Leaves green above, silvery-sericeous beneath. Fruit green.

Vernacular name (Arawak), White Kuyama.

X. Benthami *R. E. Fries* in Svensk. Vet. Akad. Handl. xxxiv. no. 5, 35, t.v., fig. 2-4 (1900); in Acta Hort. Berg. Band 10, no. 1, p. 112 (1930).

Moraballi Creek, Essequibo River, September 28th, 1929, *Sandwith* 353. Small tree, 45 ft. high, 5 in. diam., in wallaba forest on sandy ridge, of which it is a characteristic constituent. Cauli-florous; buds green; open flowers starlike, cream. Carpels in huge round bunches, green, turning crimson. Leaves glaucous beneath.

Vernacular name (Arawak), Weshiraure.

Distr. British Guiana, Brazil (Rio Negro), Venezuela (Rio Casiquiare). Not recorded from British Guiana by Fries in his recently published monograph of the genus, but it had already been collected on the Moblissa River, Demerara County, in February 1910, by C. W. Anderson in Forestry Department record no. 555; and on the Mora-mora-bisi Creek, Mapenna River, Corentyne River, in May 1918, by L. S. Hohenkerk in Forestry Department record no. 555A.

INDEX OF VERNACULAR NAMES.

Arara	Unonopsis glaucopetala R. E. Fries
Armadillo Tree	Duguetia Yeshidan sp. nov.
Doro or Duru	Annona symphyocarpa sp. nov.
Karampai	Annona haematantha Miq.
Karikahuh	Guatteria scandens Ducke
Kurihikoyoko	Anaxagorea dolichocarpa sp. nov.
Kuyama, Black	Guatteria atra sp. nov.
„ Red	Xylopi pulcherrima sp. nov.
„ White	Xylopi cinerea sp. nov.
Kuyechi	Rollinia multiflora Splitg.
Murnek-Yek	Anaxagorea dolichocarpa sp. nov.
Weshiraure	Xylopi Benthami R. E. Fries
Yarri-Yarri, Black	Anaxagorea dolichocarpa sp. nov.
„ Black Hill	Unonopsis glaucopetala R. E. Fries
„ Fine-leaved	Duguetia neglecta sp. nov.
„ Large-leaved	Duguetia pycnastera sp. nov.
„ Red	Duguetia neglecta sp. nov.
„ Swamp	Anaxagorea dolichocarpa sp. nov.
Yeshidan	Duguetia Yeshidan sp. nov.
Yoarno	Guatteria scandens Ducke

LII.—ON THE FLORA OF THE NEARER EAST: IX.*

A CONTRIBUTION TO OUR KNOWLEDGE OF THE FLORA OF AZERBAIDJAN, N. PERSIA. B. GILLIAT-SMITH AND W. B. TURRILL: IV.

CHENOPODIACEAE (continued).

Halocnemum strobilaceum M. Bieb. Flor. Taur.-Cauc. iii. 3 (1819)

Hills north of Tabriz, 10.29, No. 2653.

Distrib. Medit. Region and Cent. Asia.

Kochia lanata Rechinger ex Bornm. in Verh. Zool.-Bot. Ges. Wien lx. 167 (1910). *K. prostrata* var. *canescens* Moq.

Hills south of Tabriz, 19.6.28, No. 2307.

Distrib. Orient.

Noaea spinosissima Moq. in DC. Prodr. xiii. ii. 209 (1849).

Near Tabriz, 9.27 (flower and fruit), No. 2140; (in fruit) No. 2172. Fruit every shade of pink and red.

Distrib. Medit. Region.

Petrosimonia glauca Bunge Anab. Rev. 52, 58 (1862).

Tabriz, weed in garden, 24.8.27, Nos. 2136, 2137. Flowers red, minute, from June to August and is in fruit Sept. to Oct.

Distrib. N. Persia and shores of the Caspian Sea.

Salsola brachiata Pall. Illustr. 30, t. 22 (1803).

Near Tabriz, 11.25, No. 1315.

Distrib. S. Russia, Caucasus, N. Persia, Afghanistan, Cent. Asia.

*Continued from K.B. 1930, p. 463.

S. glauca M. Bieb. Flor. Taur.-Cauc. i. 185 (1808).

Near Tabriz, 17.7.27, No. 1989; 7.27, No. 2161; north-east of Tabriz, among the ruins of an old fort called the Rashdiye Fort, 8.27, No. 2178.

Distrib. Armenia, Caucasus, N. Persia.

S. Kali L. Sp. Pl. 222 (1753).

Hills south of Tabriz, 8.27, No. 2132; Tabriz, weed in garden, 6.27, Nos. 2138, 2139; hills south of Tabriz, 7.27, Nos. 2141, 2142. Flowers from summer to early autumn.

Distrib. N. Temp. Region.

This species is known to be very polymorphic and to vary greatly with age and I have not attempted to apply varietal names.

S. spissa M. Bieb. in Mem. Soc. Mosc. i. 103 (1811).

Tabriz, weed in garden, 24.8.27, flowers minute, red, Nos. 2135, 2157; 28.10.27, No. 2179; cultivated at Kew from Tabriz seeds as K.682, 3.10.28, 26.11.28.

Distrib. S. Russia, Asia Minor, Armenia, Persia, Afghanistan, Cent. Asia.

Salsola sp. nov. ? aff. *S. glaucae* M. Bieb.

Near Tabriz, 11.25, No. 1312.

The material is unfortunately too imperfect for a complete description to be prepared.

Seidlitzia florida Bunge ex Boiss. Flor. Or. iv. 950 (1879).

Near Tabriz, 11.25, No. 1316 (?); north-east of Tabriz, near the ruins of Rashdiye Fort, 10.27, No. 2177 (?); east of Tabriz, 29.10.27 (fruit), No. 2181. Fruit various shades of pink, red, or orange.

Distrib. Armenia, Persia.

The nature of the material makes the identification of the first two numbers somewhat doubtful.

Spinacia tetrandra Stev. ex M. Bieb. Flor. Taur.-Cauc. ii. 417 (1808).

Tabriz, garden weed, 4.26, No. 1384; 4.26, No. 1425.

Distrib. Caucasus, Armenia, Turkestan, Iraq, N. Persia, Afghanistan, Caspian districts.

Suaeda altissima Pall. Illustr. Pl. 49 t. 42 (1803).

Near Tabriz, 5.26, No. 1515; 6.26, No. 1665; 13.6.27, No. 2156.

Distrib. Medit. Region, S.E. Eur., Cent. Asia.

POLYGONACEAE.

Atraphaxis spinosa L. Sp. Pl. 333 (1753), var. **glauca** Boiss. Flor. Or. iv. 1021 (1879).

Hills to the north of Tabriz, flowers June, fruits July 1928, No. 2382; Shor Dara (Dere), Yam, 7.28, No. 2478. Fruits various shades of pink and red.

Distrib. (of species) Crimea, Caucasus, east to Afghanistan and Cent. Asia, and south to the eastern Egyptian desert.

(of var.) Armenia, N. Persia, Afghanistan.

Polygonum ammannioides *Jaub. et Spach* Ill. Plant. Or. ii. 28, t. 119 (1844-46).

Near Tabriz, 8.9.29, Nos. 2617, 2618; Yam, 7.28, No. 2380.

Distrib. Azerbaidjan.

P. aviculare *L.* Sp. Pl. 362 (1753) s.l.

Tabriz, in garden, 6.27, No. 2147; 6-7.28, No. 2381; east of Tabriz, 29.10.27, No. 2180; in Consulate garden, Tabriz, 10.29, Nos. 2650, 2651.

Distrib. Cosmopolitan.

P. Bellardii *All.* Flor. Pedem. ii. 207, t. 90. f. 2 (1785).

Tabriz, garden weed, 9.25, No. 1304; 5.26, No. 1614; 5.26, No. 1671; 5.27, Nos. 2066, 2067, 2146; in Consulate garden, Tabriz, 10.29, No. 2652. Flowers white or pink, through the spring, summer, and autumn.

Distrib. Medit. Region and Cent. Asia.

P. luzuloides *Jaub. et Spach* Illustr. Plant. Or. ii. 37, t. 126 (1844-46).

Yam, 7.8.28, No. 2022.

Distrib. N. Asia Minor, Armenia, N. and W. Persia.

P. paronychioides *C. A. Mey.* in Bull. Soc. Nat. Mosc. 1838, 356.

Hills south of Tabriz, 6.27, flowers pink or red, No. 2134; 6.28, No. 2268.

Distrib. N. Persia.

P. polycnemoides *Jaub. et Spach* Illustr. Plant. Or. ii. 30, t. 120 (1844-46).

Plain under Mishou Dagh, 9.29, No. 2605.

Distrib. E. Asia Minor, Syria, Iraq, Persia, Afghanistan.

Rumex Acetosella *L.* Sp. Pl. 338 (1753).

Mishou Dagh, 22.5.27, No. 1796.

Distrib. Cosmopolitan.

R. obtusifolius *L.* Sp. Pl. 335 (1753).

Garden weed in Tabriz, 5.26, No. 1661; 23.5.27, Nos. 2169, 2170.

Distrib. E.N. Temp. Region.

R. scutatus *L.* Sp. Pl. 337 (1753).

Mishou Dagh, 12.7.28, No. 2379.

Distrib. Medit. Region.

THYMELAEACEAE.

Diarthron vesiculosum *Endl.* Gen. Plant. Suppl. iv. Pars. ii. 63 (1847).

Hills north of Tabriz, 7.28, No. 2395.

Distrib. E. Asia Minor, Persia, Afghanistan, Baluchistan, Cent. and N. Asia, N. India, China.

Lygia Passerina *Fasano* in Atti. Act. Nap. 1787, 247 (1788); Boiss. Flor. Or. iv. 1052 (1879).

Yam, 2.8.28, No. 2429.

Distrib. Cent. Eur., Medit. Region, Cent. Asia.

ELAEAGNACEAE.

Elaeagnus angustifolius *L.* Sp. Pl. 121 (1753), var. **orientalis** *O. Kuntze* in Acta Hort. Petrop. x. 235 (1887).

Very common around Tabriz, in fruit, 8-9.25, No. 1299; fruiting in gardens where it is cultivated, fruits when ripe yellowish brown or brown, very dry and tasteless, in flower, 26.5.26, flowers yellow, sweet scented, No. 1659. Turki "ida," Persian "sindjif." Sometimes known as "Persian dates."

Distrib. Medit. Region, Cent. Asia, China.

SANTALACEAE.

Thesium ramosum *Hayne* in Schrad. Journ. 1800, 30, t. 7.

Village of Hassar between the lake and city of Urmia, 21.5.26, No. 1532.

Distrib. E.N. Temp. Region.

EUPHORBIACEAE.

Chrozophora obliqua *A. Juss.* Tent. Euph. 28 (1824), var. **genuina** *Prain* in Kew Bull. 1918, 112.

Plain between Tabriz and Sofia, also at Yam, 8.28, No. 2474. Flowers small, yellow.

Distrib. (of species and var.) Medit. Region.

Euphorbia Chamaesyce *L.* Sp. Pl. 455 (1753).

Hills north of Tabriz, 28.4.29, No. 2560.

Distrib. Medit. Region.

E. Esula *L.* Sp. Pl. 461 (1753).

Near Tabriz, 5.26, No. 1499 (very young); 5.27, No. 1825.

Distrib. E.N. Temp. Region.

E. falcata *L.* Sp. Pl. 456 (1753).

Near Tabriz, 17.6.27, No. 1912. Flowers in June and July.

Distrib. Cent. Eur. and Medit. Region.

• **E. Gerardiana** *Jacq.* Flor. Austr. v. 17, t. 436 (1778).

Hills south of Tabriz, 20.4.27, Nos. 1826, 1827. One of the most abundant plants on the hills, and it colours the countryside a greenish-yellow in spring and autumn.

Distrib. E.N. Temp. Region.

The plants do not agree with Boissier's description in Flor. Or. iv. 1127 (1879) of *B. Hohenackeri*, nor with Hohenacker's specimen at Kew.

E. Marschalliana Boiss. Diagn. Ser. I. vii. 94 (1845).

Hills south of Tabriz, 11.25, No. 1317; 27.3.26, No. 1334; 4.26, No. 1372. Plants quite prostrate, but with showy yellow to ruby red heads, strong smelling when in flower.

Distrib. Armenia, Transcaucasus, N. Persia.

In the absence of ripe fruits I am not quite sure of the identification of these specimens.

E. megalantha Boiss. Diagn. Ser. I. vii. 95 (1846).

Tabriz, garden weed, 26.4.26, No. 1405 (very young); near Tabriz, 20.4.27, No. 1824 (fruits slightly longer than the normal).

Distrib. Armenia, Persia.

E. orientalis L. Sp. Pl. 460 (1753).

Dik Dash, Yam, 9.29, No. 2604.

Distrib. Armenia, Kurdistan, Persia.

E. Szovitsii Fisch. et Mey. Ind. Sem. Hort. Petrop. i. 27 (1835).

Valley of Livan, among rocks near the torrent, 9.25, No. 1278; hills to the south of Tabriz, 21-29.5.27, No. 1790; near Tabriz, 5.27, No. 1828.

Distrib. Asia Minor, Syria, Armenia, Caucasus, Persia.

E. tinctoria Boiss. et Huet in DC. Prodr. xv. 166 (1862).

Hills south of Tabriz, 4.26, No. 1675 (?); Yam, 25.7.29, No. 2579 (galled by insects with the production of long pod-like structures).

Distrib. Asia Minor, Armenia, Syria, Persia.

Euphorbia sp.

Near Tabriz, 6.27, No. 1913. Attacked by *Uromyces striolatus* Tranz. (det. E. M. Wakefield).

URTICACEAE.

Parietaria judaica L. Sp. Pl. ed. 2. 1492 (1763), sensu Boiss. Flor. Or. iv. 1149 (1879).

Near Urmia, on rocks 21.5.28, No. 2258.

Distrib. E. Medit. Region.

P. persica Stapf in Denkschr. Math.-Naturwiss. Cl. K. Akad. Wiss. li. 272 (1886).

Hills to the north of Tabriz, on rocks, 15.5.27, No. 1931 (?); 28.4.29, No. 2561.

Distrib. Persia.

Ulmus glabra Mill. Gard. Dict. ed. viii. (1768).

Near Tabriz, 11.25, No. 1311; 27.3.26, No. 1332; 4.26, No. 1395; 26.4.26, No. 1422; 4.26, No. 1673. Turki "Gara aghatch" i.e. black tree.

Distrib. Widely distributed in temperate Eurasia.

U. montana With. Bot. Arr. Brit. Pl. ed. III. ii. 279 (1796).

Near Tabriz, 27.3.26, No. 1333; 4.26, No. 1394. Less common than *U. glabra* Mill.

Distrib. Widely distributed in temperate Eurasia.

SALICACEAE.

Populus alba L. Sp. Pl. 1034 (1753).

Near Tabriz, 11.28, No. 1314. The tree tends to assume a pyramidal form. Its wood is used for beams in the village houses, and in Turki it is known as "Goi kalama," i.e. "blue poplar" and also as "Tabrizi."

Distrib. N. Temp. Region.

P. euphratica Oliver Voy. Atlas, iii. 449, f. 45-46 (1801-07); Boiss. Flor. Or. iv. 1197 (1879).

Near Tabriz, 4.26, No. 1373; 5.26, No. 1645. The bark is of an intensely shining white colour, whence the Turki name "Agh kalama," i.e. "white poplar." Also used for beams in houses.

Distrib. E. Medit. Region.

Salix fragilis L. Sp. Pl. 1017 (1753).

Near Tabriz, 29.4.26, No. 1445.

Distrib. E.N. Temp. Region.

S. Medemii Boiss. Diagn. Ser. I. vii. 100 (1846).

In gardens, Tabriz, 1.4.26 (in flower), No. 1350. Known as "bid i Mishk" i.e. "Musk willow." The male inflorescences are distilled for making an essence with which food is flavoured.

Distrib. Persia.

ORCHIDACEAE.

Orchis iberica M. Bieb. in Willd. Sp. Pl. iv. 25 (1805). *O. angustifolia* M. Bieb. Flor. Taur.-Cauc. ii. 368 (1808).

Yam marshes, 20.7.28, flowers pink, No. 2375; 20.8.28, No. 2480 (in fruit); under Mishou Dagh, 25.7.29, No. 2575.

Distrib. Greece east to Persia.

O. latifolia L. Sp. Pl. 941 (1753) sensu Boiss. Flor. Or. v. 71 (1884).

Marshy field at Seivan, near Yam, 22.5.27, flowers purple, No. 1870a.

Distrib. E.N. Temp. Region.

IRIDACEAE.

Crocus Adamii J. Gay in Bull. Soc. Sci. Nat. Férussac, xxv. 319 (err. typ. 219) (1831).

Hills north of Tabriz, 2.4.26, No. 1340.

Distrib. Crimea (?), Caucasus, Armenia.

The two specimens on the sheet differ in the colouration of the perianth. In the dried condition one has the tepal lobes pale violet

with dark longitudinal lines which are partly continued into the tube ; the other had dark violet lobes, paler at the margins but not lined.

C. Adamii has been reduced to a variety of the more widely distributed *C. biflorus* Mill., as by Maw, The Genus *Crocus* 291 (1886) and by Boissier, Flor. Or. v. 112 (1884).

Gladiolus atrovioleaceus Boiss. Diagn. Ser. i. xiii. 14 (1853).

Urmia district, 5.26, No. 1567 ; Kara Dag, north of Tabriz, coll. Egger, spring 1927, No. 2174. It also occurs on the hills south of Tabriz.

Distrib. Palestine, Syria, Iraq, Armenia, N. Persia.

Iris Barnumae Foster et Baker in Gard. Chron. 1888, ii. 182.

Near Tabriz, 5.29, flowers violet purple or claret, No. 2488.

Distrib. Between Egypt and Palestine, Armenia, N. Persia.

I. Barnumae Foster et Baker, var. **urmiensis** Dykes The Genus *Iris* 115 (1913).

Mt. Sir, Urmia, and Kushtchi Gadugi Pass north of Urmia, 27.5.28, No. 2221 ; Tabriz district, 5.29, No. 2487. Whole flower pure bright yellow, with no lines on any of the petals, but the beard often darker, orange coloured. Very plentiful.

Distrib. (of var.) Azerbaidjan.

I. Ewbankiana Foster in Gard. Chron. Ser. 3. xxix. 1901. i. 397.

Hills north of Tabriz, Baba-Baghi, 15.5.29, No. 2492.

Distrib. N. Persia and Asia Minor.

The standards and falls appear to be less acute than they should be for the type, according to description, and the veins are continuous.

I. persica L. Sp. Pl. 40 (1753).

Desert hills south of Tabriz, 19.3.26, No. 1324 ; 3.28, No. 2216. Various shades of pale mauve to pale yellow flowers which are often faintly scented. Known as "Noruz güli" in Turki, i.e. New Year flower.

Distrib. Asia Minor, N. Syria, Armenia, Persia.

I. Polakii Stapf in Denkschr. Math.-Naturw. Cl. K. Akad. Wiss. I. 20 (1885) (det. O. Stapf).

Hills south of Tabriz, 5.29, flowers purple or claret with brown-purple falls, No. 2489 ; cultivated at Kew from Tabriz material, 11.5.28.

Distrib. Persia (Haideri).

The broad standards and keeled spathes are worth notice.

I. reticulata M. Bieb. Flor. Taur.-Cauc. i. 34 (1808), var. **typica** Regel in Gartenflora xxii. 354 (1873).

Tabriz, in cultivation, 21.3.26, No. 1325, sweetly scented. var. **Krelagii** Regel l.c.

Hills north of Tabriz, 2.4.26, No. 1339.

Distrib. (of species as a whole) Caucasus and N. Persia.

An article describing the colour varieties of this species introduced into cultivation from N. Persia by Mr. Georg Egger, Secretary to the German Consul at Tabriz, appeared in The New Flora and Sylva ii. 37 (1929).

I. paradoxa Stev. in Mem. Soc. Nat. Mosc. v. 355 (1814).

Marand, north-west of Tabriz, 5.29, No. 2490.

Distrib. Armenia, N. Persia.

I. songarica Schrenk Enum. Pl. Nov. i. 3 (1841).

East of Lake Urmia, 25.5.26, flowers sky blue, No. 1593 ; under the red hills north of Tabriz, 5.29, No. 2491.

Distrib. Persia east to W. China.

I. spuria L. Sp. Pl. 39 (1753).

Urmia district, in a marshy hollow near the village of Hassar on the plain between the city and lake of Urmia, 5.26, No. 1548 ; 29.5.28, No. 2300. Tall and graceful with pale blue flowers.

Distrib. Cent. Eur. and Medit. Region.

AMARYLLIDACEAE.

Ixiolirion montanum Herb. Amar. 125, t. 20, f. 3 (1837).

Urmia district, 5.26, flowers blue, Nos. 1541, 1549 ; bulbs from near Tabriz, cultivated at Kew, 14.5.27, and 3.5.28.

Distrib. Palestine and Syria and E. Asia Minor to Persia, Afghanistan, and N. India.

In No. 1549 the anthers are up to 6 mm. long, in the other specimens 3.5-4 mm.

LILIACEAE.

Allium Akaka Gmel. ex Roem. et Schult. Syst. vii. 1132 (1830).

Near Tabriz, 5.26, flowers various shades of pink, Nos. 1444, 1485 ; 12.5.27, No. 1870 ; hills south of Tabriz, sweet scented, 5.28, No. 2219 ; cultivated at Kew from Tabriz bulbs, in flower 14.5.27. The width of the leaves varies considerably and in the desert hills south of Tabriz there is no peduncle visible.

Distrib. Armenia, N. Persia.

A. Ampeloprasum L. Sp. Pl. 294 (1753), var. **atroviolaceum** Regel et var. **leucanthum** Regel All. Monogr. 54 (1875).

Hills south of Tabriz, in cornfields and gardens, very common, flowers in June and July, purple and silver-tepalled varieties, 22.6.28, No. 2356.

Distrib. (of species) Medit. Region. Colour varieties here and there in species area.

A. dilutum Stapf in Denkschr. Math. Naturw. Cl. K. Akad. Wiss. I. 13 (1885).

Near Zindjanab, sweet-scented, 3.5.28, flowers pink to purple, No. 2222.

Distrib. N. Persia.

A. laceratum Boiss. et Noë in Boiss. Diagn. Ser. II. iv. 112 (1859).
Urmia district, Band, 20.5.26, flowers deep pink, No. 1564;
common in open grassy meadows near Band, 25.5.28, No. 2217.
Distrib. Armenia, Persia.

A. rotundum L. Sp. Pl. ed. 2. 423 (1762).
Mishou Dag, 30.8.28, flowers red, No. 2481.
Distrib. Cent. Eur. and Medit. Region.

A. rubellum M. Bieb. Flor. Taur.-Cauc. i. 264 (1808).
Above Zindjanab, Sahand Range, 25-27.6.29, flowers red, No. 2518.
Distrib. S. Russia, Caucasus, E. Medit. Region to N. India.

A. rubellum M. Bieb., var. **parviflorum** Ledeb. Flor. Ross. iv. 171 (1853).
Hills south of Tabriz, 16.5.28, flowers red, No. 2301.
Distrib. (of var.) S. Russia, Caucasus.

Asparagus officinalis L. Sp. Pl. 313 (1753).
Near Tabriz, cultivated in a garden, 26.5.27, No. 1868.
Distrib. E.N. Temp. Region.

Bellevalia ciliata Nees Gen. Pl. Monocot. ii. t. 42 (1835).
Yam, 11.5.28, whitish, No. 2220.
Distrib. Caucasus, Persia, Afghanistan.

B. tabriziana Turill in Kew Bull. 1929, 234.
Hills north of Tabriz, 10.4.27, No. 1775, flower-stalk buried in the sand almost up to the inflorescence, flowers pale blue or mauve, white or cream-coloured, with violet-black anthers.
Endemic.

Colchicum Kotschyi Boiss. Diagn. Ser. I. xiii. 38 (1853).
Yam, white tinged with pink at times, 21.8.27, No. 2084; under Mishou Dag, 7.8.27, s.n.
Distrib. Asia Minor, Armenia, Persia.

C. Szovitsii Fisch. et Mey. Ind. Sem. Hort. Petrop. i. 24 (1834), var. **Freynii** Stefanoff in Sbor. Balg. Akad. Nauk. xxii. 25 (1926).
Hills south of Tabriz, 19.3.26, flowers white, Nos. 1327, 1328; early spring, 1928, No. 2214.
Distrib. (of species) Armenia, Transcaucasus, N. and W. Persia.
(of var.) N. Persia.

Eremurus anisopterus Regel. Gartenfl. xxii. 260 (1873).
West of Zindjanab, 2.5.28, flowers white or flesh-coloured, No. 2242.
Distrib. N. Persia, Afghanistan, Cent. Asia.

Fritillaria karadaghensis Turill in Gard. Chron. 3rd ser. lxxxv. 242, 221 (1929). *F. foliosa* Bornm. in Fedde Repert. xxvii. 338/50 (1930).

Bulbs from the Kara Dag, North Persia, coll. Egger, cultivated in Tabriz, early spring, 1928, No. 2213; also in flower at Kew, 3.29.
Endemic.

Fritillaria Karelinei Baker in Journ. Linn. Soc. xiv. 268 (1874); Bot. Mag. t. 6406 (1879).

Hills south-east of Tabriz, in full purple flower, 19.4.28, east of Tabriz, 17.4.28, No. 2212; 5.29, No. 2494.
Distrib. N. Persia, Afghanistan, Baluchistan, Cent. Asia, Sind.

F. Olivieri Baker in Journ. Linn. Soc. xiv. 261 (1874).
Tabriz district, Mt. Heron, 5.29, flowers purple brown, No. 2493.
Distrib. N. Persia.

Gagea confusa Terracc. in Boll. Soc. Ort. Palermo ii. repr. 5 (1904)?
Mishou Dag, 22.5.27, flowers yellow (No. 1795).
Distrib. Russia, Persia.

G. reticulata Roem. et Schult. Syst. vii. 542 (1829).
On the hills south of Tabriz, 31.3.26, flowers yellow, No. 1330; 9.4.26, Nos. 1361, 1362.
Distrib. Medit. Region.

Hemerocallis fulva L. Sp. Pl. ed. 2. 462 (1762).
In gardens near Tabriz, 6.26, flowers orange, No. 1752.
Distrib. E.N. Temp. Region.

Merendera trigyna Stapf in Denkschr. Math.-Naturw. Cl. K. Akad. Wiss. I. 18 (1885); Woron. in Acta Hort. Petrop. xxviii. 431 (1909). *M. caucasica* M. Bieb. Flor. Taur.-Cauc. i. 293, 426 (1808), iii. 281 (1819).
Hills north of Tabriz, 2.4.26, flowers white or pinkish, No. 1341; Yam, early spring, 1928, No. 2215.
Distrib. Armenia, Caucasus, Persia.

Muscari caucasicum Boiss. Flor. Or. v. 293 (1884).
Cultivated at Kew from bulbs near Tabriz, 14.5.27.
Distrib. Caucasus.

Ornithogalum montanum Ten. Prodr. Flor. Nap. xxii. (1811).
Yam Pass, 22.5.27, flowers white, No. 1871 (?); 11.5.28, No. 2218.
Distrib. S. Italy and Sicily east to Caucasus and N. Persia.

O. pyrenaicum L. Sp. Pl. 306 (1753).
Top of Mishou Dag, 19.7.28, flowers white, No. 2369.
Distrib. Cent. Eur. and Medit. Region.

Tulipa cuspidata Stapf in Denkschr. Math.-Naturw. Cl. K. Akad. Wiss. I. 17 (1885) var. ?
Gardens in Tabriz, 4.29, No. 2498. The flowers are scarlet and larger than in wild material at Kew.
Distrib. Persia.

T. montana Lindl. Bot. Reg. xiii. t. 1106. (1827).

Near Zandjan, 3.5.28, flowers red, No. 2223; 5.29, No. 2497 (var. ?)

Distrib. Persia.

T. polychroma Stapf in Denkschr. Math.-Naturw. Cl. K. Akad. Wiss. I. 18 (1885).

South of Tabriz on the desert hills, 30.3.26, flowers white tinged with cream, pink, or blue, No. 1329; hills north of Tabriz, 4.28, No. 2224.

Distrib. N. and W. Persia, ? Afghanistan.

Bornmüller in Beih. Bot. Centrbl. xxiv. 100 (1908) considers this as synonymous with *T. Buhseana* Boiss. [Diagn. Ser. II. iv. 98 (1859)], which he reduces to a variety of *T. humilis* Herb. I have seen no type or authenticated material of *T. Buhseana* Boiss. and for the time therefore retain Stapf's name.

T. silvestris L. Sp. Pl. 305 (1753).

In gardens round Tabriz, 22.4.27, flowers yellow, No. 1869; cultivated at Kew from Tabriz bulbs, 12.4.28.

Distrib. Medit. Basin.

T. violacea Boiss. et Buhse Aufz. 211 (1860).

Urmia, 5.29, flowers pale violet pink, No. 2496.

Distrib. N. and W. Persia.

T. violacea Boiss. et Buhse, var. **pallida** Hausskn. ex Bornm. in Beih. Bot. Centrbl. xxiv. 100 (1908).

North of Tabriz, Kara Dag, coll. Egger, spring, 1927, No. 2173.

Distrib. (of var.) N. and W. Persia.

NAIADACEAE.

Triglochin maritimum L. Sp. Pl. 339 (1753).

Urmia, 5.28, No. 2267a; Yam, 12.7.28, No. 2394.

Distrib. Widely spread in N. Temp. Region.

GRAMINEAE.

Aegilops triuncialis L. Sp. Pl. 1051 (1753).

Tabriz, weed in garden, 22.6.27, No. 2201.

Distrib. Medit. Region.

Agropyron Buonapartis Th. Dur. et Schinz Consp. Flor. Afric. v. 1894, 936 (1895).

Near Tabriz, 16.5.26, No. 1506.

Distrib. N. Afr. and Orient.

A. repens Pal. de Beauv. Agrost. 102 (1812).

Near Tabriz, 5.26, No. 1638.

Distrib. N. Temp. Region.

Alopecurus myosuroides Huds. Flor. Angl. 23 (1762).

Near Tabriz, 11.5.27, No. 2203.

Distrib. E.N. Temp. Region.

Atropis festucaeformis Schur Enum. Pl. Transsilv. 780 (1866), sensu Boiss. Flor. Or. v. 615 (1884).

Near Tabriz, 5.26, No. 1633; 27.5.27, Nos. 2197, 2198.

Distrib. W. Eur., Medit. Region, Armenia, Caspia.

Avena abyssinica Hochst. ex. A. Rich. Tent. Flor. Abyss. ii. 415 (1851) (det. C.V.B. Marquand).

Near Tabriz, 22.6.27, No. 2202a.

Distrib. Medit. Region and E. Afr. as a weed.

No oats are cultivated in Azerbaidjan and no native names are given to them.

A. fatua L. Sp. Pl. 80 (1753).

Yam, apparently wild in fields, 6.28, No. 2441.

Distrib. E.N. Temp. Region.

A. sterilis L. Sp. Pl. ed. 2, 118 (1762).

Weed in garden near Tabriz, 22.6.27, No. 2202.

Distrib. Medit. Region and as an introduced weed in many parts of the world.

Bromus japonicus Thunb. Flor. Jap. 52, t. 11 (1784).

Near Tabriz, 27.5.27, No. 2206.

Distrib. Cent. Eur., E. Medit. Region, and as a weed in many parts of the world.

B. macrostachys Desf. Flor. Atlant. i. 96. t. 19 (1798), var. **triaristatus** Hack. Flora lxii. 155 (1879).

Near Tabriz, 6.28, No. 2444; 6.29, No. 2550.

Distrib. (of species) E.N. Temp. Region.

(of var.) Asia Minor east to Afghanistan.

B. tectorum L. Sp. Pl. 77 (1753).

Near Tabriz, 5.26, No. 1637; 5.6.27, No. 2205.

Distrib. E.N. Temp. Region.

Cynodon Dactylon Pers. Syn. Pl. i. 85 (1805).

Near Tabriz, 9.7.27, No. 2187.

Distrib. Cosmopolitan.

Dactylis glomerata L. Sp. Pl. 71 (1753).

Tabriz, weed in garden, 5.26, No. 1635; 5.6.27, Nos. 2192, 2193, 2194.

Distrib. E.N. Temp. Region.

Eragrostis minor Host. Gram. iv. 15 (1809).

In garden, near Tabriz, 5.28, No. 2442.

Distrib. E.N. Temp. Region.

Hordeum murinum L. Sp. Pl. 85 (1753), var. **leporinum** Richter Pl. Eur. i. 130 (1890).

Tabriz, weed in garden, 5.26, No. 1636; 5.6.27, No. 2199.
Distrib. (of species) E.N. Temp. Region.
(of var.) Medit. Region.

Lolium perenne L. Sp. Pl. 83 (1753).

Near Tabriz, weed in garden, 27.5.27, No. 2189.
Distrib. Eur. and Medit. Region.

L. multiflorum Lam. Flor. Fr. iii. 621 (1778).

Near Tabriz, 5.28, No. 2446.
Distrib. Eur. and Medit. Region.

L. persicum Boiss. et Hohen. in Boiss. Diagn. Ser. i. xiii. 66 (1853).

Tabriz, weed in garden, 27.5.27, No. 2190.
Distrib. Armenia, N. Persia, Afghanistan, Baluchistan.

Melica Cupani Guss. Suppl. Flor. Sic. Prodr. 17 (1832), var. **inaequiglumis** Boiss. Flor. Or. v. 590 (1884).

Hills south of Tabriz, 8.28, No. 2445; Mishou Dagh, 5.8.29, No. 2603.
Distrib. (of species) Medit. Region and Cent. Asia.
(of var.) Asia Minor, Iraq, Armenia, Persia.

Panicum miliaceum L. Sp. Pl. 58 (1753).

Yam, fields, 8.9.29, No. 2620. Turki "Dari."
Distrib. Eur. and Asia, as a cultivated plant, ruderal, or weed.

Phleum asperum Jacq. Coll. i. 110 (1786), var. **ciliatum** Boiss. Flor. Or. v. 482 (1884).

Near Tabriz, 6.27, No. 2204.
Distrib. (of species) E.N. Temp. Region.
(of var.) Caucasus, Persia, Afghanistan.

Poa bulbosa L. Sp. Pl. 70 (1753), viviparous.

Weed in garden near Tabriz, 11.6.27, No. 2200.
Distrib. E.N. Temp. Region.

P. pratensis L. Sp. Pl. 67 (1753).

Tabriz, weed in garden, 5.26, No. 1634; 27.5.27, No. 2196.
Distrib. N. Temp. Region.

P. pratensis L. var. **angustifolia** Sm. Flor. Brit. 105 (1800).

Tabriz, weed in garden, 27.5.27, No. 2195.
Distrib. (of var.) here and there in species area.

Setaria italica Pal. de Beauv. Agrost. 51 (1812).

As a weed in the millet fields, Yam, 8.9.29, No. 2619.
Distrib. Nearly cosmopolitan as a weed and ruderal.

S. verticillata Pal. de Beauv. Agrost. 51 (1812).

Near Tabriz, weed in garden, 7.27, No. 2143. Two pieces of *S. viridis* Pal. de Beauv. mixed with the material.
Distrib. Old World.

S. viridis Pal. de Beauv. Agrost. 51 (1812).

Tabriz, weed in garden, 7.27, No. 2144; 12.7.27, No. 2188.
Distrib. E.N. Temp. Region.

Stipa barbata Desf. Flor. Atlant. i. 97, t. 27 (1798), var. **Szovitsiana** Hack. in Denkschr. Acad. Wien i. 8 (1889) et in Mon. Jard. Bot. Tiflis xxiv. 19 (1912).

Near Tabriz, 5.28, No. 2443.
Distrib. (of species) Medit. Region.
(of var.) Armenia, Persia, Turcomania, Caucasus.

Triticum sativum Lam. Encycl. ii. 554 (1786), var. **erythrospermum** Kornicke Syst. Übers. ii. (1873); Körn u. Wern. Handb. Getr. i. 46, t. I. f. 3 (1885), ii. 337 (1885).

Near Tabriz, 6.27, No. 2191.
Distrib. Cultivated—cosmopolitan.

CONIFERAE.

Juniperus communis L. Sp. Pl. 1040 (1753).

Upper regions of Mishou Dagh, 21.8.27, No. 2117.
Distrib. N. Temp. Region.

GNETACEAE.

Ephedra nebrodensis Tin. in Guss. Flor. Sic. Syn. ii. 638 (1844), var. **procera** Stapf in Denkschr. Math.-Naturw. Cl. K. Akad. Wiss. lvi. 80 (1889).

Hills north of Tabriz, 29.9.29, No. 2628.
Distrib. (of species) Medit. Region.
(of var.) S. Balkan Penins., Asia Minor, Armenia, Caucasus, Persia, Baluchistan, Afghanistan, Himalaya.

FILICES.

Cystopteris fragilis Bernh. in Schrad. Neues Journ. i. ii. 27 (1806).

Damp crevices in rocks in ravines, Mishou Dagh, 2.9.29, No. 2622.
Distrib. Nearly cosmopolitan.

(Concluded).

LIII.—MISCELLANEOUS NOTES.

EDWARD MORELL HOLMES.—The death of Mr. E. M. Holmes, Ph.C., F.L.S., on the 10th of September at the age of 88, removes one more distinguished correspondent of Kew. As a botanist Holmes was associated with two Directors of Kew on the Committees of Reference in Botany for the British Pharmacopoeia on behalf of

the General Medical Council of the United Kingdom, in 1898 with the late Sir William Thiselton-Dyer, and in 1914 with Sir David Prain. As a Pharmacist he received the distinction of being awarded the International Flückiger Medal (1897) and the International Hanbury Gold Medal (1915) in *Materia Medica*, and his knowledge of drugs and medicinal plants was probably unrivalled. He constantly sought the assistance of Kew in the determination of those that were unfamiliar to him and which were also new to science or the trade, and the last of his many letters to Kew, relating to the apparently decorticated seeds of *Plantago ovata*, was received a few days only before his death. His numerous articles in the *Pharmaceutical Journal*—three hundred at least—on drugs and medicinal plants are evidence of his ability to unravel problems in his own special subject. Among his many literary activities he contributed the articles under G. to K. on Drugs to the *Encyclopaedia Britannica* (8th Ed.).

Holmes was a born collector and systematist. He had a very good general knowledge of the British Flora, including the Bryophyta and Cellular Cryptogams, and was a specialist on Lichens and Marine Algae. He also made considerable collections of Lepidoptera and Coleoptera. He published many papers on Seaweeds, the most important of his contributions being the Revised List of British Marine Algae compiled by himself and E. A. L. Batters (Ann. Bot. 1890). He also prepared a set of "*Algae Britannicae Rariores Exsiccatae*" which were issued in twelve fasciculi. On Seaweeds he was a recognised authority and his retentive memory was never at fault as to the exact localities on the shore where rare forms were to be found.

In 1900 Holmes was President of the Pharmaceutical Conference in London and his address, published in the Year Book of Pharmacy, displays his wide interests both in the commercial and in the scientific lines of development of that subject.

He retired in 1922 from the service of the Pharmaceutical Society at Bloomsbury Square, where as Curator of the Society's Museum he had served for fifty years with conspicuous ability. He continued to reside at Sevenoaks, and to the end of his long and busy life he maintained his interest and enthusiasm in botany and carried on his various activities with undiminished vigour.

SIR FRANCIS WATTS, K.C.M.G.—We record with deep regret the death of Sir Francis Watts, on September 26th, in Trinidad. Sir Francis's connection with Kew has been a long and intimate one, from the commencement of his Colonial career in 1889, when he was appointed Analytical Chemist, Antigua, until the close of his active life, devoted to the welfare of the West Indian Islands and the progress of Agriculture both there, in Mauritius and elsewhere.

Sir Francis was born in 1859 and went to Antigua after completing his studies at Mason's College, Birmingham. After nine years'

service in Antigua he occupied a similar post in Jamaica, but returned to the Leeward Islands in 1899 to take up the duties of Government Chemist and Superintendent of Agriculture, when Sir Daniel Morris was Imperial Commissioner of Agriculture for the West Indies.

On Sir Daniel's retirement from this post in 1906 he succeeded him in that important office and ably carried on the valuable work of the Department on the lines so well laid down by his predecessor, and greatly added to the prestige of the Department. Sir Francis carried on the work of the Imperial Department in Barbados until the Imperial College of Tropical Agriculture was founded in Trinidad, when he transferred the office of the Commissioner to that island and retained both that post and the Principalship of the College (*K.B.* 1922, p. 303) until his retirement in 1924.

It is in connection with the establishment of the College that Sir Francis Watts's name will be principally retained in grateful remembrance, since it was largely due to his efforts that this important project came into being. In recognition of his services as the first Principal of the College he was made 'Principal Emeritus' on his retirement, and his portrait, which was presented to him, very fittingly adorns the College. He received the honour of the C.M.G. in 1904 and the further honour of the K.C.M.G. in 1917 (*K.B.* 1917, p. 84).

During his residence in Trinidad he entered fully into the public life of the island with the customary enthusiasm which marked his activities up to the close of his life, and he filled the office of President of the Agricultural Society with conspicuous ability. He was nominated an official member of the Legislative Council of Trinidad and Tobago in 1928, and his advice on agricultural matters was constantly asked for and as freely given. He had only recently, in August last, returned from Mauritius, whither he had been sent, as a special Commissioner, to investigate the condition of the sugar industry in that island. His death will be mourned throughout the Empire; for the far-reaching effects of his valuable labours extended beyond the limits of the West Indian Islands.

JOHN MASTERS HILLIER.—We greatly regret to record the death of Mr. J. M. Hillier, who retired in 1926 after forty-seven years' service at Kew, for the last twenty-five of which he was Keeper of the Museums (*K.B.* 1926, p. 220). On retirement Mr. Hillier went to live at Osterley, and had recently returned to his home after his summer holiday, when he contracted pneumonia and died suddenly on the 5th October.

ADOLF ENGLER.—We regret to announce the death of Dr. Heinrich Wilhelm Adolf Engler, late Professor of Botany in the University of Berlin, and Director of the Botanical Garden and Botanical Museum at Dahlem, Berlin, who passed away at Dahlem on the 10th October, in his 87th year. In him Systematic Botany and Plant-Geography have lost their *doyen*. So intimately is his

work in these two fields linked up with the modern progress of Botany, and so potent is still his influence, that a full account of his long and remarkably intensive and many-sided activity is obviously beyond the scope of this notice. We may, however, refer to the address given by Professor Poulton at the anniversary meeting of the Linnean Society of London on May 24, 1913, when he handed over to a representative of the German Government the Linnean Gold Medal which the Council of the Society had awarded to Professor Engler. In this address a condensed appreciation of Engler's work up to 1913 may be found, but that year by no means marked the conclusion of his contributions to Botany.

A long series of papers of limited extent followed, one of the last being an article on *Podostemonaceae Americanae Novae* (1927); his Monograph of *Saxifraga* (1872), up to then the standard work on this genus, was superseded by a new and most comprehensive monograph of over 700 pages in the *Pflanzenreich* (1916-1919), as were his *Araceae*, published in A. De Candolle's *Monographiae* (1879) by an equally comprehensive treatise, occupying 9 Hefte of the same series, the last issued in 1920; his "Syllabus," a concise summary of his concept of Botanical Taxonomy, went from edition to edition, ever keeping pace with the progress made in that field until in 1925 it reached its 10th edition. At the same time Engler continued with unbroken energy the direction and editorship of the "*Pflanzenreich*" which had begun in 1900, so that by the time of his death it covered over sixty families. In addition to this a new revised edition of the "*Natürliche Pflanzenfamilien*," also under his direction and editorship, was commenced in 1924, and of this eleven volumes have been produced so far, one of them, containing "Brief Outlines of the Flowering Plants and Principles of their Systematic Arrangement," being by Engler himself (1926). The *Botanische Jahrbücher*, begun in 1881, continued likewise under his direction, the last volume (1929-30) for which he was responsible bearing the number 63. Nor did his interest in the problems of plant distribution flag, as is proved by the last volumes of his "*Character Pflanzen Afrikas*" (1916-21) and a volume on the vegetation of tropical Africa (1925), but above all by the continuation (as joint editor with Professor Drude) of the splendid series of "*Die Vegetation der Erde*," of which so far twenty volumes have appeared, including those just mentioned. When he finally retired in 1921 he still retained up to the last a considerable measure of influence in the policy of the establishment which he had directed through so many years.

Engler was born at Sagan, Lower Silesia, on March 25th, 1844. From 1863 he studied at Breslau, where he came under the influence of Goeppert and Cohn, and obtained a Doctor's degree with his dissertation "*De Genere Saxifraga*" in 1866. He remained at Breslau acting as schoolmaster at the St. Maria Magdalene Gymnasium until 1871, when he was appointed Custos of the Royal Herbarium

at Munich. When, in 1878, Eichler left Kiel for Berlin as successor to Alexander Braun, Engler took Eichler's place as Professor of Botany and Director of the Botanic Garden at Kiel. It was here that he wrote his *Entwicklungsgeschichte der Pflanzenwelt* (1879-1882), and started the *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* (1881). Six years later (1884) he was, on the death of Goeppert, called to the Chair of Systematic Botany in the University of Breslau and to the directorship of the Botanical Garden there. Whilst at Breslau he conceived, in conjunction with his friend Prantl, then Professor of Botany in the Forestry School at Aschaffenburg, the plan of the "*Natürliche Pflanzenfamilien*," the first part of which appeared in 1888. Early in the next year he moved to Berlin where a Professorship in Botany had become vacant by the death of Eichler. Here at last he found the field worthy of his ambition and genius. A Chair and a Garden made famous through a succession of illustrious botanists, a city which had recently become the focus of a new colonial empire whose immense vegetable wealth called for exploration and study, and a liberal far-seeing government gave him his opportunity. The old Botanic Garden at Schöneberg had by that time become buried in a sea of houses and cried for removal to more open land. Dahlem on the south-western outskirts of the city was chosen for the site of the new Garden. It afforded ample space, but was hardly ideal in other respects. However, Engler's energy and indefatigable power of work triumphed also here. Begun in 1897, the new Garden, with its grandly conceived outlay, its glass-houses and magnificently equipped institutions, gradually grew towards completion. Partially opened as early as 1903, it presented itself in its final shape in 1910 to the foreign Botanists who had been invited to inspect it.

Engler was now approaching the proverbially allotted span of life and one might have expected him to slow down, but his amazing vitality—the more amazing as he was in his younger years by no means a robust man—continued. Early given to travelling and to study in the field, he had visited most parts of Europe and the Mediterranean beyond it, and when over 60 years of age he travelled through South and East Africa, India and Malaya; finally, when nearly 70, he encircled the world by way of Siberia, Japan, and North America (March-November, 1913). It was only after his retirement that he allowed himself comparative rest from desk and Herbarium work, and not until the last year of his life did he show decided signs of increasing physical infirmity. Mentally he remained fresh and interested in the progress of his science almost to the last.

His achievements were fully recognised far beyond the frontiers of his native country. He was a member of the Berlin Academy of Sciences and a corresponding member of many other Academies in Europe and America, a Doctor Honoris causa of the Universities of Cambridge (England), Geneva, Upsala, and Cape Town, and a foreign member (1888) and Gold Medalist (1913) of the Linnean Society of

London, but most lasting will be the renown which he has created for himself through his work, and the School which he has built up all over the world, as the worthy successor and rival of the De Candolles and Hookers.

O. S.

ERNEST HENRY WILSON.—The tragic death, on the 15th October last, of Dr. E. H. Wilson, M.A., D.Sc., V.M.H., as the result of a motor car accident in which his wife also lost her life, came as a sad and sudden shock to botanists and horticulturists alike throughout the world. His car apparently skidded on a greasy road near Worcester, Massachusetts, crashed through a fence, and dropped down a steep embankment. In Wilson's death botanists and horticulturists have lost one of their most famous and intrepid explorers, whose name will always be linked with that vast country whose treasures he introduced to our gardens, and with the famous Arnold Arboretum, of which he had for the past three years been Keeper.

Wilson was born at Chipping Campden, Gloucestershire, on February 15th, 1876. In 1892 he entered Birmingham Botanic Gardens, and came to Kew in January, 1897. In the practical work of the Gardens, and in the lecture room, his ability was soon evident. He gained the "Hooker Prize" of the Mutual Improvement Society for an essay on Coniferae, and in the lecture courses he occupied leading places. Botany as a science soon attracted him, and he gained a Studentship at the Royal College of Science, South Kensington, with a view to training in botany for the teaching profession.

His first step towards distinction came in 1899, when Messrs. Veitch applied to the then Director of Kew, Sir William Thiselton-Dyer, to recommend a man suitable to send to China as a collector. On Sir William's advice Wilson was selected, and thus began the first of a series of plant-collecting expeditions which made his name famous in horticultural and botanical circles all over the world. He returned from his first expedition in 1902, but set out again in 1903 for another part of China and did not return till 1905. His fame as a plant-collector was now becoming established, and 1907-09 found Wilson again visiting China, this time chiefly on behalf of Harvard University. A fourth trip followed in 1910-11.

The results of his labours up to this time are shown in the "Plantae Wilsonianae," which contains descriptions of no fewer than 2,716 species and 640 varieties of plants, of which nearly nine hundred were new introductions.

Wilson next made two journeys, in 1914 and 1917, to Japan, including Yakushima, Korea, Formosa, and other outlying parts of an Empire rich in botanical and horticultural treasures.

In 1919 Wilson was appointed Assistant Director of the Arnold Arboretum. The following year he began a two years' tour through Australia, New Zealand, Tasmania, Java, Singapore, the Federated Malay States, the greater part of India, East Africa, Rhodesia and South Africa.

On the death of Professor C. S. Sargent in 1927, he was appointed to take charge of the Arnold Arboretum with the title of Keeper. The confidence placed in him was amply justified, and during the last three years he showed, in a remarkable degree, the abilities of administrator, botanist and gardener.

The love of travel and the thirst for knowledge were ever present with him, and he was never happier than when on botanizing rambles, or visiting notable gardens and nurseries. Wilson had a vast knowledge of the country within week-end motoring distance of Boston. He knew, and had photographed, many famous specimen trees in Massachusetts and the adjoining states.

A tireless worker, Wilson found time to write numerous books:—*A Naturalist in Western China*, 1913; *Cherries of Japan*, 1916; *Conifers and Taxads of Japan*, 1916; *The Romance of our Trees*, 1920; *A Monograph of Azaleas* (in collaboration with Rehder), 1921; *Lilies of Eastern Asia*, 1925; *America's Greatest Garden: the Arnold Arboretum*, 1925; *Aristocrats of the Garden*, 1926; *Plant Hunting*, 1927; *China, Mother of Gardens*, 1929; and *Aristocrats amongst Trees*, 1930. He contributed numerous papers to botanical, horticultural and other periodicals. One of particular interest was on Northern Trees in Southern Lands, which appeared in the *Journal of the Arnold Arboretum*, vol. iv. pp. 61-90, 1923.

Amongst the honours he received were the Victoria Medal of the Royal Horticultural Society; the Veitch Memorial Medal; the Geoffroy St. Hilaire Gold Medal; the George Robert White Medal and The Rhododendron Society Cup. He was President of the Kew Guild in 1922. Harvard University conferred on him the honorary degree of M.A., and as recently as June of this year he was given the D.Sc. of Trinity College, Hartford, Conn. He was a fellow of the American Academy of Arts and Sciences, and a Trustee and Chairman of the Exhibitions Committee of the Massachusetts Horticultural Society.

A. O.

International Address Book of Botanists.—At the Final Plenary Meeting of the Fifth International Botanical Congress, on the 23rd August, 1930, a Resolution was carried unanimously to the effect that an Address Book of the Botanists of the World should be prepared and published.

An International Committee was appointed to carry out this Resolution:—Prof. L. Diels, Director of the Botanic Gardens, Berlin; Dr. E. D. Merrill, Director-in-Chief, New York Botanical Gardens; Dr. T. F. Chipp, Assistant Director, Royal Botanic Gardens, Kew (to whom communications should be addressed).

It is intended to follow the general scheme of Dörfner's *Botaniker Adressbuch*, Ed. 3, 1909, the arrangement to be by countries, arranged alphabetically under each continent.

There will be two sections under each country:—

A list of (a) Botanical Societies; (b) Institutions wholly or chiefly botanical; (c) Educational Institutions in which there is a distinct botanical department.

A list of botanists, both professional and non-professional.

In applied technical subjects such as forestry, agriculture and horticulture, only those working in the botanical aspects of the subject will be included.

It is hoped to collect the necessary information by the end of April, 1931.

Imperial Botanical Conference, 1930.—The Conference was held on 15th August, 1930, at the Imperial College of Science and Technology, South Kensington, London, the President, Dr. A. W. Hill, C.M.G., F.R.S., being in the Chair. In addition to a number of British Botanists, there were present delegates from fourteen overseas Dominions or Colonies, and from four Overseas Universities or Research Institutes.

The Reports of the various Committees set up by the Imperial Botanical Conference, 1924, were presented.

It was decided that an Imperial Botanical Conference should take place in England in 1935, shortly before the Sixth International Botanical Congress, which is to be held in that year in Holland.

The following Interim-Committee was appointed:—The Director of Kew (Convenor); the Keeper of Botany, British Museum (Natural History); the Professors of Botany at Oxford and Cambridge; a Professor of Botany of the University of London (to be nominated by the Chairman of the Board of Studies of the University); one representative of the Dominion Office, and one representative of the Colonial Office.

It was decided that this Committee should summon a Meeting of British botanists in the near future for the purpose of appointing an Executive Committee for the said Conference.

Museums of Economic Botany.—The recent publication of the fourth edition of the Guide to Museum No. 1 at the Royal Botanic Gardens, Kew, completes the revision of the Guides to the four Museums. The Museums are devoted to the exhibition of specimens of the Economic Products of Plants and the collection is divided in the following manner:—Museum No. 1 includes the products of Dicotyledonous Plants; Museum No. 2 is devoted to specimens of Monocotyledonous Plants; Colonial Timbers are shown in Museum No. 3, and Museum No. 4 is confined to specimens of timbers which have been grown, manufactured or collected in the British Isles and to the practice of British forestry generally. Owing to the attention at present being paid to Economic Botany, a subject which teachers of geography tend more to include in their curriculum, these Guides, now revised, will be found to be particularly useful not only to visitors to the Museums, but also for general consultation in the library and the home. The Guides include information about such important subjects as timbers, fibres, vegetable oils, drugs, tans and dyes, rubbers, beverages, fruits and similar subjects. The Guide to

Museum No. 1 is priced at 2s. 0d., by post 2s. 2d.; those to Museums Nos. 2 and 3 are 1s. 0d., by post 1s. 1½d.; and that to Museum No. 4 1s. 0d., by post 1s. 2d., and all are obtainable in the Museums, at the Publications Kiosk in the Gardens, or on application to the Curator of the Gardens.

Cacao Pollination Studies.—The important question of pollination in Cacao, connected as it is with the problem of hybrid cacao (see *K.B.*, 1929, pp. 126-129), has until recently been little understood, and continues to receive increasing attention from those engaged on work with the crop. Sterile cacao trees, which produce apparently normal flowers but fail to set fruit, are known to occur commonly in the plantations of cacao-growing countries. A possible cause of this sterility, at least in so far as Ceylon is concerned, has been investigated by Mr. J. C. Haigh, Assistant Mycologist in the Department of Agriculture. Mr. Haigh's interesting report, on the germination tests he has made with cacao pollen, which has been forwarded to Kew by the Director of Agriculture, Ceylon, is here reproduced, since it is likely to be of value to those working on cacao in other parts of the Empire:—

"Germination tests have been carried out with pollen from a sterile cacao tree at the Experiment Station, Peradeniya. The tree bears abundant flowers but has never been known to set a pod. Comparative tests were carried out at the same time with pollen from a tree (No. 5, "B" cacao) that in the last three series of yearly records has produced respectively 119, 108 and 105 pods.

The flower of *Theobroma Cacao* opens in the early morning; advantage was taken of this fact to ensure that only fresh pollen was used for the tests. In the evening all opened flowers were removed from one branch of each of the trees under examination, thereby assuring that the flowers picked for experiment next morning were newly opened. The flowers were picked in the early morning and the pollen from them was sown on 1.5 per cent. agar in petri dishes. Five flowers were taken from each tree per day and the pollen from each anther was sown separately; twenty-five pollen masses per tree per day were thus obtained. Normal pollen germinates in a few hours in a moist atmosphere, but for convenience the pollen was examined twenty-four hours after sowing. Germinative power was judged by the percentage of pollen grains that had produced a germ tube. From the good tree 4,664 pollen grains were examined, of which 3,379, or 72.4 per cent., had produced a germ tube in twenty-four hours; from the sterile tree 4,191 pollen grains were examined, of which only 15, or 0.36 per cent., had germinated in the same length of time. Samples of pollen from the sterile tree were kept for five days, but no increase in germination percentage was observed. Pollen from the good tree was seen to germinate a few hours after sowing. The only observable difference between the pollen from the two trees was that that from the sterile tree contained

a small percentage of larger, thin-walled grains. The normal pollen grain examined was about 20 μ in diameter and had a thick wall; the larger grains had a thin wall and were about 30 μ in diameter.

The above tests show that the failure to germinate of the pollen of the sterile tree is a factor responsible for the sterility of the tree, since self-fertilisation is impossible. It is generally held that the cacao flower is in the main self-fertilised, but Harland* has shown that cross-fertilisation occurs in cacao; it is still necessary, therefore, in accounting for the complete sterility of this tree, to explain the failure of cross-pollination. A detailed investigation will probably be necessary before this explanation is found; in the meantime a few simple hand pollinations have been made, using pollen from the good tree of the germination tests. It is perhaps of interest to note that similar tests carried out in the West Indies failed to show a significant difference in germinative power between pollen from good and poor yielders, and that in such trees, which were incidentally the progeny of the same parent, sterility was due to a defect in the female part of the flower."

Jelutong.—The production of jelutong in Malaya and Borneo continues to increase, the bulk of the output being taken by the U.S.A., where it is used as a substitute for chicle in the manufacture of chewing-gum. Chicle, the coagulated latex of the Sapodilla (*Achras sapota* L.), derived principally from Central America, commands a higher price than jelutong. The high relative cost of collection of chicle, combined with the fact that supplies are rapidly diminishing as a result of destructive tapping methods, renders it probable that the demand for jelutong will continue to increase. Borneo jelutong is derived from *Dyera Lowii* Hk. f., a tree confined to the swamps. In Malaya the product is derived from *Dyera costulata* Hk. f. and *Dyera laxiflora* Hk. f., two species occurring chiefly on flat land and low hills at altitudes below 1500 feet. There does not appear to be any intrinsic difference in the jelutong of these three species, though the Malayan product, owing to better methods of preparation, is generally preferred and commands an enhanced price. It has been found from experimental work in Malaya that the exercise of certain precautions in coagulation and in the agents used as coagulants results in a markedly superior product. Iron, from the use of rusty tins, is now known to cause oxidation and subsequent deterioration of the finished product. Consequently attempts are being made to induce collectors to refrain from using as coagulating vessels, iron receptacles or wooden boxes caulked with clay, which also contaminate the product.

It is estimated that in America, where the consumption of chewing-gum is steadily increasing, the markets are capable of absorbing about 5,000 tons of jelutong annually. The use of

chewing-gum is stated to be on the increase in parts of Europe and also in the north of England among factory hands. F. N. H.

Botanical Magazine.—Part i of vol. cliv (1928) has now been published and contains the following plates:—*Lilium formosanum* Wallace (t. 9205), formerly considered a variety of *L. philippinense*, a native of the island of Formosa from the coast to 2400 m.; *Maxillaria elatior* Reichb. f. (t. 9206) from Central America, the plant figured having been collected by Dr. A. W. Hill near Cartago, Costa Rica, in 1924; *Rhododendron Albrechtii* Maxim. (t. 9207), from Northern and Central Hondo, Japan; *Codonopsis ovata* Benth. (t. 9208), a native of the Western Himalaya and South Kashmir; *Ligustrum Quihoui* Carr. (t. 9209), from China; *Primula sikkimensis microdonta* Stapf (t. 9210), a violet-flowered form of the familiar yellow *P. sikkimensis*, found from South-eastern Tibet to Western Szechuan; *Osmanthus fragrans* var. *aurantiacus* Makino (t. 9211), a Chinese plant only known in cultivation, the example figured having come from Col. D. V. Pirie's garden at Savennières; *Arisaema purpureogaleatum* Engl. (t. 9212), a native of Yunnan; *Leontopodium haplophylloides* Handel-Mazz. (t. 9213), a strongly lemon-scented Edelweiss from the mountains of Kansu and Northern Szechuan; *Acacia elata* A. Cunningham ex Benth. (t. 9214), from New South Wales, and *Veronica Teucrium* Linn. subsp. *thracica* Velenovský (t. 9215), a native of the Balkan Peninsula.

Size and Form in Plants.—The thesis developed in this book* is that the size of plant bodies is limited by the physiological application of the Principle of Similarity which expresses itself through the proportion of any limiting surface to the bulk of the tissues enclosed by it. As size increases the strength of a structure increases as the square of the linear dimensions, but the weight or mass as the cube, provided the form and material remain the same. Also, in solid figures, whatever their form, provided that on enlargement the same form be maintained, the surface increases as the square, and the bulk or volume as the cube of the linear dimensions. In the construction of any ordinary vascular plant there are three chief limiting tissue-surfaces:—1. the outer contour, 2. the endodermal sheath, and 3, the collective surface by which the dead tracheal system faces upon the living cells or tissues that embed it. It is the last which is chiefly considered by Prof. Bower. The anatomical structure of the axes of living and fossil *Pteridophyta* is described and often figured, in so far as it supports the author's contention that increase in size is only possible when correlated with modification of the contact surface of the tracheal system with the surrounding living tissues. It is shown that the proportion of surface-exposure of this system

* S. C. Harland, Studies in Cacao. Part I. The Method of Pollination. Ann. Appl. Biol. XII., 1925, p. 403.

* Size and Form in Plants, with special reference to the primary conducting tracts, by F. O. Bower. Macmillan & Co., Ltd., London, 1930, pp. 232 with 72 figures and 25 tables. Price 12s. 6d. net.

to the living cells is effected by: (A.) *Medullation*, forming a central pith, (B.) *Sculpturing* of the outer surface of the woody tract, which may take various forms, such as that of deep fluting, (C.) complete *Disintegration* of the xyletic mass as it appears in transverse section, (D.) general *Vitalisation*, living cells being scattered throughout the xyletic mass. The action of the 'Size-Factor' is said to be *morphoplastic*: that is, it induces by change such mature form as shall tend to maintain a due proportion of surface to bulk.

The views outlined above are given detailed expression for the Vascular Cryptogams and briefly extended to the *Spermatophyta*. There is throughout the work a tacit assumption that increase in size is an evolutionary tendency at least in the series used as illustrations of the accepted principles. This is certainly corrective to the very prevalent idea that evolution has been entirely or almost entirely a downgrade affair, so far as the size of existing plants is concerned. Yet though the hypothesis that the herbaceous habit is derived from and cannot give rise to the arboreal has, in its extreme forms, led to the publication of absurd suggestions, it is probable that the direction of evolution has been from the larger to the smaller organism at least as often as from the smaller to the larger. Correlation of form and size with decrease of the latter is not investigated in this book. It is of interest to note that the Monocotyledon type of stem structure is accepted as relatively primitive, and, excepting the palms, members of the group are predominantly herbaceous. It appears likely from a survey of modern knowledge on the subject that the Dicotyledons contain types both more primitive and, in important characters, more advanced than any Monocotyledons and that the polyphyletic origin of the latter group is very probable.

Prof. Bower uses the term "size" somewhat ambiguously both for bulk (volume) and for sectional area (generally given in terms of diameter). The concepts he emphasises open up many possibilities for new interpretations of morphological characters, both external and internal, and support the author's contention that "a new morphology of all tissues will have to be developed, somewhat of the nature of an internal organography, and complementary to the organography of external form."

W. B. T.

Strasburger's Text-Book of Botany.*—The fact that this well-known textbook has reached its 6th edition in English shows that its well deserved popularity is being maintained. The new edition, translated from the 17th in German, follows the same general lines as the last which appeared in 1921. In the first half of the book general botany is dealt with from the morphological and physiological standpoints by Profs. Fitting and Sierp respectively. There is no great

*Strasburger's Text-Book of Botany. 6th English edition, translated from the 17th German edition by W. H. Lang. Macmillan and Co. Ltd., London, 1930. Price 31s. 6d.

alteration in the morphological section except that stelar evolution is considered more fully. On the other hand the physiology section has been largely re-written and improved by the incorporation of many comparatively recent developments in the subject and the introduction of a few illustrative graphs. The subjects of heredity, variability, and the origin of species have also been expanded and brought more up-to-date.

In the second half of the book, devoted to special botany, the different groups of the plant kingdom are dealt with in turn—Thallophyta, Bryophyta, and Pteridophyta by Prof. Harder, and Spermatophyta as in the last edition by Prof. Karsten. The Thallophyta and Pteridophyta sections have been largely re-written, and numerous comparative diagrams illustrating the life histories of some of the types dealt with have been introduced, and the arrangement and classification of the groups reorganised. Useful surveys have been appended at the ends of each of the separate groups of plants which help to prevent a mass of facts from obscuring the important points brought out in each of the groups.

The book should continue to be of great service to the student and as a book of reference.

Bacterial Plant Pathogens.*—Dr. Charlotte Elliott's book is one which will be extremely useful as a work of reference. She has compiled a list of all known bacterial plant pathogens, and for each organism has given a brief description, synonyms, symptoms of affected plants, hosts, geographical distribution, means of control when known, and literature. The nomenclature followed is in accordance with Smith's modification of Migula's system, and the names of the organisms are arranged alphabetically.

The list of pathogens extends to p. 270. Following this is a list of non-pathogenic organisms which are cited in literature in connection with plant diseases, and a chart giving the chief morphological, cultural and physiological characters of the various organisms for purposes of comparison. The book is completed by an index of host-plants and bacteria.

*Manual of Bacterial Plant Pathogens, by Charlotte Elliott. Baillière, Tindall & Cox, London, 1930, pp. ix+349. Price 22s. 6d.

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BULLETIN OF MISCELLANEOUS INFORMATION Appendix I 1930 ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1929.

General.

STAFF.—The most noteworthy changes during 1929 were the retirement of the Curator, Mr. W. J. Bean, I.S.O., after forty-six years' service at Kew, and of Mr. C. H. Wright, A.L.S., for forty-five years an Assistant in the Herbarium. Mr. Bean was succeeded as Curator by Mr. T. W. Taylor, Assistant Curator in charge of the Tropical Department, the vacancy thus created being filled by the promotion of a Sub-foreman, Mr. L. Stenning. Mr. F. Ballard, B.Sc., was appointed an Assistant to fill the vacancy caused by the retirement of Mr. Wright. An additional post of Assistant, with special reference to the preparation of the *Index Kewensis*, was substituted for that of Sub-Assistant, and was filled by the transfer of Miss M. L. Green, B.A., who had occupied the latter post. Dr. J. M. Cowan vacated his appointment as Temporary Botanist and Mr. H. K. A. Shaw, B.A., acted as a Temporary Botanist in his place until the return of Mr. J. Hutchinson from South Africa, when Miss M. B. Moss, who had been seconded to fill Mr. Hutchinson's place during his absence, reverted to her substantive post as Temporary Botanist.

A grant from the Empire Marketing Board, for the purpose of providing additional herbarium assistance at Kew for the Dominions and Colonies, permitted the addition to the staff of two Temporary Assistants and two Temporary Sub-Assistants. Mr. N. Y. Sandwith, B.A., a Temporary Botanist, and Mr. C. E. Hubbard, a Sub-Assistant, were appointed Temporary Assistants, and the posts of Temporary Sub-Assistants were filled by Mr. E. W. B. H. Milne-Redhead, B.A., and Mr. A. A. Bullock, B.Sc. The post of Temporary Botanist was filled by the appointment of Mr. H. K. A. Shaw who had previously served in an acting capacity. A second clerical officer and an additional shorthand-typist were added to the Herbarium staff.

EMPIRE MARKETING BOARD.—In addition to continuing the grants recorded in last year's Review (*Kew Bulletin* Appendix I, 1929, p. 1), the Empire Marketing Board has made a grant of £1200, alluded to in the preceding paragraph, for the purpose of providing additional herbarium assistance at Kew for the

Dominions and Colonies, and another of £700 for procuring and distributing, within the Empire, seeds of the Tung-oil trees (*Aleurites Fordii* and *A. montana*). A further reference to this grant appears on p. 8.

OFFICIAL VISITS.—The ASSISTANT DIRECTOR returned to Kew on the 25th March (*K.B.* 1929, App. 1, p. 4). An extensive tour of the Anglo-Egyptian Sudan included first a visit to Dongola Province, thence to Khartoum, and along the Blue Nile to The Fung. After returning to Khartoum a southern excursion was made with a digression westwards to El Nahud in Kordofan, thence southwards through the Nuba Mountains to Tonga, where the Bahr-el-Gebel was followed to Rejaf. The western part of Mongalla Province was visited, and later the central portion (*K.B.* 1929, pp. 177-197). On returning to Khartoum a report was made to the Government on forest policy and organisation, local horticultural problems and staff requirements, a scheme for training subordinate staffs in botanical departments, and items of general economic importance in the south of the country. During the year various matters arising out of the report have been discussed and further investigations have been followed up.

Before returning to England a visit was made to Sicily to enquire into various botanical problems.

MR. H. C. SAMPSON, Economic Botanist, was asked by the Secretary of State for the Colonies, at the request of the Government of the Gold Coast, to attend the Second West African Agricultural Conference which was held in that Colony in the latter half of October. He was also requested by the Secretary of State to take the opportunity thus offered of visiting the other West African Dependencies. He left this country on October 2nd and returned on January 21st of the following year. During the time at his disposal he was able to see the work which was being carried out by the several local Departments of Agriculture, and in addition was able to form a very fair idea of the existing state of agriculture in West Africa. Thanks are due to the Governments concerned and to their officers, especially those who accompanied him on his journeys, for the very thorough arrangements which were made for giving Mr. Sampson a full opportunity of seeing as much as possible of these Colonies and their local agriculture.

With the object of attending the meetings of the British Association for the Advancement of Science and of visiting the various botanical institutions with which Kew has for so long been in intimate correspondence, the KEEPER OF THE HERBARIUM paid an official visit last summer to South Africa and parts of British East Africa. He left Kew on June 29th and reached Cape Town on July 19th, the British Association meetings being held at Cape Town during the following week and at Johannesburg the week after.

At the Association meetings Mr. Cotton met practically all the botanists of South Africa and during his stay at Cape Town he visited the Bolus Herbarium, National Botanic Gardens, Kirstenbosch, the Herbarium in the South African Museum, and the Botanical Department and Herbarium in the new University buildings at Rondebosch. On his way to Johannesburg he visited the Karoo Garden at Matjesfontein and the Herbarium at the McGregor Museum, Kimberley, which Miss Wilman has done so much to build up.

Time was also set aside to visit the important Department of Botany in the University at Johannesburg and the numerous agricultural and botanical centres at Pretoria. After spending a short time at the Natal University College at Pietermaritzburg and the Natal Herbarium and Botanic Gardens at Durban, he travelled north into Southern Rhodesia, making a brief call at Bulawayo in order to examine the Herbarium in the Museum and the Government Farm at Matopas. A longer stay was made at Salisbury in order to see something of the various activities of the Departments of Agriculture and Forestry, especially with regard to pasture plant problems and plant pathology. Plans to collect material with a view to the elaboration of a systematic Flora were also discussed. The next stay was at the East African Agricultural Research Station, Amani, Tanganyika Territory, and en route he was able to call at Umtali, Beira, Dar-es-Salaam, Zanzibar and Tanga, and see something of the agricultural development in these districts. Considerable attention was paid to the research in progress at Amani. Here problems of phytopathology, soil-chemistry and systematic botany were among the earliest to receive attention on the re-opening of the Institution, while of those now being investigated by the more recently appointed staff, bio-chemistry and plant breeding are the most noteworthy.

On leaving Amani Mr. Cotton, in company with Dr. A. S. Hitchcock of the Bureau of Plant Industry, U.S. Department of Agriculture, visited the coffee-growing centre at Moshi and had the unexpected opportunity of spending a few days on the slopes of Kilimanjaro. During this time a collection of seeds and dried plants was made which has added to the Kew Herbarium several species not hitherto represented and three species hitherto undescribed. Thence they travelled via Taveta and Voi and proceeded to Nairobi where most of the time was spent in the Forestry Department and the Department of Agriculture. Kew was reached on October 5th.

MR. J. HUTCHINSON made a botanical tour in South Africa (see *K.B.* 1929 : 273-285, with map, and *K.B.* App. 1, 1929, p. 5), leaving England at the end of July, 1928, and returning on April 29th, 1929. Most of the time was devoted to the study and collection of specimens representative of the vegetation of South Africa. After spending some time on the Cape Peninsula, he made a tour of Namaqualand and Bushmanland. The principal flower-shows

in the Cape Province were visited and some time was spent at the National Botanic Gardens, Kirstenbosch, and the Bolus Herbarium. At the end of October, with a companion, he started on a long journey by the coast route from Cape Town to Durban. From Durban he proceeded to Pretoria, where he joined General Smuts and Mr. and Mrs. Arthur Gillett, whom he accompanied on a collecting trip as far north as the Limpopo River, in the Northern Transvaal. The Zoutpansberg Mountains, which, botanically, are little known, were explored, and trips were made to the reserve at Dongola and to Lake Fundusi and Woodbush. He accompanied Dr. Pole Evans to the Barberton District and the Blaauwberg, and later he visited the Belfast Area. A circular tour was then made along the Magaliesberg to Mafeking and Vryburg, when experimental and agricultural stations were visited. From Pretoria he proceeded south via Kimberley, whence he traversed the little known Kaap Plateau and Asbestos Mountains. He returned southwards via Bloemfontein, Fauresmith, Graaff Reinet, Meirings Poort and Mossel Bay, arriving at Cape Town at the end of March.

Mr. Hutchinson collected over 3000 species of plants, of most of which he was able to secure four to five sets of specimens. Two of these sets have been presented to South Africa, one to the National Herbarium, Pretoria, and the other to the Bolus Herbarium, the botanists at both of these institutions having generously assisted him in his work. A large number of living succulent plants were forwarded to Kew for cultivation, and on the homeward voyage Mr. Hutchinson took care of four Wardian cases of rare plants from the Kirstenbosch Botanic Gardens.

Last summer Mr. N. Y. SANDWITH, of the Herbarium Staff, accompanied the Oxford University Expedition to British Guiana as one of the botanists (*K.B.* 1929, pp. 237, 238). His object was to collect herbarium material with a view to an intensive study of the flora of the Colony, in particular material of the forest trees. Many of these provide valuable timber and are at present known to foresters only by their vernacular names, as they have never been identified with certainty. The Expedition sailed on July 19th and arrived at Georgetown on August 5th, spending days *en route* at Barbados, Grenada, and Trinidad, where it was entertained by the Imperial College of Tropical Agriculture, and by Mr. R. O. Williams, Assistant Botanist, with whom the two botanists visited the Botanic Gardens and the St. Clair Experiment Station. A few days were spent in Georgetown in making the preparations necessary for an expedition into the forest. The Forestry Department very kindly lent two of their best native Indians, conversant with the vernacular names, for felling trees, and a third for looking after the collecting presses in camp; while Mr. T. A. W. Davis, Assistant Conservator of Forests, accompanied the party for the whole trip. Needless to say, his knowledge and help were invaluable to the success of the botanical investigation.

The Expedition left Georgetown on August 10th, and crossing the Demerara River by ferry, took the train to Parika on the Essequibo River, where it boarded the public steam-launch and proceeded upstream to Bartica, arriving just before dark. The next morning the whole party, now joined by eleven native servants, embarked with personnel, luggage and camp equipment on the expedition boats, and made its way to its destination on the Moraballi Creek, which flows into the right bank of the Essequibo some ten miles above Bartica. Here an excellent site for a camp was chosen about two miles above the mouth, and for the next fifteen weeks the Expedition carried out its work of investigating a small and typical area of tropical rain forest. The weather was wet until about the middle of October, when a comparatively dry season set in which lasted for a month. The Acting Governor, Mr. C. D. Douglas-Jones, C.M.G., accompanied by the Conservator of Forests, Mr. B. R. Wood, paid a visit to the Expedition; and Mr. E. B. Martyn, Government Botanist and Mycologist, spent a fortnight in camp. Two excursions were made to the first falls of the Essequibo, where the numerous islets abound in interesting low trees and in species of Podostemonaceae. On November 19th, the Expedition struck camp and moved for the last week to a site on the right bank of the Cuyuni River just below the first falls. From here it was possible to examine Beebe's ecological area at Kartabo Point, as well as Kartabo Road, and the secondary growth by the portage road at Camaria Landing.

The party returned to Georgetown on November 28th and took ship for Trinidad on November 30th. Mr. R. O. Williams entertained the botanists, Messrs. Sandwith and P. W. Richards, for two days, showing them the high woods at Morne Bleu, Aripo Savannah, and the Pitch Lake. The Expedition arrived in London on December 21st. Mr. Sandwith was able to collect over 700 numbers, comprising over 2900 sheets of flowering plants, trees and climbers, while a very large number of cryptogams was collected by Mr. P. W. Richards.

DR. J. M. COWAN left Kew in February on an expedition to Persia for the purpose of studying agricultural and horticultural methods and to make a collection of the representative plants of the country.

After travelling through Palestine and across the Syrian Desert from Damascus to Baghdad, the route followed lay through Kermanshah, Hamadan, Sultanabad, Isfahan, Qum, Teheran and Tabriz to Urumia. Later an excursion was made to Astara on the Caspian Sea. Owing to disturbances among the Kurdish tribes, it was not possible to visit much of the western frontier region, but from Urumia an extended tour was made in the Tergavar and Mergavar Districts and some of the mountains towards the frontier were explored. A large collection of bulbs as well as seeds, cuttings and 2500 specimens for the Herbarium, were sent to Kew. On the

return journey Dr. Cowan visited the Botanic Gardens at Tiflis, Batum, and Vienna.

An opportunity was offered by the Secretary of State for the Colonies, to attach a botanist to the Joint British and Italian Boundary Commission in Somaliland. The Director was able to arrange for Mr. C. L. COLLENETTE, a naturalist with experience of Tropical Africa, Brazil, and the Far East, to join this expedition. (*K.B.* 1929, pp. 238, 239). Mr. Colletette arrived at Berbera in August and has since accompanied the Commission. Excellent sets of herbarium specimens have been received from him, and from his letters he appears to be making a thorough examination of the country on each side of the boundary (*K.B.* 1929, p. 322).

Kew was also fortunate in being able to employ as a collector, in the Solomon Islands, Mr. J. H. L. WATERHOUSE, formerly Head Master of the School and Training College at Roviana, New Georgia, and an authority on the native languages of the Solomons. While stationed at Roviana, Mr. Waterhouse had interested himself in the flora and had at various times sent collections to Kew. He gladly availed himself of the opportunity to return to the islands and devote himself uninterruptedly for some months to botanical collecting. Despite adverse weather conditions, ill health, and unrest amongst the natives due to the discovery of gold in New Georgia, Mr. Waterhouse was able to make extensive collections, while his familiarity with the native languages enabled him to acquire very full information as to the plants collected. A large number of these are of considerable economic and ethnological interest while many also are remarkable botanically. Owing to the position of the islands between New Guinea on the one hand and the Pacific Islands proper on the other, their flora is of great interest in linking up these two floras.

The foregoing visits were all rendered possible thanks to the grant received from the Empire Marketing Board for overseas missions and collecting purposes.

In addition the following visits were undertaken by members of the staff during the year :—

Mr. A. D. COTTON attended the Congress of the South Eastern Union of Scientific Societies held at Brighton in June, 1929, and as president of the Botanical Section delivered an address entitled "The Importance of the Study of Systematic Botany," which was published in The Proceedings and Transactions of the Union for 1929, pp. 33-44.

Early in the year Miss WAKEFIELD visited the Herbarium at the Botanical Gardens and Museums at Berlin, and the Cryptogamic Herbarium of the Jardin des Plantes at Paris, in order to examine types of African fungi, in connection with work on the fungus flora

of Uganda. At Berlin the whole of the Polyporaceae were worked through as well as certain other genera. At Paris special attention was also given to Polyporaceae, both in the general herbarium and in that of Montagne. An opportunity was afforded of attending a meeting of the Société Mycologique de France, and thus of meeting many of the French workers.

Mr. C. A. SMITH, Assistant for South Africa, visited the herbaria at Brussels, Berlin, Zürich and Geneva (Conservatoire Botanique) in February, in connection with the preparation of a revision of the South African species of *Senecio* sect. *Paucifolii*, which have assumed considerable importance in connection with poisoning of stock. The opportunity was taken to examine also numerous type-specimens of South African Vitaceae, for the purposes of a memoir on the subject. Altogether about 600 specimens were examined.

Mr. W. DALLIMORE, Keeper of Museums, was delegated to attend the International Congress of Forestry Experimental Stations, held in Sweden between July 14th and August 4th. At this Congress a week was devoted to papers and discussions on various aspects of silvicultural research, and two weeks were spent in visiting some of the more important forest areas, and commercial undertakings connected with timber, in the country, where methods of Swedish silviculture and timber handling and conversion could be seen and studied. At the Congress he contributed a paper on "Arboriculture as an Aid to Silvicultural Research." An account of the tour was given in *K.B.* 9, 1929, pp. 287-302.

The DIRECTOR also attended this Conference and in the course of his tour visited the Herbaria at Copenhagen, Lund, Stockholm and Upsala and also the Botanic Gardens, and renewed acquaintance with the Directors and the botanists in Denmark and Sweden.

Mr. F. N. HOWES, Assistant, Museums, attended the Annual Meeting of the Museums Association, held in Worthing in July, as the official delegate from Kew. At these Annual Meetings papers are read and discussions held on various phases of Museum work.

Mr. C. P. RAFFILL, Assistant Curator, Temperate Department, visited the French and Italian Rivas in March for the purpose of studying cultivated plants in private and public gardens. Among establishments visited were those of Mr. Cecil Hanbury, M.P., at La Mortola, H.R.H. The Duke of Connaught at Cap Ferrat, and H.H. the Prince of Monaco.

IMPERIAL INSTITUTE COMMITTEES.—Close co-operation with the Imperial Institute in works of economic importance for the Empire continued to form an important feature of the overseas activities of Kew. The pioneer stage of all problems dealing with plant products is first undertaken by Kew, close touch being kept through its representatives on the Imperial Institute Committees. The Director, who is on the Board of Governors, continued to serve on the Advisory Council on Plant and Animal Products, and also as Chairman of the Advisory Committee on Oils and Oilseeds.

Advisory Committees on which there are representatives from Kew, are those dealing with Oils and Oilseeds, Essential Oils and Resins, Vegetable Fibres, Tanning Materials, and Timbers.

TUNG-OIL.—The Empire Marketing Board made a grant of £700 for the purpose of procuring and distributing, within the Empire, seeds of the Tung-oil trees (*Aleurites Fordii* and *Aleurites montana*), and for the purchase of commercial samples from different sources for analytical and technical research. In the administration of this grant Kew is co-operating with the Tung-oil Sub-Committee of the Imperial Institute Advisory Committee on Oils and Oilseeds. Much time has been devoted to the furtherance of the efforts which are being made to test thoroughly the suitability of different parts of the Empire for the cultivation of these trees. The results of previous seed distribution have been followed up, samples of Empire-grown fruits are being collected for examination, and a further distribution of seed has been made, more especially to those parts of the Empire where previous trials show indications of the successful cultivation of this valuable oil-seed.

INTERNATIONAL BOTANICAL CONGRESS, 1930. The Director has been appointed a Vice-President of the Congress and the Assistant Director is one of the Secretaries. Four members of the Herbarium Staff are Secretaries of their respective Sections:—Mr. A. D. Cotton and Dr. T. A. Sprague, Section of Taxonomy and Nomenclature; Dr. W. B. Turrill, Section of Phytogeography and Ecology; Miss E. M. Wakefield, Section of Mycology and Plant Pathology. Heavy duties in connection with the arrangement of the Congress and the programmes for the Sections have fallen on the Secretaries.

OTHER ACTIVITIES.—The Director has been appointed by the Lords Commissioners of His Majesty's Treasury to be the representative of the Treasury for a term of five years on the Committee of Management for the administration of the Chelsea Physic Garden.

The Director has also been appointed to serve on an Advisory Committee on Forestry Research, which has been constituted by the Forestry Commissioners at the instance of the Research Co-ordination Sub-Committee of the Committee of Civil Research.

At the meeting of the British Association for the Advancement of Science, held in South Africa, the Director was appointed President of Section K for the meeting of the Association to be held at Bristol in 1930.

The Assistant Director was appointed by the Lord President of the Council, on the nomination of the Minister of Agriculture and Fisheries, to be a member of the Empire Timbers Committee of the Forest Products Research Board.

The Assistant Director was also appointed to serve on the Advisory Committee on Timbers of the Imperial Institute.

PRESENTATIONS.—Lady Thiselton-Dyer has presented an excellent photograph of Sir William Thiselton-Dyer taken in the year 1896.

Sir David Prain has also very generously presented the tinted crayon drawing of himself, which was presented to him by one hundred and seven of his botanical and other friends. This very beautiful and characteristic drawing was made by Miss F. A. de Bieden Footner during the past summer. It is now exhibited with the portraits of Sir William Hooker, Sir Joseph Hooker and Sir William Thiselton-Dyer in the visitors' room at the Herbarium.

PUBLICATIONS.—The Volume of the *Kew Bulletin* for 1929 contained ten Numbers and three Appendices. References to other publications by members of the Staff at Kew will be found under the respective Sections.

The seventh Supplement of the *Index Kewensis* was published during the year. It covers the quinquennial period 1921-1925 (*K. B.* 1929, pp. 323, 324).

COURSES OF INSTRUCTION.—Special courses of instruction were again arranged, at the request of the Secretary of State for the Colonies, for officers on leave from scientific departments in the Colonies.

The Gardens.

VISITORS.—The number of visitors to the Gardens in 1929 was 1,169,900, an increase of 42,897 on the figures of the preceding year. The severe weather in February and unsettled weather during April were responsible for a decrease of 114,000 during the first four months of the year as compared with the corresponding period in 1928. During the months May-July there was a decrease of 63,000, but between August and December there was an increase of nearly 220,000.

The greatest monthly attendance was in August with 237,466, the least being January with 7,781. The highest daily attendance was 54,730 on Whit-Monday, May 20th, and the lowest 8 on January 29th. It may be noted that commencing on August Bank Holiday, August 5th, 1929, the penny charge for admission to the Gardens was abolished.

PLANT HOUSES.—The interior of the Mexican House and the south end of the Palm House have been repainted. The Economic Houses (11-12), the Orchid Houses (13-14), Succulent House (5) and several small plant houses in the Office Yard were overhauled, and in some cases considerable repairs were made to the woodwork owing to decay, whilst the internal iron parts were thoroughly cleaned of rust and repainted. During the summer months H.M. Office of Works installed in the Palm House stokeholds six large sectional boilers. These have replaced the old and worn out

horizontal tubular boilers, which had, for several winters past, given cause for anxiety, it being a common occurrence for two or more to be out of action at the same time. The old boilers had done service for over 50 years, but it is doubtful whether any part, other than the front diaphragm, of the original boilers remained. Many of the tubes have been renewed several times during that period.

ROCK GARDEN.—In October work was commenced on the north end of the rock garden, where extensive alterations are being made. At the present time (January, 1930) the work is still in progress; it is hoped to have the re-building completed by the end of February, by which time the area adjacent to the rose pergola will show considerable change and be greatly improved. The rock garden itself will be much enlarged; some idea of the extent of the re-building may be gathered from the fact that about 200 tons of sandstone, from East Grinstead, Sussex, have been used.

IRIS GARDEN.—During the early autumn, the beds were re-arranged so as to permit room for a large collection of the best garden varieties of Iris. Special mention must be made of the Orpington Nurseries Company, by whose generosity the collection has been greatly enriched by the addition of several new varieties.

The species which had been grown in the small beds were removed to a situation alongside the pond, near Museum No. 1, where it is hoped they will benefit by the moister conditions.

ARBORETUM.—The winter of 1929 was one of the severest experienced at Kew for many years, and in consequence a number of shrubs suffered much injury. The greatest number of losses occurred among *Ericas*, of which *E. mediterranea* and *E. Veitchii* suffered the most. Many fine plants were killed, and several years must elapse before the young plants attain similar dimensions.

Among shrubs growing on a west wall, the following were killed to the ground level:—*Aristotelia Macqui*, *Caesalpinia japonica*, *Escallonia illinita*, *Hydrangea altissima* and *Ribes speciosum*. A large plant of the common Myrtle on a south wall also suffered similar damage. The losses among the large and interesting collection of tender shrubs growing in the recesses of the Temperate House are deplorable, as nearly two hundred species were either killed or badly injured, many of them being fine specimens which had withstood the winters for several years past. The following are a few of the most noteworthy:—*Camellia rosae-flora*, *Escallonia floribunda*, *Fabiana imbricata*, *Fremontia mexicana*, *Loropetalum chinense*, *Olearia Forsteri* and *Tricuspidaria lanceolata*.

The exceptionally late spring was very favourable to flowering trees and shrubs, it being several years since there has been such a wealth of blossom with no frosts or cold winds to damage it; consequently it continued in full beauty for a much longer period than is usual.

The prolonged drought and hot sunny weather during the summer and autumn months necessitated much artificial watering among the tree and shrub collections, as it was only by continuous watering that Rhododendrons and other surface-rooting subjects were kept alive. As in 1921 the lawns suffered severely from the effects of drought and heat; in places where there is a concentration of traffic the turf was worn bare and past recovery. This necessitated a considerable amount of re-turfing during the latter part of the year, the turf for this work being obtained from the less frequented parts of the gardens, where it is more convenient to re-sow with grass seeds in the spring.

The brilliance of colour produced by the abundant crops of fruits and berries on many trees was of outstanding merit, and not for a number of years have the *Crataegus*, *Pyrus* and *Hollies* been so heavily laden. A long dry summer is not usually conducive to the autumn colouring of deciduous trees and shrubs, the reason being that the leaves often become shrivelled before the season of colour arrives. Last year, however, was an exception, as a number of trees and shrubs produced some wonderful colour effects until late in November.

The last two months of the year will long be remembered for the excessive rainfall and boisterous gales which occurred in all parts of the country. During the great storm of Friday, 6th December, several large trees were blown down, among them being the magnificent Turkey Oak which stood on the slope at the south-west end of the Rhododendron Dell. Not only was this tree a conspicuous feature, but its spreading branches afforded shade to the rhododendrons for some distance around it. In its fall much havoc was done to these plants, among which were some very old specimens of the first hybrids raised in this country.

Another large tree of which the disappearance is greatly to be regretted is one of the Horse Chestnuts near the Main Gate. Although not uprooted it was so badly damaged that it had to be taken down. Other noteworthy trees brought down by the gale were a large *Celtis occidentalis* growing near the Economic Houses, and a "Judas Tree" (*Cercis Siliquastrum*) in Cambridge Cottage Garden. Neither was a particularly fine tree, but they were probably the oldest specimens in the Gardens.

In addition to the above mentioned, three large Beeches and an Elm were uprooted, and a considerable number of large branches were broken off many other trees by the wind.

The incessant and heavy rains of the past two months have cleaned all the evergreen and other trees and shrubs, and freed them from all soot and dirt; the grass lawns have also been unusually bright green for the same reason. This welcome washing of the trees and shrubs, which are usually soot-begrimed in winter, besides adding to the beauty of the Gardens, will doubtless be very beneficial to the plants themselves.

ITEMS OF SPECIAL INTEREST.—The exhibition of interesting subjects in House 14c continues to attract much attention. Among exhibits arranged during the year the following are noteworthy :—A collection of tropical and hardy Gourds, all of which had been grown in the Gardens ; examples of plants bearing Tendrils showing different types of development ; a collection of the modern garden varieties of Chrysanthemum, with examples of the species from which they have evolved ; Pelargoniums and the derived modern garden " Geraniums."

For the third year in succession a plant of the " Giant Aroid," *Amorphophallus Titanum*, has flowered at Kew. The specimen, which flowered in September, was the last of three tubers received from Mr. A. de Kock, of Sumatra, early in 1927.

Another interesting plant that flowered during the year was *Pelargonium Cotyledonis*. This remarkable species was sent by Mr. Bruins-Lich, a former Kew student gardener, now Horticulturist at St. Helena. Mr. Bruins-Lich states that it grows on rocky cliffs in almost inaccessible places.

STUDENT GARDENERS.—There were fairly considerable changes in the personnel during the year ; nineteen men completed their training, while the new entrants numbered twenty.

Nine of the men who left secured positions at home—four in various Parks Departments : two as temporary technical assistants in the Herbarium, Kew : three in private gardens or nurseries. Six men proceeded to appointments overseas, their destinations being British Columbia, the Republic of Honduras the Botanic Garden, Kirstenbosch, South Africa, the garden of Mr. Cecil Hanbury at La Mortola, Mentone and Singapore. One Student Gardener who came to Kew from New Zealand, proceeded to University College, Reading, for a year's study, and three foreigners, whose term of service is for one year only, returned to their own countries, Germany, Italy and Sweden respectively.

Sixteen of the new entrants came from botanic, public or private gardens or commercial nurseries in the British Isles ; of the remainder there are three from the Colonies—two being from South Africa and one from New Zealand, and one foreigner, an Italian, from Mr. Hanbury's garden at La Mortola.

THE NEW SUNDIAL.—Professor C. Vernon Boys has constructed and presented a sundial which has been erected on a pillar which was one of the balusters of the old Kew Bridge. This stands in the centre of the Medicinal Garden in Cambridge Cottage Garden. The pillar was presented by Mr. George Hubbard, F.S.A.

The dial is in the form of a Greek cross and is constructed of gun-metal. The castings were worked up and the dial was constructed by Professor Boys himself. It consists of five equal cubes and one trapezium-shaped support, all with plain faces only. It was

necessary that the 36 surfaces should be produced all truly square to one another, and of equal dimensions for the cubes, but containing the angle of the colatitude for the support.

The dial, being in the form of a Greek cross, has eight outer edges. If such a cross were to be laid flat at the Pole, these edges would be all parallel to the axis of the earth ; and since the sun, when above the horizon as in summer, appears to travel round the sky, each of these edges would cast a shadow for three hours on a face of the adjacent cube. So the eight faces would take it turn and turn about for three hours each, and the shadow would be found on one of the cubes throughout the 24 hours. If, instead of being laid level at the Pole, the dial were removed to any other part of the earth and was then placed parallel to its supposed position at the Pole, it would then equally receive, on one or other face, three hours for each, the moving shadow of one or other edge. As in these latitudes the sun is never above the horizon before 3 a.m. or after 9 p.m., the two outer edges of the cross on the northern cube will never cast shadows on the east and west cubes, and so no divisions are needed on the north faces of these cubes.

In order that anyone wishing to tell the exact time may do so with the minimum of trouble, the dial carries on its upper surface a statement giving the position of Kew and directions for adding or subtracting a certain number of minutes to or from the time indicated by the dial to obtain Greenwich mean time, or, when it is in force, " Summer Time." This information is contained in a table of 88 entries, calculated from the equation of time of 1930 (a year half-way between two leap years) for each day, to which the time corresponding to the longitude of Kew has been (algebraically) added. Any member of the public with this in sight can then, by making the correction for the actual date to the time shown by the sun, discover Greenwich mean time. The table is true throughout to the nearest half-minute.

On the sloping face facing south the following inscription has been engraved :—

" This Dial, designed, constructed, and erected by C. V. Boys, F.R.S., was presented by him to the Royal Botanic Gardens, Kew. Engraved by H. Routledge. The stone column, taken from Old Kew Bridge, was presented by George Hubbard, F.S.A., the capital and base were supplied by H.M. Office of Works. A. W. Hill, F.R.S., Director, 1929."

In a letter to the " Times " on December 3rd, with reference to the dial, Professor Boys writes :—

" In order to obtain a degree of accuracy of construction not generally, if ever, found in sundials, I made the Kew dial of five cubes screwed together with internal screws and all so completely locked that the parts cannot be unscrewed either severally or as a group, and the locking means can neither be discovered by inspection nor would they be revealed by an X-ray photograph.

I had one other object in mind, which was to remove the slur from which sundials have been allowed to suffer, partly from their often slovenly construction, but more often from the futile way in which they are so often planted, and finally, from the absence on the spot of the means of finding the two corrections to observations made on a correct dial in order to find Greenwich mean time. The public do not carry tables of equation of time, and they probably do not know the longitude, and without these the time shown may be more than a quarter of an hour wrong; but with the combined correction to the nearest half-minute for every day of the year in plain figures on the face of the dial anyone may find the time to the nearest minute, which may, in spite of all our wireless time signals, be very useful, at least as long as our watches are liable to be a minute or more wrong."

PRESENTATION OF STATUE.—Mr. A. T. Hare, of St. Margarets-on-Thames, has presented the bronze statue "Out in the Fields," by Arthur G. Atkinson, which was exhibited at the Royal Academy in the year 1890. The statue has been erected by H.M. Office of Works in the centre of the Iris Garden.

BIRDS.—During the past year several broods of geese have been reared, including Bar-headed and Magellans. Both the black-necked Swans, which were thought to be a pair, made nests and laid eggs; the Zoological Society have now very kindly sent us a male swan. The Society also presented a Snow gander to pair with our solitary goose. Additions to the collection of water fowl include a pair of Redbill Tree Ducks and a South African Pintail, which have not been represented before in our collections; two pairs of Carolinas and a pair of Mandarins, a pair of Common Teal, and a pair of Spotbills. Magellan and Bar-headed geese were presented to the Zoological Society and to the Royal Parks.

EXPERIMENTAL PLANTATION IN RICHMOND PARK.—In May, 1926, a number of trees and shrubs, chiefly from Southern Europe and New Zealand, were planted with the object of comparing their behaviour as to hardiness with those grown in the Gardens (*K.B.* 1927, Appendix I, p. 14). The atmospheric conditions obtaining in Richmond Park and in the Gardens are very similar, but it was thought when the plantation was made that, by reason of its higher elevation, the plants put out there might escape the injury attendant upon the late frosts which are experienced at Kew during April and May. Meteorological observations were made and compared with those taken at Kew for a considerable period, but the differences were not very marked, and, as most of the plants were killed by the severe spring frosts of 1929, which were so disastrous in the Gardens, it was decided to discontinue the experiment.

RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1929.

Inches.			Inches.		
January	...	0.96	July	...	2.89
February	...	0.39	August	...	2.19
March	...	0.03	September	...	0.21
April	...	1.08	October	...	2.82
May	...	1.19	November	...	4.81
June	...	1.11	December	...	4.03
Total 21.71 inches.					

The total for 1928 was 26.44 inches.

CONTRIBUTIONS TO THE GARDENS, 1929.—The most striking presentation during the year was the collection of Cacti generously given by Mrs. A. Sherman Hoyt, of Pasadena, California; full details are contained in Kew Bulletin No. 7, 1928, p. 239. Through the kindness of Mr. T. Hay, M.V.O., Superintendent of Hyde Park, Kew has received a large number of plants and seeds of interest, many of which were collected in Nepal. Several correspondents in Australia and New Zealand have sent supplies of seeds collected in their respective countries. We are again indebted to Major Lionel de Rothschild, and the Hon. Vicary Gibbs, particularly for collections of trees and shrubs.

During the year 909 separate consignments of living plants, seeds, etc., were contributed to the Gardens. The more important donations were as follows:—

Private Donors:—

- Mr. E. Ashby, Blackwood, South Australia.—41 packets of seeds.
- Mr. Shirley C. Atchley, British Legation, Athens.—Bulbs and corms of *Narcissus*, *Cyclamen*, *Anemone* spp., etc.
- Mr. G. P. Baker, Sevenoaks.—Plants and seeds, including *Arnebia echioides*.
- Messrs. Bakers, Codsall, Wolverhampton.—A collection of seeds of New Zealand plants, and plants of *Rhodohypoxis Bauri*.
- Mr. F. R. S. Balfour, Dawyck.—Cuttings of *Alnus incana fastigiata*, and miscellaneous seeds.
- Messrs. Barr & Sons, Covent Garden.—Seeds and plants, including *Cyclamen cilicicum*.
- Mr. A. C. Bartholomew, Reading.—25 packets of seeds of alpine and herbaceous plants.
- Mr. A. Beer, Innsbruck, Austrian Tyrol.—Plants of *Juniperus communis* with parasite *Arceuthobium oxycedri*, and *Pinus Cembra* with parasite *Viscum album*.
- British Banana Co., Ltd., West Smithfield.—Rootstocks of South American Bananas.
- Mr. N. E. Brown, Kew.—Cape succulents, including *Monadenium Lugardae*.

Mr. H. Bruins-Lich, St. Helena.—Bulbs and seeds, including *Watsonia* spp. and *Pelargonium Cotyledonis*.
 Mr. A. K. Bulley, Neston.—20 packets of seeds of Alpines.
 Messrs. Burkwood & Skipwith, Kingston-on-Thames.—Plant of *Osmarea Burkwoodii*.
 Mr. H. Campbell, Kyrenia, Cyprus.—Seeds of *Quercus alnifolia*, etc.
 Mr. W. N. Campbell, Pasadena, California.—Seeds, including *Lyonothamnus floribundus* var. *asplenifolius*.
 Mr. G. J. Carpenter, Dover.—Seeds of *Drosophyllum lusitanicum*.
 Messrs. James Carter & Co., Raynes Park.—A collection of seeds of herbaceous plants.
 Mr. G. Catt, Siquirres, Costa Rica.—A collection of seeds.
 Dr. T. F. Chipp, Kew.—A collection of seeds from Southern Sudan.
 Dr. R. Ciferri, Moca, Dominican Republic.—Seeds of *Sicana* sp. nov.
 Lt.-Col. Stephenson Clarke, Haywards Heath.—A collection of Rhododendrons.
 Dr. L. Cockayne, Wellington, New Zealand.—A collection of seeds of New Zealand plants.
 Sir Jeremiah Colman, Bart., Gatton Park.—Collection of orchids from British Honduras.
 Mr. H. F. Comber, Garlieston, Wigtownshire.—Alpines.
 Mr. H. Correvo, Geneva.—82 packets of seeds.
 Mr. A. D. Cotton, Kew.—Plants of *Senecio* spp. from East Africa and *Huernia Gardneri*.
 Mr. W. Cradwick, Mandeville, Jamaica.—Plants and seeds, and a collection of orchids, including *Angraecum* sp., *Oncidium pulchellum*, etc.
 Mr. V. C. Davies, New Plymouth, New Zealand.—Seeds of *Ixerba brexoides*.
 Messrs. Dobbie & Co., Edinburgh.—Seeds, *Lilium Sargentiae*, and a collection of new roses.
 Major H. Dodds, Palermo.—Seeds of *Rhus Coriaria*.
 Mr. James Douglas, Great Bookham.—Border carnations.
 Messrs. Clarence Elliott, Ltd, Stevenage.—Alpines and *Oxalis gigantea*.
 Messrs. Engelmann, Ltd., Saffron Walden.—Border and greenhouse carnations.
 Messrs. Fisher, Son & Sibray, Sheffield.—A collection of hardy trees and shrubs.
 Mr. R. C. Bruce Gardner, Northwood, Middlesex.—Seeds of *Quercus* spp.
 Mr. C. S. Garnett, Derby.—A collection of orchids.
 Hon. Vicary Gibbs, Elstree.—Hardy trees and shrubs.
 Mr. A. V. Giblin, Hobart, Tasmania.—A collection of Tasmanian plants, and miscellaneous seeds.
 Mr. B. Gilliat-Smith, Persia.—169 packets of seeds from Tabriz.

Dr. M. Grabham, Madeira.—Stove plants and seeds of *Sida sessiliflora*.
 Mr. A. Grove, London.—Seeds of *Lilium Bolanderi*.
 Dr. Giuseppi, Felixstowe.—Herbaceous and alpine plants, seeds and bulbs.
 Mr. W. F. Gullick, Salisbury.—Bulbs of *Lilium Bakerianum* and *L. nepalense*.
 Mr. Cecil Hanbury, M.P., La Mortola, Ventimiglia, Italy.—Miscellaneous seeds.
 Professor A. Henry, Dublin.—Seeds and plants of hardy trees, also seeds of *Widdringtonia* spp., *Podocarpus elongatus*, etc.
 Miss A. E. Hill, Groendoorn, S.W. Africa.—20 packets of seeds; miscellaneous bulbs and succulents.
 Dr. A. W. Hill, Kew.—Seeds of *Geranium* sp. from Tasmania; *Gaultheria* spp., cuttings of *Salix* spp. (from Sweden), also seeds of *Arctostaphylos alpina*.
 Messrs. Hillier & Sons, Winchester.—Hardy trees and shrubs.
 Mr. C. W. von Hirschberg, Elizabethville, Belgian Congo.—Seeds of *Amorphophallus Eichleri*, etc.; plants of *Habenaria Lugardii*, and a collection of bulbs.
 Mr. H. M. Holloway, Kew.—56 packets of seeds of South African plants.
 Mr. F. N. Howes, Kew.—Plants of *Cyathea Dregei*; corms of *Richardia* spp.; bulbs of *Ixia* sp., and seeds of *Cussonia spicata*, *Anemone Fanninii*, etc.
 Mrs. Sherman Hoyt, California.—A collection of Cacti.
 Mr. S. B. Hutton, Pemberton, New Jersey.—Plants and scions of *Gordonia Altamaha*.
 Capt. Collingwood Ingram, Benenden, Kent.—Seeds, including *Araucaria* sp., *Rhododendron* spp., and plants of Japanese *Prunus*.
 Major L. Johnston, Campden, Glos.—Seeds collected on Mount Kilimanjaro, and plants, including *Olearia chathamica*.
 Mrs. L. Kemp, Waterloo, Sierra Leone.—Tubers of *Amorphophallus leonensis*.
 Dr. A. F. G. Kerr, Bangkok, Siam.—Fruits and seeds of *Diospyros* sp., and economic plants.
 Mr. C. E. Lane-Poole, Canberra, Australia.—Seeds of *Hardenbergia Sarsaparilla*.
 Mr. A. E. Lawrance, Venezuela.—Miscellaneous orchids.
 Sir Wm. Lawrence, Bart., Burford.—Seeds and plants, including *Hibbertia volubilis*.
 Mr. H. Lawton, Wellington, New Zealand.—Plants of *Celmisia* spp., and numerous seeds, including *Chordospartium Stevensonii*, *Notospartium torulosum*, etc.
 Mr. G. W. E. Loder, Ardingly, Sussex.—Seeds of *Gaultheria antipoda*, *G. perplexa*, and half-hardy shrubs.
 Mr. T. Ashton Lofthouse, Middlesbrough.—23 packets of seeds from Spain.

Dr. J. P. Lotsy, Velp, Holland.—Cuttings of *Salix Caprea* var. *pendula*.
 Lady Manners, Christchurch, Hampshire.—Seeds collected in India, including *Rosa* sp.
 Mr. E. M. Marsden-Jones, Devizes, Wilts.—Seeds of herbaceous plants.
 Mrs. R. Mayne, Kodaikanal, S. India.—Bulbs of hybrid *Liliums*.
 Mr. F. W. Millard, Felbridge, East Grinstead.—Alpines.
 Lady Milner, London.—Bulbs of *Brunsvigia gigantea*.
 Mr. H. Arraytage Moore, Saintfield, Co. Down.—Hardy trees and shrubs, including *Nothofagus Solandri*.
 Mr. C. Musgrave, Hascombe Place, Godalming.—Plants of *Primula serratifolia*, *P. imperialis*, and *Meconopsis nepalensis*.
 Mr. O. H. Myers, Boxmoor.—Seeds and bulbs from Palestine.
 Hon. H. D. McLaren, Bodnant, N. Wales.—Seeds and plants, including *Primula chionantha*.
 The Orpington Nurseries, Orpington.—A collection of Irises.
 Mr. E. D. Page, Chelmsford, Essex.—Plants of *Orychophragmus violaceum*.
 Mrs. Parry, Lushai, Assam.—A collection of orchids.
 Sir John Ramsden, Bart., Bulstrode, Gerrard's Cross.—A collection of rhododendrons.
 Mr. G. Reuthe, Keston, Kent.—Miscellaneous seeds.
 Mr. G. W. Robinson, Harlesden.—64 packets of seeds collected in Chile.
 Rev. F. A. Rogers, Baghdad, Iraq.—Collections of bulbs from Baghdad.
 Major L. de Rothschild, Exbury, Southampton.—Hardy trees and shrubs, including *Lonicera Hemsleyana*.
 Dr. F. S. Russell, Marine Biological Station, Plymouth.—A collection of seeds from the Great Barrier Reef.
 Hon. Mrs. Ryder, Beaulieu.—Plants, including *Leucadendron plumosum*; bulbs and seeds from South Africa.
 Mr. H. C. Sampson, Kew.—Orchids and seeds.
 Messrs. Sanders, St. Albans.—Orchids, including *Cirrhopetalum spathulatum*, *Dendrobium Wardianum* and *Caladiums* in variety.
 Mr. T. Sharp, Westbury, Wilts.—Succulents, including *Ceropegia Rendallii* and *C. Haygarthii*.
 Mr. F. L. Skinner, Dropmore, Manitoba.—Seeds and bulbs, including *Lilium tenuifolium*.
 Mr. G. E. Stephens, Horsham, Sussex.—Exotic ferns.
 Major F. C. Stern, Goring-by-Sea, Sussex.—Seeds of New Zealand plants.
 Messrs. Sutton & Sons, Reading.—Seeds, and a collection of *Cyclamen* in 14 varieties.
 Lt. Col. E. E. Todd, Gibraltar.—Seeds of *Wilkesia Grayana*, *Viola arborescens*, and bulbs of *Narcissus niveus*.
 Messrs. Vilmorin-Andrieux et Cie., Paris.—Miscellaneous seeds.

Messrs. R. Wallace & Co., Ltd., Tunbridge Wells.—Bulbs and seeds, including *Fritillaria Karadaghensis*.
 Mr. F. Walker, Launceston, Tasmania.—Seeds of *Telopea truncata* and *T. spicata*.
 Major General H. D. O. Ward, London.—A collection of orchids, bulbs and seeds from Kashmir.
 Major W. F. Ward, Kenya.—Tubers of *Gloriosa* sp.
 Mr. J. C. Watt, Aberdeen.—Seeds and plants, including *Primula Calderiana*.
 Mr. A. Wilkinson, Nelson, New Zealand.—47 packets of seeds.
 Mr. J. C. Williams, Caerhays Castle, Cornwall.—Plants and seeds, including *Gordonia Altamaha*.
 Miss Wilman, Kimberley.—Bulbs and Cape succulents.
 Mr. T. C. Wollaston, Adelaide.—Seeds, including *Banksia grandis*.
 Mr. A. Worsley, Isleworth.—Plants, grafts and miscellaneous bulbs.
 Mr. K. Yashiroda, Kagawaken, Japan.—Plants of *Chrysanthemum ornatum* and *C. morifolium*; bulbs of *Lycoris radiata*, and numerous packets of seeds, including *Lilium* spp. and *Rhus* spp.

Large collections of bulbs, seeds and plants were received from Dr. J. M. Cowan and Mr. J. Hutchinson as a result of their journeys in Persia and South Africa respectively.

Public Institutions :—

Aberdeen, Cruickshank Botanic Garden.—*Liparis Craibiana*, and new Siamese introductions.
 Adelaide Botanic Gardens, South Australia.—Miscellaneous seeds.
 Amani, East African Agricultural Research Station.—Seeds and miscellaneous plants.
 Arnold Arboretum, U.S.A.—Seeds of hardy trees and shrubs.
 Bermuda, Department of Agriculture.—Seeds, spores, and bulbs of *Lilium longiflorum* var. *eximium*.
 Bucharest Botanic Gardens, Roumania.—44 packets of seeds.
 Buitenzorg Botanic Gardens, Java.—Seeds of economic plants and *Primula imperialis*.
 Calcutta Botanic Gardens.—Seeds of *Euryale ferox*, *Rosa macrocarpa*, etc.
 Chelsea Physic Garden.—60 packets of seeds of herbaceous plants.
 Copenhagen Botanic Gardens, Denmark.—Plants and seeds.
 Dahlem Botanic Garden, Berlin.—43 packets of seeds.
 Darjeeling, Lloyd Botanic Gardens.—112 packets of seeds, including many collected in Tibet.
 Dehra Dun, Forest Research Institute.—Miscellaneous seeds.
 Dominica, Department of Agriculture.—*Lissochilus* sp., *Cyathea* spp.
 Dunedin Public Gardens, New Zealand.—252 packets of seeds, and a collection of New Zealand native plants.

Eddy Tree Breeding Station, California.—A collection of seeds of *Pinus* spp.

Edinburgh, Royal Botanic Garden.—295 packets of seeds, and miscellaneous plants.

Glasnevin Botanic Gardens, Dublin.—40 packets of seeds, and plants of exotic ferns.

Hyde Park (per Mr. T. Hay, Superintendent).—204 packets of seeds, including many collected in Nepal; herbaceous and decorative plants, including *Lilium princeps*, *Lisianthus Russellianus*, *Meconopsis* and *Primula* spp.

Imperial Institute, South Kensington.—Plants of *Euphorbia piscatoria* and *E. balsamifera*.

Jamaica, Department of Agriculture.—A collection of Tree Ferns.

Jassy Botanic Garden, Roumania.—99 packets of seeds.

John Innes Horticultural Institution, Merton.—Plants, seeds and cuttings, including stove and greenhouse subjects.

Kirstenbosch, S. Africa, National Botanic Garden.—A large collection of South African plants and seeds.

Kuala Lumpur, F.M.S., Department of Agriculture.—Suckers of varieties of *Musa*, and seeds of other economic plants.

Leningrad Botanic Garden, U.S.S.R.—59 packets of seeds.

Lisbon Botanic Garden, Portugal.—81 packets of seeds.

Marsh Botanic Gardens, Yale University.—A collection of seeds.

Montpellier Botanic Garden, France.—225 packets of seeds.

Nancy Botanic Garden, France.—41 packets of seeds.

Ottawa, Central Experimental Farm.—Miscellaneous seeds, including *Zizania aquatica*.

Oxford Botanic Garden.—Plants of *Epidendrum Brassavolae*.

Paramaribo, Surinam, Department of Agriculture.—Plants of commercial varieties of *Theobroma Cacao*.

Paris, Museum d'Histoire naturelle.—77 packets of seeds.

Penang Botanic Gardens.—A collection of economic plants, orchids, etc.

Peradeniya, Ceylon, Department of Agriculture.—A large collection of economic plants and ferns.

Pretoria, Department of Agriculture.—Seeds, including *Erythrina acanthocarpa*.

Pruhonice, Czechoslovakia, Dendrological Society.—Seeds and cuttings of hardy trees and shrubs.

The National Rose Society, Westminster.—A collection of 41 species and varieties of *Rosa*.

Rouen Botanic Garden, France.—55 packets of seeds.

Simla, Viceregal Gardens.—Seeds of *Lilium* spp., *Gynandropsis speciosa*, etc., and bulbs of *Lilium Thomsonianum*.

Singapore Botanic Gardens.—Seeds and plants.

Sydney Botanic Gardens, N.S.W.—24 packets of seeds.

Tiflis Botanic Gardens, U.S.S.R.—46 packets of seeds.

Trinidad, Botanic Gardens.—A collection of economic plants, orchids, etc.

United States Department of Agriculture, Washington.—Seeds and plants, including *Juglans cinerea*, *Posoqueria latifolia*, economic plants and hardy trees and shrubs.

Wisley, Royal Horticultural Society's Gardens.—32 packets of seeds of herbaceous and alpine plants.

DISTRIBUTION OF PLANTS AND SEEDS.—Following the circulation of the 1928 seed list, 170 consignments of seeds were sent out from Kew in the early part of the year, the total number of packets thus distributed being 9,736; hardy trees and shrubs, 3,415; herbaceous plants, 6,321.

The most important seeds specially distributed included:—*Juglans* spp., *Caesalpinia brevifolia*, *Sorghum* spp., *Schinopsis Balansae*, *Acacia* spp., *Arachis hypogaea*, *Aleurites Fordii* and *A. montana*, *Sapium sebiferum*, *Voandzeia subterranea*, and Turkish tobacco.

Wardian cases of plants were despatched to the Botanic Gardens, Hobart, Tasmania; also to the Departments of Agriculture of the Federated Malay States and Bermuda. Other overseas consignments were sent to the Superintendent, Frasers Hill, Federated Malay States; Director, Department of Agriculture, Trinidad; Director of Agriculture, Tanganyika Territory; Director of Forestry, State Forest Service, Wellington, New Zealand; and the Director of Agriculture, Cyprus. In addition to the foregoing, consignments of plants, which had been sent to Kew from various parts of the Empire for re-packing and re-forwarding, were despatched to the East African Agricultural Research Station, Amani; Lady Storrs, Cyprus; and the Director of Agriculture, Northern Provinces, Nigeria.

Other recipients of plants, etc., from Kew, included the following:—

Sir F. D. Acland, Killerton, Exeter.—Herbaceous plants and rhododendrons.

Prince Mohamed Aly, Cairo.—Plants of *Agave* spp. and fruits of *Rosa* spp.

Mr. H. G. Bell, Coulburn, New South Wales.—Cuttings of *Populus* and *Salix* spp.

Berlin-Dahlem, Kaiser Wilhelm Institut für Biologie.—Seeds and bulbs.

Cambridge, Botanic Garden.—Seeds, greenhouse and stove plants, trees and shrubs.

Mr. H. Campbell, Cyprus.—Cuttings of *Populus* spp.

Cheshunt, Herts, Experimental and Research Station.—Plants and seeds.

Cracow, Poland, University Botanic Garden.—Cuttings of *Aesculus*, *Tilia* and *Ulmus* spp., etc.

Mr. W. Cradwick, Jamaica.—Orchids and fuchsias.

Dewsbury, Parks Department.—Collection of economic plants.

Monsieur L. A. Dode, Paris.—Grafts of *Aphananthe aspera* and *Maackia amurensis* var. *Buergeri*, etc.
 Messrs. Donard Nursery Co., Newcastle, Co. Down.—Plants, cuttings and seeds.
 Trinity College Botanic Garden, Dublin.—Collection of stove and greenhouse plants.
 Edinburgh, Royal Botanic Garden.—Plants and seeds.
 H.E. The Governor, Falkland Islands.—Seeds, including *Caragana arborescens* and *Cupressus macrocarpa* var. *guadalupensis*.
 Fisheries Research Station, Alresford.—Trees and shrubs.
 Hon. Vicary Gibbs, Aldenham.—Plants, seeds and cuttings.
 Giessen, Germany, Botanic Gardens.—Plants and cuttings.
 Glasnevin Botanic Gardens, Dublin.—Plants and seeds.
 Director of the Public Parks, The Hague, Holland.—Grafts of *Crataegus*, *Fraxinus*, *Ulmus* spp., etc.
 Mr. A. J. Hamilton Harding, Agra Patnas, Ceylon.—Acorns of 6 species of *Quercus*.
 Messrs. Hillier & Sons, Winchester.—Plants, seeds and cuttings.
 Captain Collingwood Ingram, Benenden, Kent.—Plants, including *Stewartia Malachodendron*, *Amelanchier stolonifera*, and species of *Rhododendron* and *Prunus*; also seeds.
 John Innes Horticultural Institution, Merton.—Seeds, greenhouse plants and shrubs.
 Rt. Hon. Viscount Lascelles, Knaresborough.—Seeds of *Lilium regale*.
 Sir William Lawrence, Bart., Burford.—Greenhouse plants.
 London County Council, Parks Department.—Plants and seeds.
 Messrs. Stuart Low & Co., Enfield.—Plants, seeds and cuttings.
 Middlesex County Council.—Plants of *Forsythia intermedia* var. *spectabilis*.
 Sir Frederick W. Moore, Willbrook House, Rathfarnham.—Trees and shrubs.
 Munich, Bavaria, Botanic Garden.—Seeds of *Typhonodorum Lindleyanum*.
 Oxford Botanic Garden.—Seeds and tubers.
 Paris, Museum d'Histoire naturelle.—Collection of ferns.
 Peradeniya, Ceylon, Royal Botanic Gardens.—Tubers of *Nymphaea* spp.
 Reading University, Horticultural Department.—Grafts of *Prunus* and *Pyrus* spp.
 Richmond Central School, Surrey.—Collection of trees and shrubs.
 Major L. de Rothschild, Exbury.—Tubers of *Nymphaea* spp., plants and seeds.
 Hon. Mrs. Ryder, Beaulieu.—Bulbs, seeds and plants.
 Dr. Sun Yat Sen's Mausoleum and Memorial Park, Nanking, China.—Seedling oaks and birches, also 101 packets of seeds.
 Mr. W. C. Slocock, Goldsworthy Old Nursery, Woking.—Plants, seeds and grafts.

Major A. A. Dorrien-Smith, D.S.O., Tresco Abbey, Isles of Scilly.—Greenhouse plants.
 Stockholm, Sweden, Botanic Garden.—Plants of *Rhododendron* spp.; seeds of *Lysichitum camtschatcense* and *Typhonodorum Lindleyanum*.
 Messrs. Sutton & Sons, Reading.—Plants, seeds and cuttings.
 United States Department of Agriculture.—Seeds of *Pistacia integerrima*.
 Upsala, Sweden, Botanic Garden.—Seeds of *Xanthoceras sorbifolia*.
 Utrecht, Holland, Botanic Garden.—Plant of *Drosera dichotoma*.
 Messrs. R. Wallace & Co., Ltd., Tunbridge Wells.—Seeds, plants and cuttings.
 Mr. A. Worsley, Isleworth.—Plants, including *Strelitzia reginae*, *Cereus* spp. and *Amaryllis Belladonna* vars.
 Mr. K. Yashiroda, Kagawaken, Japan.—Seeds of South African Heaths.

The usual distribution of surplus trees, shrubs and herbaceous plants to educational and public institutions was made in March.

National Pinetum at Bedgebury.

Despite the long and cold winter of 1928-29, and the abnormally dry summer of 1929, the year, taken all round, was the most favourable there has been for the growth of young trees since work was commenced in 1925. The long winter retarded growth in early spring until the danger of late frosts was over, therefore uninterrupted growth was possible. Moreover injury from pine weevils was very slight compared with previous years, and early spraying kept green fly on spruce, which was very troublesome from 1926 to 1928, in check. This combination of circumstances resulted in the recovery of a number of plants that had been injured by frost and insects in previous years. Some plants, however, that were injured during those years will have to be replaced.

A few plants of *Cupressus* have been killed by honey fungus (*Armillaria mellea*), which is very prevalent on old stumps.

Although during summer all the streams and most of the springs dried up, none of the plants actually suffered from want of water. The policy of preparing large holes for the plants, with the hard pan beneath the surface soil thoroughly broken up, has been fully justified as it has resulted in the roots being able to penetrate into moist subsoil. Many of the young trees have made very good growth, and some interesting data should become available at the first quinquennial general measurement, which is timed to take place during 1930.

A new approach to the Pinetum, 60 feet wide, has been made across the bottom of the meadow near Marshall's Lake. In order to compensate the farmer, whose farm includes this meadow, for the loss of a drinking place for cattle, a zinc trough has been provided with a pipe line to carry water from the well on the hill near the

Pine Avenue. The new approach has been bordered with deciduous cypress and a mass of the same tree has been formed on the mud bank in Marshall's Lake.

The opportunity was taken during the summer drought of opening out a number of silted-up drains in the vicinity of Marshall's Lake and of carrying out other drainage work. Sixty *Rhododendrons* from the Temperate House Pits were planted in November.

A number of people interested in the *Coniferae* have visited the Pinetum during the year and expressed their pleasure at the appearance of the young trees. As funds are not available for the provision of smooth avenues and paths, visitors should be on the look out for old tree butts, holes and other inequalities in the ground, many of which are unavoidably present. As opportunity offers the worst of the obstructions are being removed and holes filled, but progress is necessarily slow.

Unfortunately several old trees were blown down and others injured during the December gales.

The Museums.

GENERAL.—The increasing interest taken in the economic products of plants that has been noticeable for some years, continued during 1929, and a good deal of time was spent in correspondence and in discussing home and colonial products with visitors. Many of the questions that arose related to well-known crops and the identification of specimens, but there were others of a more troublesome character, particularly those that referred to finding new markets for well-known crops, and the suggestion of new crops for farmers in the colonies and at home that would be likely to pay better than those already grown. The difficulty in answering such questions is often intensified by the writers of newspaper articles allowing the spirit of optimism to outrun discretion.

The incorporation of new specimens in the Museums made a good deal of work, for in the congested state of the collections additions can only be made by extensive re-arrangement or by the removal of old specimens. In some instances the exchange of new for old can be effected without difficulty, but where Museum specimens are complementary to others in the Herbarium, the old ones must be retained. The ideal means of dealing with such specimens would be to consign them to a special room or building where they could be examined when necessary, but where they would not interfere with the proper display of more important commercial products.

Attention to labels has provided constant work. This appears to become heavier year by year, partly by discoloration of old labels and partly through the necessity of keeping names up to date in accordance with the findings of research in nomenclature.

A good deal of the preparatory work for a new Guide to Museum No. I has been done, and it is hoped that the Guide will be published

during 1930. An Assistant has devoted part of his time to the collection of information relating to plants used in various parts of the world as native fish poisons, and material of many of these plants has been procured and despatched to the Department of Insecticides and Fungicides at Rothamsted, where experiments were conducted with a view to finding out their approximate value as insecticides.

The Keeper has continued to act as Executive Officer for the Pinetum at Bedgebury, and has attended to various questions on Silviculture addressed to the Gardens.

Very good use was made of the Museums during the spring and summer months by various London schools. Large numbers of children were brought by their teachers and showed considerable interest in the exhibits. Such parties are usually well behaved, but there are some children unfortunately who are unable to resist the temptation to tear or otherwise destroy card labels.

MAINTENANCE.—H.M. Office of Works have redecorated part of Museum No. II, and the repainting of the insides of the cases in that building, commenced in 1927, has been continued. A new roof of copper has been placed on the North Gallery to replace the original zinc roof, which, during the last few years, has been a source of considerable trouble owing to cracks.

PRESENTATIONS TO MUSEUMS.—Director of Field and Animal Husbandry, Union Buildings, Pretoria.—Three samples of S. African grain Sorghums, grades K.A, K.2, K.3.

Mr. S. Lister James, British Honduras.—Specimens of Pita Fibre.

Director, Department of Agriculture, Uganda.—Specimens of varieties of *Eleusine coracana* as cultivated in Uganda.

Messrs. Pinnock Bros., 30, Mark Lane, London, E.C.2.—Sample of Powdered Lucerne.

Mr. F. N. Howes, Royal Botanic Gardens, Kew.—Thirty specimens of S. African woods.

Mr. A. Bruce Jackson.—Cones of *Pinus Thunbergii*, and seeds of *Cedrus brevifolia*, *Quercus alnifolia*, *Juniperus phoenicea*.

Dr. Youngman, Economic Botanist, Central Provinces, India.—Fruits of *Arachis nambyquarae* and *Acacia arabica*.

Mr. J. D. Kelly, Information Branch, Anglo-Persian Oil Co. Ltd., Britannic House, Finsbury Circus, London, E.C.2.—Prints of photographs of Tamarisk trees taken on the coastal plain near Ganaweh, S. Persia.

Dr. Dalziel, Herbarium, Kew.—Sample of *Psyllium* seeds and twigs and roots of *Cryptolepis triangularis*.

Mr. J. Rochford, Coggeshall, Essex.—Two sheets of illustrations of grasses.

Mr. W. H. Fairbairns, "Marston," Aldenham Avenue, Radlett, Herts.—Walking stick of Purple Heart (*Peltogyne porphyrocardia*).

Mr. A. A. Kennedy, Technical Director, International Icilm Trading Co. Ltd., 37-45, King's Road, St. Pancras.—Sample of Mawah Oil.

Mr. F. C. Deighton, Agricultural Department, Sierra Leone.—Sample of "Pa-Kamlo Rice."

Mr. E. I. Nisbett, Agricultural Department, Sierra Leone.—Seeds of *Drypetes Afzelii*.

Dr. Kerr, Bangkok, Siam.—Sample of "Kalampak," a medicinal wood sold in Bangkok; specimen of Som Mû (Fingered Lemon) used as smelling salts, prepared in Bangkok.

Dr. A. C. Thaysen, Bacteriological Laboratory, R.N. Cordite Factory, Holton Heath, Dorset.—Table napkins made from Ramie fibre.

Major Du Plat-Taylor, 36, Victoria Street, Westminster, S.W.1.—Section of Greenheart timber riddled by seaworms, *Limnoria* and *Teredo*, from Swanage.

Mr. G. Soames, Sheffield Park, Uckfield.—Transverse section of trunk of *Ailanthus glandulosa*.

Mr. E. B. Eckbo, Forest Department, Union of S. Africa.—Fourteen specimens of S. African woods.

Messrs. Lever Bros. Ltd., Port Sunlight, Cheshire.—Twenty-three specimens of West African Oil Palm and Coconut products, to replace old exhibits.

Messrs. Pitalles Ltd., 9-11, Fenchurch Street, London, E.C.3.—Eleven specimens of Pita fibre in an unmanufactured and manufactured state.

Surgeon-Colonel A. W. Sinclair, "Edina," Chipping Sodbury, Gloucestershire.—Writing desk made of wood of Kayu-Rengas, (*Melanorrhoea* or *Gluta* sp.).

Messrs. Fortnum and Mason, Ltd., 182, Piccadilly, London, W.—Ten jars of preserved vegetables to replace old exhibits.

Professor G. Stahel, Agricultural Experiment Station, Paramaribo, Surinam.—Two fruits of wild *Cacao*.

Mr. H. Clinton-Baker, Bayfordbury, Herts.—Distillate and extract from branches of *Davidia*, and a plank of *Quercus velutina*.

Director, Botanic Garden, Singapore.—Collection of Chinese Drugs, received through Mr. Burkill.

Mr. C. Moriondi, Pergolesi 19, Milan.—Samples of fibre of *Spartium junceum*, with thread and fabric manufactured from the same.

The Balsa Wood Company, 4, Great Queen Street, Kingsway, London.—Plank of Balsa Wood.

Miss J. Bostock, Monte Creek, B.C.—Twigs of Douglas Fir with deposits of sugar.

Messrs. Joseph Rogers and Sons, Ltd., 6, Norfolk Street, Sheffield.—Ten samples of wood used in making knife handles, also handles made from the same.

Director A. Löf, Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden.—Nine photographs illustrating charcoal-burning in Sweden.

Mr. R. S. Lynch, Dartington Hall Estate.—Twenty-three photographs of features on the Dartington estate.

Dr. Grabham.—Two spoons made of wood of *Clethra arborea* in Madeira.

Mrs. Collins, Sriracha, Siam.—Rice and rice-meal from Bangkok. Conservator of Forests, Belize, British Honduras.—Pods and seeds of Wild Cacao, and pods, leaves and wood of "Cacaopaste."

Director, Imperial Institute.—Collection of 147 specimens of Colonial woods.

Director, Botanic Garden, Eala, Belgian Congo.—Fruits and seeds of *Sclerosperma Mannii*.

Mr. R. N. Parker, Forest Botanist, Dehra Dun.—Dried bark and leaves of *Albizzia stipulata*, *A. procera* and *Ougeinia dalbergioides*.

Perry's Hardy Plant Farm, Enfield.—Transverse section of the trunk of the old Cedar of Lebanon from Enfield Old Palace.

The Jodrell Laboratory.

The microscopic structure of a large number of specimens was studied with the object of identifying them as far as possible by the help of their anatomical characters. The specimens examined were of varied nature, including samples of wood, fibres, bark and seeds. Among these were a collection of medicinal roots, etc., from Canada, used by native Indians; a series of ancient specimens (tubers, twigs, leaves, etc.), from the Badari district, Egypt; a number of samples of wood from North Borneo; splinters from two panels of pictures by Rembrandt, which were identified as wood of *Cedrela* sp.; pieces of wood received under the name of Nut Wood or Scented Wood, found to be *Convulvulus scoparius*, "Rose Root" of the Canary Islands, which contains an oil once used in perfumery; samples of Peruvian Mahogany, the identity of which was, for some time, uncertain, but appears to have been established (in 1928) as *Swietenia macrophylla*.

Dr. D. Hooper examined several specimens of Chinese drugs, both microscopically and by the application of chemical tests, for purposes of identification, the specimens belonging to the collection referred to in last year's report.

Mr. F. N. Howes was engaged in a study of the comparative anatomy of African *Rutaceae*, the sub-family *Toddalieceae* being dealt with chiefly during the current year.

Dr. S. Junell prepared material of the flower-buds of various species of *Loganiaceae* and *Labiatae* for cytological study, especially relating to the reduction division in the anthers.

Miss I. Manton prepared further material of the roots of a number of species of *Cruciferae*, for cytological work on the morphology of the chromosomes.

Dr. A. W. Ossowski carried out an investigation dealing with the character and chemical composition of the megaspore-membrane in several members of the *Coniferae* and in *Cycas*, and also studied the development and cell-contents of abnormal periderm-tissue in two species of *Khaya*.

Cultures of different *Fungi* were prepared and examined by members of the Herbarium Staff in connection with their Mycological work.

The Herbarium.

The second part of the cabinet extension programme, namely, the provision of an extra tier of cabinets above the existing blocks on the ground and first floors, was completed in 1929 by the addition of a tier on the first floor of the west wing. This has temporarily relieved the congestion of the specimens in that part of the Herbarium and afforded a certain amount of room for expansion. The crowded state of the material on the second floors of both wings (comprising the Gamopetalae and part of the Apetalae) presents an increasingly serious problem, the shelves of such families as Rubiaceae, Apocynaceae, and Labiatae being filled to the limit of their capacity, so that the incorporation of fresh material belonging to these and other groups has had to be suspended until further accommodation can be provided. Nevertheless over 78,000 sheets were "laid in" during 1929, which constitutes a record, the previous maximum being 68,000 in 1927.

During the past year there has been a further increase in the activities of the Herbarium. International co-operation in research has been assisted by a large extension of the system of reciprocal loans between important botanical institutions. During the year, over 9000 specimens were received on loan, including 4000 required for the preparation of the Flora of Madras, and nearly 6000 specimens were sent out on loan to other institutions at home and abroad. A considerable amount of the material sent out consisted of partially-named specimens, which have been returned fully named and authenticated by specialists in the various groups concerned, so that the scientific value of the material has been greatly enhanced.

Consultation of the Orchidaceae in the Herbarium has been greatly facilitated by the re-arrangement of the genera according to Schlechter's "Das System der Orchidaceen."

Notices of publications embodying the results of research by members of the staff and visiting botanists are given below under their respective geographical headings. A paper on "The Herbal of Otto Brunfels" (Journ. Linn. Soc., Bot. xlviii. pp. 79-124), published in December, 1928, escaped mention in the Annual Review for that year. It consists of a scientific study of the Herbal in the light of modern knowledge, and includes identifications of the numerous plants figured.

EUROPE AND THE ORIENT.

Routine.—Work on the unmounted collections on hand has been very satisfactory. Over 20,000 sheets have been mounted, poisoned, and laid in. This figure includes recent collections which have been mounted shortly after receipt. In addition to the current year's mounting, nearly the whole of the arrears of specimens ready to lay in have been incorporated, and only a small number, mostly belonging to families for which no space is available, have not yet been placed in their proper covers in the Herbarium. This is a considerable achievement since it means that approximately 40,000 sheets from Europe and the Orient (in the sense of Boissier's *Flora Orientalis*) have been laid in during 1929.

As a consequence of the extra concentration on clearing the stores and the large numbers of plants received for determination fewer genera have been written up than usual. A great deal of work remains to be done in this direction before the collections are arranged in such a manner as to make consultation easy. The following genera have been written up during the year according to recent monographs or standard lists or floras; *Quercus* and other smaller genera of the *Cupuliferae*, *Clematis*, *Adonis*, *Anemone*, *Ranunculus*, and some small genera of the *Ranunculaceae*.

The distribution of plants for the Botanical Society and Exchange Club of the British Isles was undertaken from Kew. 4804 specimens were distributed under the supervision of Dr. W. B. Turrill, who also edited the Distributor's Report. As a result of calling attention, by this and other means, to the interest of Kew in the British flora, very valuable parcels of specimens were received for the Herbarium, notably from Mr. J. E. Little, Mr. P. M. Hall, and Dr. E. Drabble. It is hoped that all interested in the flora and vegetation of the British Isles will aid the efforts being made to complete the representation of the British flora in the Herbarium.

Additional valuable collections have also been received during the year from Albania, Thessaly, Thrace, Bulgaria, Yugoslavia and Spain, but the most important contributions have been from farther east, especially from Palestine, Iraq and Persia. The fine collections of Mr. Gilliat-Smith from Azerbidjan have been completed and an account of them has been prepared for publication.

During the autumn collections made by Dr. Cowan and Dr. C. D. Darlington in Persia were arranged and partly named. The work of identification is necessarily slow, since the literature is scattered and in some cases the species are not represented in the Kew Herbarium. Information as to the occurrence and distribution in Persia of various species of *Pyrethrum* was given to the Anglo-Persian Oil Company.

Research and Publications.—The following papers appeared:—
Botanical Society and Exchange Club: Distributor's Report for 1928.

The Flora of Foula (Bot. Soc. & Exch. Club, 1928, vol. viii, part v. p. 838: 1929).

Researches on *Silene maritima* and *S. vulgaris*: II-IV (*K.B.* 1929, pp. 33, 145, 197).

On the Flora of the Nearer East: IV. (*K.B.* 1929, p. 223).

Variations in Sex Expression in *Ranunculus* (*Nature*, cxxiii. p. 798).

Colour and Sex in *Ranunculus* (*Journ. Genetics*, xxi. p. 169).

Vegetation of the Rodope Mountains (*Journ. Ecol.* xviii. p. 409).

Quercus stranjensis Turrill (*Bull. Soc. Bot. Bulg.* ii. p. 61).

Modern Methods in Taxonomic Botany (*Bull. Soc. Bot. Bulg.* iii. p. 119).

ASIA.

INDO-MALAYAN REGION.—*Routine*.—Mounting and laying in progressed satisfactorily. Practically all the Indian material has now been laid in, and only the most recent contributions remain to be incorporated. Some 20,000 sheets of Malay Islands and Philippine Islands specimens still remain in store awaiting accommodation in the general Herbarium, since lack of space prevents their incorporation.

Contributions to the herbarium were received from the Singapore Botanic Gardens; the Imperial Forest Botanist, Dehra Dun; the Forest Botanist, Burma; and the Systematic Botanist, Ceylon.

About 800 specimens collected by Captain F. Kingdon Ward in the Abor and Mishmi Hills were presented during the year; the majority of these remain to be determined.

Dean Elmer D. Merrill presented a set of Squire's collection made near Hue in Indo-China, the locality where Loureiro's types were found.

Further extensive collections of Siamese plants were received from Dr. A. F. G. Kerr, and are being determined by Prof. W. G. Craib.

Smaller contributions were received from Mrs. A. D. Parry (Cachar and Garo Hills, Assam) and Revd. W. J. L. Wenger (Lushai Hills, Assam). Dr. Gravely, Superintendent of the Madras Museum, sent two interesting collections (mainly of *Eriocaulon* and *Impatiens*), made by himself, Mr. E. Barnes and Mr. Mayuranathan, in the Nilgiri Hills of South India.

Research and Publications.—Progress was made with the preparation of the Flora of the Presidency of Madras.

A very interesting assemblage of about 400 sheets, sent by J. G. Koenig to A. J. Retzius in the last quarter of the 18th Century, was received on loan from the Botanical Museum at Lund. A number of these appear to be the original specimens on which were founded some of the species described by Retzius in his "Observationes Botanicae," published from 1779 to 1791. The collection was still under investigation at the close of the year.

The following papers appeared:—

"Contributions to the Flora of Siam," additamentum XXVI, by W. G. Craib, J. E. Dandy and E. T. Geddes (*K.B.* 1929, p. 105).

"Contributions to the Flora of Burma," parts VII. and VIII. (*K.B.* 1929, pp. 204, 310).

"Plants new to Assam," part I (*K.B.* 1929, p. 247).

"A new *Michelia* from the Borders of Tibet and Assam," by J. E. Dandy (*K.B.* 1929, p. 222).

"New species from the Malay Peninsula and Borneo," by H. N. Ridley (*K.B.* 1929, p. 254).

"Some interesting *Erias* from Burma" (*K.B.* 1929, p. 307).

"Notes on *Blastus Cogniauxii*" (*K.B.* 1929, p. 317).

CHINA AND NORTHERN ASIA. *Routine*.—Approximately 6600 sheets have been incorporated in the Herbarium this year, and the labels of several large collections have been written up from the lists concerned.

Perhaps the most important piece of work accomplished has been the urgently required rearrangement of a great many genera in accordance with monographs and revisions, mostly of recent date. In many cases critical determination has now been made possible in genera which previously contained such a high proportion of unnamed or incorrectly named material that accurate specific determination was impossible without a prohibitive expenditure of time. Though some 38 genera have been dealt with, much still remains to be done in this direction.

The naming of Abbé E. Licent's valuable collection from North China and Mongolia has been continued, and Capt. F. Kingdon Ward's Upper Burma (1926) collection is also in process of identification. Further instalments of the excellent set of exsiccata issued by the University of Central Asia (Tashkent) have been received and laid into the Herbarium. The critical notes on the labels accompanying the specimens from this comparatively poorly represented area are of great value to any worker studying the genera concerned.

Among the more important accessions to the Herbarium was a set of over 700 specimens from the province of Chekiang, received from the University of Nanking.

Research and Publications.—Owing to the kindness of Dr. E. D. Merrill and others, who sent numerous specimens of *Gentiana* and *Crawfordia* on loan, it has been possible to enlarge the revision of these genera referred to last year.

The investigation of the Asiatic herbaceous *Sambuci* referred to in last year's report has been continued, but publication has been delayed by pressure of other work. Great assistance was rendered by the loan of all the material of *Sambucus* from the Royal Botanic Garden, Edinburgh, which has been named and returned. The preparation of a paper on certain species of *Allium* has also been facilitated by the loan of all the Edinburgh material, the greater part of which has already been named.

A posthumous paper by the late Herr W. Becker, entitled " *Violae Asiaticae Novae*," was published in the *Kew Bulletin* for 1929, p. 200. An account of " The Botanical Collection made by Capt. F. Kingdon Ward in the Eastern Himalaya and Tibet in 1924-25 " appeared in *Journ. Linn. Soc., Bot.* xlviii. 149 (1929).

AFRICA.

Although all the old African collections in the Store have now been sorted and mounted, it has not been possible to make much progress with the work of determination, since the naming of current collections more than occupies the time of the available staff. The preparation of further Parts of the two African Floras also makes considerable demands on the time of the staff of this section. Part 5 of Volume IX of the Flora of Tropical Africa, dealing with the genera *Setaria*—*Melinis*, was sent to press in the autumn, and the preparation of a further Part dealing with the next section of the Gramineae is now in hand. Good progress has been made with Part iii of the Flora of West Tropical Africa.

The next in the series of the local African Floras it is hoped to prepare will be a Flora of East Tropical Africa, and efforts are being made to obtain as complete and as representative collections as possible from Uganda, Kenya, Tanganyika Territory, Nyasaland, Northern and Southern Rhodesia.

WEST TROPICAL AFRICA.—*Routine*.—Numerous collections were received from Sierra Leone (coll. F. C. Deighton and R. R. Glanville), Gold Coast (coll. C. Vigne and F. R. Irvine), Northern Nigeria (coll. H. V. Lely and A. S. Thornehill), Cameroons (coll. T. D. Maitland), and duplicate material from Liberia, Gold Coast and Nigeria was presented by the Imperial Forestry Institute, Oxford. Lists of determinations have been forwarded, and, as far as possible, these collections have been cited in the West African Flora. Further instalments of the very large collections made by Mr. G. Proctor Cooper on behalf of Mr. Firestone in Liberia were presented by Prof. S. J. Record of Yale University. A number of determinations of this collection has been supplied and distribution of the duplicate material has been made. Specimens of Sorghums from the various Departments of Agriculture, especially from Southern Nigeria (coll. Glendon Hill), have been received, which will be of great value in the systematic work on the genus which is being undertaken at Kew.

A considerable number of grasses was received for identification, especially from the Cameroons (coll. T. D. Maitland), and from the Gold Coast, including a set from Professor R. G. Linton in connection with research on the composition of grasses which is being undertaken by the Royal (Dick) Veterinary College, Edinburgh. In connection with the preparation of the West African Flora considerable revision of the Rubiaceae, which is represented in the area by over 400 species, was found necessary, and concurrently with

this revision a rearrangement of the herbarium material was carried out, which will greatly facilitate future work.

Research and Publications.—In the absence of Mr. J. Hutchinson in South Africa during the last five months of 1928 and the first four months of 1929, the work on the Flora of West Tropical Africa was delayed. It is expected, however, that Part iii, containing all the Metachlamydeae (Gamopetalae), will be ready for press by the end of June, 1930. In this connection the valuable monograph on the Vanguerieae by Dr. W. Robyns of Brussels, prepared mainly at Kew, has been of great service.

NORTH-EAST AFRICA.—Little material from this area was on hand in January, but several interesting collections were received during the year, notably a small series made by Mrs. E. Burne in British Somaliland, a set of over 300 specimens from the Anglo-Egyptian Sudan by Mr. N. Douglas Simpson, and Dr. T. F. Chipp's collection, the first from the Imatong Mountains, Southern Sudan. A collection made by Lady Maffey at Erkowit, Red Sea Hills, and one by Mr. R. A. Farquharson, the Director of Agriculture for British Somaliland, were also received and dealt with. A considerable proportion of these two collections consisted of grasses, which were augmented by a small but interesting set from Italian Somaliland, which was presented by Dr. Pampanini. Lists of determinations were sent in all cases.

Reference should be made also to the Anglo-Italian Somaliland Boundary Commission, to which Mr. C. L. Collenette is attached from Kew as a botanist. Three instalments from him have come to hand and these will be dealt with as a whole when the remainder have been received.

Research and Publications.—A paper entitled " The Imatong Mountains, Sudan," based on the collection referred to above, was published in *Kew Bull.* 1929, pp. 177-197.

EAST TROPICAL AFRICA.—Large supplies of material have continued to come to hand from Uganda, Kenya, Tanganyika, and this year interesting collections have been received from Northern Rhodesia.

From Uganda about 900 specimens from various collectors were forwarded by Mr. L. C. C. Liebenberg, the Government Botanist at Kampala, for determination or corroboration. Several valuable collections of grasses, especially from the mountains in the south-west corner of the Protectorate, amounting in all to over 600 numbers, were received from Mr. J. D. Snowden. These contained not only several new species but also a new genus.

Kenya material was received mainly from Mr. H. M. Gardner, Conservator of Forests, and other members of the Forestry Department, and smaller collections were sent by Mr. J. MacDonald, Mycologist and Botanist, and several of the Agricultural Officers. Several novelties have been found in these collections. A particularly useful donation was a collection of duplicate grasses with

several co-types, which was presented by Dr. R. E. Fries of Stockholm.

From Tanganyika the most interesting collections have again been received from Mr. A. E. Haarer, who sent 300 specimens from the Moshi and Kilimanjaro districts, in which were included a new genus of grasses, and from Mr. P. J. Greenway of the East African Agricultural Research Station, Amani, who forwarded 850 plants, mostly in connection with the Flora of Zanzibar, on which he is engaged. Two other collections of Kilimanjaro plants were also received. From Nyasaland, Dr. J. Burt Davy of the Imperial Forestry Institute, Oxford, presented a valuable collection which he had made on Mt. Milanje, an area which had not been worked for nearly 40 years. A useful series of Sorghums and rices was received from Mr. F. Barker of the Department of Agriculture.

The Northern Rhodesian accessions were of special interest as this territory has been little explored botanically. A collection was received from Dr. Burt Davy from the Livingstone, Lusaka and Fort Jameson areas, and another and larger donation principally from the Lusaka district, containing a large number of grasses, was presented by Mrs. Cecil Sandwith. An extremely interesting collection, which contained many novelties, was presented by Miss J. M. Marks, from the Mwinilunga district, which had not been previously explored botanically. The determination of all these collections has been put in hand, but it has not been possible to supply more than partial lists of the names to the collectors.

Material was again forwarded from Southern Rhodesia by Mr. F. Eyles and Mr. R. G. N. Young, whilst contributions from the Belgian Congo and Mauritius were received from Messrs. W. Robyns and R. E. Vaughan respectively.

Research and Publications.—The following papers dealing with East African Grasses were published in the *Kew Bulletin*, 1929: "Snowdenia, A New Genus from Uganda" (pp. 28-31); "A New Genus of Grasses" (*Holcolemma*, pp. 244-247); "A New Genus from Tanganyika Territory" (*Heterocarpha*, pp. 263-265).

SOUTH AFRICA.—The largest accession from South Africa has been Mr. J. Hutchinson's collection made during his tour in the Union in 1928 and 1929 (see *K.B.* 1929, pp. 273-285). Over 3200 numbers were collected and there are usually 4 or 5 sheets of each. Two sets have been presented to Herbaria in South Africa. This collection is being mounted and named as time permits. Other collections received from South Africa include a set of critical Transvaal plants from Professor C. E. Moss, a useful series from the Cape Province presented by Commander T. N. Salter, and a small but interesting collection from the Limpopo District collected and presented by General J. C. Smuts.

The Assistant for South Africa has been engaged in naming collections received from the National Herbarium, Pretoria, the Herbarium of the Albany Museum, Grahamstown, the Witwatersrand

University Herbarium, Johannesburg, and the MacGregor Museum Herbarium, Kimberley, in addition to a small number from the Herbarium of the Natal Botanic Gardens. In many cases duplicates were presented to Kew. The total number of specimens named in this connection was about 2000, including a parcel of 500 sheets of *Senecio* on loan from the Delessert Herbarium at Geneva.

As an outcome of representations by Dr. I. B. Pole Evans, Chief of the Division of Plant Industry at Pretoria, made largely as a result of Mr. Hutchinson's visit, it has been arranged to present to the National Herbarium at Pretoria duplicate material of types and authentic specimens now in the Kew Herbarium. This will prove of great assistance to the botanical institutions in South Africa, as it will enable them and other botanists to deal with their own taxonomic problems and name their plants with certainty without such constant recourse to the Kew Herbarium. With this in view the whole of the Kew collections are being systematically examined, and where possible duplicate material is being extracted and sent to Pretoria. Such a transference could only be made to a Government Department which is engaged in responsible systematic research, and where it is felt that it is in the interests of science as well as in the interests of the Empire that such specimens may be distributed.

Publications and Research.—In connection with specimens submitted from Pretoria the revision of certain genera has been necessary, namely *Nuxia*, *Olea*, and the section *Pseudopachyrrhizus* of *Dolichos*. Papers on these subjects have been prepared for publication by the Assistant for South Africa; that on *Nuxia* has already appeared (*K.B.* 1, 1930).

The receipt from Johannesburg of some apparently undescribed species of *Senecio* led to the investigation of about 25 South African species in the light of type material from the Delessert and Upsala Herbaria. The result has been to effect a revised grouping of the species concerned, and the separation of a number apparently hitherto undescribed. Work on the Section *Paucifolii* of the "Flora Capensis," as referred to last year, has been continued (*Kew Bull.* App. 1, 1929, p. 33).

The preparation of the Flora of the Fauresmith Division, O.F.S., was also continued at intervals. A paper on the revision of the South African species of Vitaceae has been prepared. "Notes on African Grasses": IX and XI, dealing with "Some Saline-loving Grasses occurring in South Africa" (pp. 83-87), and "A New Genus of Grasses from Bechuanaland" (*Megaloprotachne*, pp. 319-322), were published in the *Kew Bulletin*, 1929.

The following papers on South African botany were published by Mr. N. E. Brown:—"The Iridaceae of Burmann's *Florae Capensis Prodrum*": I and II (*K.B.* 1929, pp. 129 and 243), and "New Species of and Critical Notes on Mesembryanthemum and allied Genera" (*K.B.* 1929, p. 56).

AMERICA.

Routine.—The work of mounting and incorporating material from the Store has continued satisfactorily throughout the year. About 8500 sheets have been mounted, and 10,500 laid in. The American material in the Herbarium has been greatly enriched by the inclusion of collections made by Ducke and Ule in Brazil, and by Cooper in Panama, as these contain a number of valuable type specimens. Numerous duplicates of Trinidad species, previously unrepresented, have been presented by Mr. R. O. Williams. A set of 80 Peruvian grasses has been presented by Dr. A. S. Hitchcock.

The most important accession during the year was the extensive botanical collection formed by the botanists of the Oxford University Expedition to British Guiana, 1929, comprising over 1600 numbers of Phanerogams and Cryptogams, and nearly 3000 sheets of the former alone. A special feature of the collection is the number of duplicates of the less known and larger forest trees, many of which have not up to the present been identified with certainty, owing to lack of material and accurate data. A brief note on the Expedition is given on pp. 4 and 5.

Among the more important collections which have been named may be mentioned some 400 specimens of Costa Rican plants collected by Mr. C. H. Lankester, 400 of Mr. W. Fishlock's plants from Dominica, nearly 500 sheets of the Amazonian collection made by Ule, 100 of M. Robert's Matto Grosso plants, the collection made in Canada by Prof. R. Ruggles Gates and Mr. K. Mellanby, and most of the West Greenland plants collected by the Oxford University Expedition in 1928. The work of naming the Lehmann collection was continued, several of the monocotyledonous families being dealt with, and more than 350 duplicates prepared for distribution.

The work of writing up genera in the Herbarium according to the latest floras and monographs has been continued, the following being among the more important genera which have been dealt with: West Indian species of *Ternstroemia*, South American species of *Heliotropium*, *Gentiana* and *Halenia*, and the genus *Zauschneria*.

Over 900 sheets of partially named West Tropical South American Rubiaceae have been determined by Dr. P. C. Standley, who has based new species on a number of the specimens, thus greatly increasing the scientific value of the material. Several hundred sheets of American species of *Bidens*, which had been on loan to Dr. E. E. Sherff, have been critically named and returned by him.

The work of the American section has been carried on under great difficulties owing to shortage of staff, the time of the Assistant in charge having been almost wholly occupied for the first eight months with investigations and constructive work on Nomenclature in preparation for the International Botanical Congress to be held at Cambridge in August, 1930 (see p. 42), and for the remainder of the year by administrative duties. In effect, the entire scientific work

of the section, which includes three extremely diverse floras—those of North America, Tropical America, and Temperate South America—each requiring special knowledge and training, has been performed by a single botanist, while at the same time there has been a marked increase in the collections received for critical identification, especially from Trinidad and British Guiana. Hence only the more urgent collections could be dealt with.

Research and Publications.—The work of checking the typescript of the Flora of Trinidad and Tobago was continued, and some of the more interesting results obtained were incorporated in a paper entitled "Notes on Trinidad Plants" (*K.B.* 1929, p. 75). Numerous new species of Ferns from Tropical America and the West Indies were described by Prof. Domin from specimens in the Herbarium (*K.B.* 1929, p. 215). A history and full description of *Dahlia coronata* Hort. was drawn up, showing its relationship with *D. coccinea* Cav. (*K.B.* 1929, p. 52). The new combination *Sphaeralcea Creeana* Sprague and Sandwith was given to a plant which has recently been received from several gardens and which, it was found, was in cultivation in England nearly a century ago and had been described and figured as *Malva Creeana* Graham (*K.B.* 1929, p. 203). Various nomenclatural and bibliographical investigations on American genera and species were also carried out. These are mentioned in the section on Nomenclature.

AUSTRALIA AND NEW GUINEA.

Routine.—No large collections of unnamed material have been received, and the taxonomic work has consisted chiefly in dealing with special queries on critical species. Many valuable collections of named plants have been presented by Messrs. F. A. Rodway and J. M. Black and by the Directors of the National Herbaria at Sydney and Melbourne and the Governments of Tasmania, Queensland and Western Australia. Altogether about 1000 Australian plants were laid in during the year.

A fine series of photographs of Victorian and other Australian Orchids by Mr. T. Green of Melbourne has been presented by the Bentham Trustees.

Research and Publications.—Owing to the wide field covered by the Assistant in charge, it has not been found possible to carry out any research on Australian plants apart from that mentioned above. A paper "Lilaeopsis in Tasmania and New Zealand," by Dr. A. W. Hill, was published (*K.B.* 1929, p. 119). The large collection, by Brass, of Papuan Figs has been determined, and an enumeration of the specimens and descriptions of the new species appeared in the Journal of the Arnold Arboretum, vol. x. p. 142.

NEW ZEALAND.

Routine.—Many queries dealing with various difficult New Zealand genera continue to be received, and constitute the main portion of the work in this section. Extensive sets of specimens have been

presented by Drs. L. Cockayne and H. H. Allan, and by Mr. H. Carse, especially of the genera *Dracophyllum* and *Gaultheria*. In the latter genus the valuable series of natural hybrids are particularly interesting.

Research and Publications.—A detailed report on many species of the genus *Phalaris* was supplied to Dr. H. H. Allan, in connection with his work on *Phalaris tuberosa* and other species introduced into New Zealand. (See also under Australia.)

POLYNESIA.

Routine.—During the year the preliminary determination of the large collections made by Mr. W. Greenwood in Fiji has been completed, and work has been started on the valuable collection received from Dr. and Mrs. J. D. Tothill. With the assistance of a grant from the Empire Marketing Board, Mr. J. H. L. Waterhouse has been enabled to collect for Kew in the British Solomon Islands, and a valuable series of specimens has been received.

Research and Publications.—An account of the Leguminosae of Fiji is being drawn up in collaboration with Mr. Greenwood. A supplementary list of the grasses of Fiji, based on the collections of Dr. and Mrs. Tothill, is also in course of preparation.

FERNS.

The total number of specimens of ferns and fern allies laid into the Herbarium during the year was 3,468, which includes many arrears as well as most of the current collections. The Herbarium has been further enriched by a valuable donation of named duplicates from the late Dr. Eryl Smith collected by her in Siam, Malaya, the Dutch East Indies and French Indo-China.

The collections named during the year were as follows:—Bulgaria (coll. W. B. Turrill); Greenland (Oxford University Expedition, coll. C. G. Trapnell); Assam (coll. F. Kingdon Ward); Papua (coll. A. Wade); Hainan (coll. Eryl Smith); Sierra Leone (coll. F. C. Deighton); Liberia (coll. G. P. Cooper); Tanganyika Territory (coll. B. D. Burtt); and Siam (coll. H. B. G. Garrett).

The naming and laying in of the large collections made in Siam by Dr. A. F. G. Kerr and in the Lushai Hills by the Rev. W. J. L. Wenger have been continued, but are not yet quite completed.

Progress has been made with arranging the Herbarium collection according to C. Christensen's "Index Filicum." About two-thirds of the entire collection has now been written up and arranged according to the sequence of that system.

BRYOPHYTA.

On Mr. Wright's retirement the charge of the *Bryophyta* was handed over to Mr. C. V. B. Marquand, and a commencement was made by him of sorting the material in the Store as far as his other duties permitted. A small number of current collections was named.

ALGAE.

In the early part of the year interest was shown by several African botanists in the marine Algae of South Africa and especially in those of Natal. Two particularly fine collections were received for naming from the Museum of Pietermaritzburg, these being collected respectively at Ifafa in the Alexandra Division of Natal, and Richards Bay, Zululand. Freshly collected material has also been forwarded for identification by Miss H. Forbes, Government Botanist at Durban, who is making a special study of the marine Algae of that area. With a view to publishing a complete list of Natal seaweeds, a selection of specimens from the Natal Herbarium at Durban is being sent on loan to Kew, for revision. Lists of names of specimens from these three sources have been sent to the Institutions concerned and further instalments are to follow.

Several small collections of British Algae, both marine and freshwater, have been received for determination during the year. Amongst collections which have been incorporated that of Lewis Weston Dillwyn (the author of the celebrated work "British Confervae" published in 1809), presented to Kew by Mrs. Story Maskelyne in 1923, is the most important. This comprised some 170 specimens, all of which were examined before being laid in.

Miss Dickinson spent a week at Easter at the Marine Biological Station, Plymouth, facilities for study being afforded by Dr. C. E. Allen, Director of the Station. The neighbourhood was worked from Wembury Bay on the east to Cawsand Bay on the west. As a result of this visit a note appeared in the Journal of Botany on the occurrence of *Colpomenia sinuosa* in Britain.

Advantage was taken of Dr. Y. Yamada's visit in November and December to name certain critical Japanese Algae and to examine critically all the material of *Laurencia* in the Herbarium, a genus which is in great need of revision.

LICHENS.

Sincere thanks are again due to Mr. R. Paulson for the voluntary help he has continued to give in naming collections of lichens. Those determined by him this year include collections from the Royal Botanic Gardens, Peradeniya, Ceylon (coll. A. H. G. Alston); Greenland (Oxford University Expedition, coll. C. G. Trapnell); Kaio Tao, Siam (coll. A. F. G. Kerr); Uruguay (Prof. F. Felippone); N. E. Tibet (coll. G. Forrest); Singapore (coll. T. F. Chipp), and other minor gatherings.

FUNGI.

Routine. The usual large number of miscellaneous enquiries was received. The work of investigation falls roughly into three categories:—(1) the determination of specimens of fungi, both British and foreign; (2) the examination of diseased material, and advisory work; (3) the examination of type specimens and critical

comparisons for the assistance of research workers, both at home and abroad. Work in the third category takes up an increasing amount of time, and is extremely valuable in maintaining close relations between Kew and research workers both at home and in other parts of the world. During the current year such comparisons have been undertaken for mycologists in Australia, India, Egypt, and the United States, as well as for officers of the Advisory Service of the Ministry of Agriculture and Fisheries and for the Imperial Bureau of Mycology.

Among collections of fungi received and named during the year may be mentioned those from the Cameroons (T. D. Maitland), Nyasaland (E. J. Butler), South Africa (Department of Agriculture), Australia (J. B. Cleland), Trinidad (W. E. Broadway), and British Guiana (E. B. Martyn). In connection with work on the flora of British Guiana about 60 sheets of fungi from the herbarium at Georgetown were received on loan. These have been examined and the determinations checked or corrected.

Loan and exchange transactions were less heavy than in former years, but specimens have been sent to Herr Sydow for his work on Pyrenomycetes, and to various workers in the United States. From Herr Sydow about 30 specimens of fungi collected in Costa Rica were received in exchange for duplicate material sent from Kew.

Considerable time has been given to work on nomenclature and the preparation of a revised Code, which was undertaken by the Sub-Committee for Nomenclature appointed by the Imperial Botanical Conference in 1924 (see p. 42).

Research and Publications.—During the year two papers mentioned in the last report have been published, namely:—"Further notes on the connection between *Rhizoctonia Crocorum* and *Helicobasidium purpureum*," by W. Buddin and E. M. Wakefield (Trans. Brit. Myc. Soc. xiv, Mar. 1929, pp. 97-99), and "The fungus causing Leaf Rot of the Carnation," by W. Buddin and E. M. Wakefield (Trans. Brit. Myc. Soc. xiv, Oct. 1929, pp. 215-221).

For her Presidential Address to the British Mycological Society, Miss Wakefield prepared an account of the history of mycological work abroad, with special reference to work in the tropical possessions of the Empire. The address was entitled "Fungi Exotici: Past Work and Present Problems," and it will be published in the Transactions of the Society.

BIOLOGICAL AND GENETICAL HERBARIA.

Thanks mainly to the continued interest of members of the Kew staff, about 2,000 specimens have been added during the year to these collections. The space available in the small room next to the Visitors' room is being rapidly filled, and their future housing will have to be considered sooner than was anticipated. The collections are now in excellent order and are frequently consulted. Specimens illustrating phases of the life-history of any British species are welcomed.

SUMMARY.

The following table summarises the routine work, apart from naming, accomplished by the regular staff and by the special Store staff during 1929.

Mounted*	...	...	...	...	62,876
Incorporated*	...	...	...	...	78,811
Duplicates distributed	...	...	...	...	10,481
Specimens received on loan	...	...	...	...	9,283
Specimens sent out on loan	...	...	...	...	5,829
Specimens presented or purchased (approx.)	...	...	...	...	62,000

COLLECTION OF DRAWINGS AND PHOTOGRAPHS.

The artist has been engaged in preparing plates for the *Icones Plantarum*, photographing herbarium sheets and various living plants and groups of plants in the Gardens. The number of type-specimen sheets photographed was not so great as last year, being about 700; half of these were Kew types of which photographs were sent to other institutions and the other half were types borrowed from abroad, of which it was considered desirable to have photographs in the Kew collection.

Among the additions to the collection acquired this year was a very fine series of 900 stereoscopic negatives of Australian orchids presented by the Bentham Trustees. Prints of these will be made and added to the collection of photographs.

Over 500 other photographs and drawings were presented, among which were the following:—

A collection of coloured photographs from the Director of Migration and Settlement, Australia House; 75 paintings of Travancore and other plants by the late Mrs. A. F. Broun, presented by Mr. A. F. Broun; 74 original drawings for the *Botanical Magazine* from the Royal Horticultural Society. Sixty paintings of British plants by the late Mrs. Mary Jane Firmin were presented by Miss F. M. Lillie of Bournemouth, and 108 paintings of plants by the late Mrs. Ellis Rowan, made during her visits to New Guinea, were presented by Mr. W. H. Flavelle, formerly of Sydney, and now of St. Helier, Jersey. The work of Mrs. Firmin, who was the wife of the late Rev. John Firmin, at one time Rector of Eaton, near Congleton, Cheshire, is very good. The paintings were executed between 1858 and 1863, mostly from specimens collected in Cheshire and Worcestershire, and are named, apparently correctly. Mrs. Rowan's paintings are most beautiful works of art. They are on thin cardboard eleven inches square and each floral study is in a circle about nine inches in diameter. Analyses of the flowers are not given, identification has not been attempted by the artist, and unfortunately no precise information as to localities is supplied. Mr. Flavelle states that Mrs. Rowan made two journeys to New Guinea on his behalf, each of seven

*These figures do not include the lower cryptogams.

months' duration, for the purpose of painting birds for him. On one of the journeys she lived practically all the time in Port Moresby hospital, going in and out with fever and painting in the intervals. On the other journey she stayed on a big plantation in New Britain, and also on the Bismarck Range in what was formerly German New Guinea. Many studies of flowers and birds made by Mrs. Rowan have been purchased by the Commonwealth Government of Australia. The drawings appear to be botanically accurate. Her work as shown by the paintings presented by Mr. Flavelle is most pleasing and certainly of considerable merit. It should not be difficult in due course to name the plants with a considerable degree of accuracy.

To the general collection of portraits has been added a good photograph of Mr. C. H. Wright, presented by himself. A set of 100 hand-coloured lantern slides of fungi was purchased from Col. C. T. Green.

To facilitate the photographing of herbarium specimens a room for this purpose has been allocated in the basement of the Herbarium. The room is fitted with a stand and vertical camera, and is lighted with special electric fittings so that specimens may now be photographed with uniform lighting.

NOMENCLATURE AND BIBLIOGRAPHY.

The constructive work on nomenclature which has been in progress for the past few years culminated in the preparation of a series of proposals* to be submitted to the International Botanical Congress at Cambridge in August, 1930. The most important of these proposals is one for the revision of the International Rules of Nomenclature, put forward by the Sub-Committee on Nomenclature appointed by the Imperial Botanical Conference (London, 1924), which is composed of two botanists from the British Museum (Messrs. Ramsbottom and Wilmott), and two from Kew (Dr. Sprague and Miss Wakefield). The principal changes proposed are as follows:—

- (1) That the type-method should be explicitly recognised.
- (2) That a Latin diagnosis should no longer be made compulsory for names of new groups.
- (3) That *Tautonyms* ("duplicating binominals") should not be rejected as such. It has been found that their rejection has resulted in endless disputes as to the correct specific epithets of some of the species concerned.
- (4) That all *later homonyms* should be rejected, except where the earlier homonym was a *nomen nudum*.
- (5) An attempt has been made to remove various sources of ambiguity from the Rules. This necessitated a considerable amount of re-wording, and finally led to the re-drafting of

*International Botanical Congress, Cambridge (England), 1930: Nomenclature Proposals by British Botanists, London, 1929.

the Rules as a whole. It is suggested that their title should be altered to "International Code of Botanical Nomenclature."

- (6) In order to facilitate consultation, certain changes have been made in the sequence of some of the articles, and some that dealt with more than one subject have been divided into two or more separate articles.
- (7) The establishment of a permanent International Advisory Committee on Nomenclature is advocated, its functions being as follows:—1. Interpreting the Code in doubtful cases; 2. Considering additional *Nomina conservanda*; 3. Considering all proposals for the modification of the Code; 4. Reporting on the effects of modifications of the Code accepted at the preceding Congress.

The other proposals which appeared under the same cover as the suggested "International Code" are put forward by individual botanists, including three members of the Kew Staff. They are as follows:—

- II. List of 90 additional generic names proposed for conservation (by T. A. Sprague). Among them are such well-known names as *Epidendrum*, *Ixia*, *Combretum*, *Nemophila*, *Gardenia*, *Celmisia*, *Olearia*.
- III. List of proposed standard-species for conserved generic names (by M. L. Green).
- IV. That the application of Linnean generic names should be determined by means of specified standard-species (by A. S. Hitchcock and M. L. Green).
- V. That a Sub-Committee be appointed to prepare a list of conserved generic names for the Fungi; and that in Fungi with a pleomorphic life-cycle whose perfect state is not known, the author who unites the various imperfect states should have the right of choosing the name to be used (by E. M. Wakefield).
- VI. That names proposed by non-binarist authors should be rejected (by A. J. Wilmott).
- VII. That no generic name which has fallen into complete disuse for a period of not less than fifty years shall be re-established if there is another legitimate name in use for the genus concerned (by I. H. Burkill).

The Assistant in charge of the Index Kewensis has been engaged in the preparation of a new edition of the 'Handlist of Tender Dicotyledons cultivated in the Royal Botanic Gardens, Kew,' about half of the work having been completed. This has involved the examination and identification of many of the plants cultivated in the Gardens, in addition to extensive nomenclatural research.

The scientific names adopted in the "List of Trade Names for Empire Timbers" have also been checked, and replies have been sent to numerous enquiries on nomenclature received from all parts of the world.

Among the bibliographical investigations carried out was an enquiry into the respective dates of publication of Bergius' *Descriptiones Plantarum* and Linné's *Mantissa Prima*, which is a matter of some importance for South African botanists. It was established that the work of Bergius appeared first.

The following papers dealing with nomenclature and bibliography were prepared at Kew and published during 1929:—

Gardenia or Warneria (*K.B.* 1929, p. 12).

The Correct Spelling of certain Generic Names: IV, V. (*K.B.* 1929, pp. 38, 241).

Lagoseris Marsch.-Bieb. and Lagoseris Hoffm. & Link (*K.B.* 1929, p. 54).

The Botanical Name of the Sugar Maple (*K.B.* 1929, p. 81).

Engelmannia and Angelandra (*K.B.* 1929, p. 82).

Bergius, *Descriptiones Plantarum*, and Linné, *Mantissa Prima* (*K.B.* 1929, p. 88).

Crantziola versus Lilaeopsis (*K.B.* 1929, p. 92).

Triana's Flora Neo-Granadina (*K.B.* 1929, p. 94).

Name changes in Gomphostigma (*K.B.* 1929, p. 143).

Conservation of the name Gardenia (*K.B.* 1929, p. 143).

The Botanical Name of Shrub Yellow-Root (*K.B.* 1929, p. 235).

INDEX KEWENSIS.

The first half of 1929 was spent almost entirely in seeing Supplement VII of the Index through the Press. This contains the new names published during the quinquennium 1921-25, as well as some which had been omitted from previous Supplements. It was published in September last, about three years after the publication of Supplement VI. Owing to the war, that Supplement, which concerned the period 1916-20, did not appear until 1926, so that the delay in the preparation of the Supplements has now been reduced by nearly two years. A review of Supplement VII appeared in *Kew Bull.* 1929, p. 323, and included an account of the various improvements introduced from time to time, the latest being the provision of a separate list of new genera under their respective families arranged alphabetically.

The compilation of Supplement VIII is well in hand, and the card catalogue now contains about 6,000 entries.

EXPERIMENTAL WORK.

Work in the experimental grounds at Kew and Potterne has been continued on the genera *Silene*, *Centaurea*, *Saxifraga*, *Ranunculus*, *Anthyllis*, and *Primula*. The immediate work in hand on the last genus should be completed in 1930 and it is proposed to replace it by experiments designed to study the flower morphology and biology of *Scilla non-scripta*. The interspecific tetraploid *Saxifraga potternensis* bred true in the F_3 generation and studies in its cytology have been completed. The most important

work published consists of two papers on the inheritance of colour and sex in *Ranunculus* (*Journ. Genetics* xxi. p. 169). Five "sex" forms have been discovered and classified in the genus, and cytological research enabled the morphological features to be linked with a "time factor," involving the interval between the reduction divisions in the anther and ovule respectively. Three papers on *Silene* have appeared in the *Kew Bulletin* during 1929 and a fourth is being prepared for publication. The work on *Geum* has been completed and will shortly be ready for press. An extension, with modifications, of the time-factor theory to *Saxifraga*, *Silene*, *Centaurea* and other genera has been successful. The interest and importance of the experimental work now being carried out can scarcely be over-estimated, and its effects on taxonomic work are likely to be very great.

TRANSPLANT EXPERIMENTS.

The transplant experiments initiated in 1927 by the British Ecological Society are being carried out at Potterne, near Devizes, Wilts, in the grounds of our Hon. Associate, Mr. E. M. Marsden-Jones, with assistance from Kew. Five species of British plants are being grown in five different soils at Potterne and also in ordinary garden soil at Kew. Every species is represented by 25 plants of known origin and similar genetical constitution in every one of the soils. Four large enclosures, 35 feet long, 10 feet broad and 3 feet deep, were erected to contain the imported soils: sand, calcareous sand, clay, and calcareous clay. The species already transplanted are: *Centaurea nemoralis* Jord., *Silene vulgaris* Garcke, *S. maritima* L., *Anthyllis vulneraria* L., and *Plantago major* L. Material of *Fragaria vesca* L. is being prepared for use as the sixth species. Soil analyses have kindly been made by Mr. C. G. T. Morison, M.A., of the School of Rural Economy, Oxford. Meteorological records have been kept since April.

A full report of the results obtained up-to-date has been prepared by Mr. E. M. Marsden-Jones and Dr. W. B. Turrill, and has been presented to the Transplant Committee and accepted for publication in the *Journal of Ecology* for August, 1930. The results of periodic records for the five species transplanted for the 5 to 18 months the plants have been in the beds are embodied in the report. The chief facts emerging to date are:—

The most obvious changes are taking place in *Silene vulgaris*, *S. maritima*, and *Plantago major*.

Centaurea nemoralis has shown little change but the general tone is better on the clays than on the sands, though flowering commenced first on the latter. The mean number of stems per plant was higher on the clays than on the sands. The main seedling germination was in the spring.

In *Anthyllis vulneraria* morphological changes of a qualitative nature have not occurred but interesting facts regarding selection

are apparent from the data obtained. The species is known to be calcicolous and this is in agreement with the high death rate on the sand and on Potterne soil. It is, however, certain that absence of lime is not the sole factor involved. The death-rate at Kew, following frosts, was very much higher than on the clay (or other soils) at Potterne, though the CaCO_3 content is lower in the clay than in the Kew soil. Attack by wilt-causing fungi (*Verticillium*) blocking the vascular bundles of the root is often an immediate cause of death. Secondary flowering, stem heights and heads per stem, and seed germination showed the same sequence as that of tone and deaths. Edaphic factors are obviously important in causing the known natural limitation of this species and should be considered when it is proposed to cultivate *Anthyllis* as a forage plant. The Transplant results suggest that on suitable land it would be a valuable and relatively persistent crop.

Plantago major has proved, even within five months, exceedingly plastic. The original plant was a dwarf form and this habit has been very nearly retained on the sand and to a less degree on the calcareous sand. The measurements and figures given show the marked deviation in luxuriant growth which has occurred on the clay and amongst the Potterne reserves, and somewhat less on the chalky clay. Further developments in this species will be watched with interest.

Silene vulgaris on the calcareous sand is developing a marked "strict" habit similar to that which has been many times observed in individuals among wild populations. It is just possible that this change may prove to have a genetical basis. On the calcareous sand the foliage developed a lighter green colour, on the clay a more yellowish-green colour, and on the chalky clay a more blue-green colour than in the parent. Secondary growth occurred especially on the sand. General tone was best on the clay and worst on the calcareous sand. In pure *S. vulgaris* germination was restricted to the spring on all the soils and was best on the clay and worst on the calcareous sand and chalky clay.

In *S. maritima*, at the last record of 1929, there was a marked though irregular tendency for the plants on the sand to change to plants with smaller leaves and with more anthocyanin and a flatter habit than in the parent. On the calcareous sands the leaves were narrower and smaller, the plants were flattened, and the calyces had much more red anthocyanin than in the parent. On both clays there was little change from the parent. General tone at the last record was best on the chalky clay and worst on the clay (these records were made before the September drought). Seeds of *S. maritima* have marked autumn and spring discontinuous germination on all the soils. Spring seedlings were most numerous on the clay and least numerous on the calcareous sand. Autumn seedlings were most numerous on the chalky clay and least numerous on the clay. Autumn seedlings survived the 1928-29 winter only on the chalky clay (and at Kew).

To sum up: *Centaurea nemoralis* does not at present appear to be plastic, but is capable of survival under a wide range of edaphic conditions. *Silene vulgaris* is slowly plastic under certain edaphic conditions. *S. maritima* is decidedly more plastic than its congener. *Anthyllis vulneraria* is not plastic and is not capable of survival under a wide range of edaphic conditions. *Plantago major* is exceedingly plastic.

It is obvious that the experiments, if they are to yield a maximum of conclusive facts, will have to be continued for a long period of years. It is important to remember that the formation of soils from raw materials can be slowly followed in the beds. It is hoped that periodic analyses, for which arrangements have been made, will yield useful pedological data.

In *Centaurea nemoralis*, *Silene vulgaris*, *S. maritima*, and *Anthyllis vulneraria* extensive genetical research is being continued at Potterne and Kew, and this involves the use of lines from which the transplant materials originated. All experimental work is being correlated with field, laboratory, and herbarium studies.

Apart from actual changes in the plants and from stages in soil-making, many interesting biological facts are being observed and some are embodied in this report. The plants are grown in the absence of competition, and mass or individual differences must, on the whole, be due to edaphic factors. It is, however, necessary to emphasize that plants have an individuality, that the history of a given individual is never exactly like that of any other individual, that "accidents" happen to individuals, and that, therefore, records have usually to be of a statistical nature with the limitations of this method.

VISITORS.

Fewer visitors worked in the Herbarium during 1929 than in 1928, owing probably to the fact that many foreign and colonial botanists postponed their visits in view of the holding of the International Botanical Congress at Cambridge in 1930. 5,296 signatures appear in the visitors' book; the names of the most notable or the most frequent of these, with an outline of their sphere of work, are given below.

Dr. O. Stapf and his staff engaged on the work of the Botanical Magazine and Index Londinensis (see *K.B.* 1929, p. 305) were, as in previous years, accommodated in the top floor of the library. Mr. W. J. Bean, after his retirement, has been a regular visitor, being occupied in the preparation of a Supplement to his "Trees and Shrubs Hardy in the British Isles."

Representatives from the staffs of various botanical institutions consulted the Herbarium and Library, particularly botanists from the British Museum (Natural History), the Imperial Forestry Institute (Oxford), and the John Innes Horticultural Institution.

Home workers engaged on various aspects of British or European botany included Messrs. H. Gilbert-Carter, J. Fraser, A. B.

Jackson, E. M. Marsden-Jones, C. Norman, H. W. Pugsley, and the late C. E. Salmon, whilst Dr. Giuseppi made several calls in connection with plants collected by him in the Balkan Peninsula. Miss I. Manton (Cambridge University) continued her work on the cytology of the *Cruciferae*, and Miss D. Milner Brown (Liverpool University) spent some six weeks at the herbarium and library during the summer studying the floral development of the *Rhizophoraceae* and *Myrtaceae*. Mrs. Clement Reid and Miss M. E. J. Chandler visited the Herbarium in the summer, continuing their investigations on the fruits and seeds from the Eocene beds on the Isle of Sheppey.

Among home workers in various fields of Cryptogamic botany were the late Dr. Eryl Smith, who paid many visits in connection with the determination of the ferns sent by Dr. A. F. G. Kerr from Siam, Mr. A. A. Bullock, who worked for two weeks as a volunteer on the same group, Mr. H. N. Dixon (mosses), Mr. R. Paulson (lichens, see p. 39), and Mr. W. B. Grove, who paid a short visit in order to study mycological literature.

Continental visitors included Dr. Johannes Lid (Botanical Museum, Oslo), who came to identify plants collected by him during his Spitzbergen expeditions, and Mrs. Hanna Czechtz (Cracow), who continued work on her Anatolian plants.

Of home workers engaged in research on Asiatic botany, Mr. H. N. Ridley, as a regular visitor, was concerned principally with the flora of British North Borneo, and Mr. I. H. Burkill and Dr. D. Hooper continued their work on the Dictionary of Economic Products of the Malay Peninsula. After three years' study, almost all of which was carried out at Kew, Dr. Hooper published his work "On Chinese Medicine: Drugs of Chinese pharmacies in Malaya" (Singapore, 1929), and he has commenced a similar study on Persian drugs in co-operation with Dr. J. M. Cowan. Prof. W. G. Craib, who was at Kew for over a month during the summer vacation, continued his studies on the Flora of Siam, being concerned chiefly with the families *Myrtaceae* to *Cucurbitaceae*. Thanks are again due to Prof. Craib for naming the supplies of plants sent regularly by Dr. A. F. G. Kerr from Siam. Mr. F. Kingdon Ward paid frequent visits to the Herbarium before his departure to Burma and French Indo-China in February and again after his return in October. Mr. W. R. Price visited Kew repeatedly in connection with his work on the Flora of Formosa.

Of other workers on Asiatic botany mention should be made of Dr. Yukio Yamada (Imperial University, Tokyo), who paid many visits in November and December in connection with his revision of the genus *Laurencia* and a critical examination of types of Japanese Algae. Mr. A. H. G. Alston, late Systematic Botanist to the Department of Agriculture in Ceylon, was also a frequent visitor, and Dr. A. F. G. Kerr, Government Botanist, Siam, spent several months of his leave at Kew working on his collections. Dr. Israel Reichert (Plant Pathologist to the Zionist Agricultural

Experimental Station, Tel-Aviv) visited the Herbarium almost daily during the last six weeks of the year in connection with his study of the fungi and lichens of Palestine.

Of African visitors Professor C. E. Moss (University of Witwatersrand, Johannesburg) prolonged his Christmas visit till the middle of June, being engaged in studies on the *Thymelaeaceae*, and on the *Hydrocharitaceae* and other aquatic plants of South Africa. Mr. and Mrs. R. G. N. Young (also of the Witwatersrand University) spent several weeks at Kew in the summer determining plants collected by them in Southern Rhodesia, and Mr. B. D. Burt, of the Game Preservation Department, was at Kew during January continuing the identification of his Tanganyika plants. Mr. T. Lloyd Williams (Government Botanist at Aburi, Gold Coast) spent some five or six weeks in the summer naming his collections, and Mr. H. G. Fourcade (late of the South African Department of Forests) was a frequent visitor in the autumn, studying the flora of the George and Knysna district. From November to the end of the year Mr. N. Douglas Simpson, of the Egyptian Public Works Department, was a regular visitor, naming his collections made in the Sudan.

General J. C. Smuts visited the Herbarium on two occasions in connection with Mr. Hutchinson's work on the African flora. The following botanists and agricultural or forestry officers, all of whom were engaged in working out their own collections during their leave, also paid short visits:—Major Guy Aylmer (Sudan), Messrs. F. C. Deighton (Sierra Leone), N. S. Haig (Uganda), A. Glendon Hill (Nigeria), F. R. Irvine (Achimota College, Accra), and H. V. Lely (Nigeria). Miss E. R. Napier spent three months at Kew before taking up her position in charge of the botanical collections at the Coryndon Memorial Museum, Nairobi.

Of home workers engaged on African botany mention should be made of Mr. S. Garside (Bedford College), Mrs. Cecil Sandwith, who spent over a week at Kew naming her collection of Rhodesian grasses, and Mr. N. E. Brown, who was a regular visitor, working chiefly on the genus *Mesembryanthemum* and on the *Iridaceae*.

American visitors were somewhat fewer than usual. Prof. M. E. Peck (Willamette University, Salem, Oregon) worked at Kew during May on the Flora of Oregon, and Miss S. G. Stokes, of San Diego, was at the same time revising the American species of the genus *Eriogonum*. Dr. A. S. Hitchcock (Department of Agriculture, Washington) was at Kew for about two weeks before leaving for South Africa, being interested chiefly in grasses and matters relating to nomenclature. Dr. J. M. Macfarlane (late of the University of Pennsylvania, Philadelphia) spent about a month in the Herbarium in late summer working at comparative morphology, and Dr. H. H. Rusby, who came to England to receive the Hanbury medal of the Pharmaceutical Society, spent several days working in the Herbarium. Dr. Ivan M. Johnston and Dr. Lyman B. Smith (both of the Gray Herbarium, Harvard University) were at Kew

during parts of August and September working at *Boragineae* and *Bromeliaceae* respectively, the former returning to Kew again in October after his visit to the Continent. Mrs. E. E. Clayton, of Cornell University, New York State, worked in the Library during November and December studying works on garden design. Two Canadian mycologists were regular visitors during 1929, namely Professor A. H. R. Buller (University of Manitoba, Winnipeg), who paid his usual visit in the summer vacation, and Dr. Bisby (Manitoba Agricultural College), who was at Kew during the early months of the year and again in the autumn studying chiefly Indian fungi on behalf of the Imperial Bureau of Mycology.

Mr. J. Calvert, of Queen's College, Belfast, was at Kew during November and December studying the Australian flora before taking up his duties as Assistant Botanist for Weeds Research under the Commonwealth Council for Scientific and Industrial Research, and Mr. H. F. Comber spent a few days in the Herbarium studying the flora of Tasmania before proceeding to that island on a collecting expedition, organised by well-known British Horticulturists.

Special thanks are again due to Miss Muriel M. Whiting for the voluntary assistance rendered by her throughout a large part of the year in connection with the arrangement of the Malayan collections.

ADDITIONS TO HERBARIUM.

The total number of specimens received during 1929 was about 62,000, of which 4852 were purchased. The chief sources from which they were obtained are given below. In addition to the usual specimens purchased and presented a large number were collected on the various journeys referred to on pp. 2-6. These are shown under the heading *Collected*.

EUROPE.—*Presented*: Great Britain, by Messrs. C. E. Hubbard, E. Drabble, J. E. Little, E. M. Marsden-Jones, F. Ballard, V. S. Summerhayes, E. Milne-Redhead, James W. White, C. W. Rudd, C. E. Salmon, Patrick M. Hall, F. Druce, R. H. Jeffers, E. Thurston, the Watson Exchange Club (per Mr. E. C. Wallace), Mr. C. H. Wright (Mosses), Dr. A. W. Hill, Dr. W. B. Turrill, Dr. C. G. Druce, Dr. Beatrice Lovibond (Herbarium of the late Rev. Leicester Darwall), Mrs. R. F. Burrow, Rev. H. J. Riddelsdell, Col. H. H. Johnston, the Welsh Plant Breeding Station, Aberystwyth University College (per Prof. R. G. Stapledon), and the Royal Horticultural Society (per Dr. O. Stapf); Sweden, by Dr. A. W. Hill; Tyrol, by Mr. J. W. Wyatt; Italy, by Prof. R. Pampanini; Bulgaria, by the Department of Botany, University of Sofia (per Prof. N. Stoyanoff); Roumania, *Flora Romaniaae Exsiccata*, Cent. viii, ix, by A. Borza (per Museum Botanicum Universitatis, Cluj); Thrace, by Mr. H. Griffith Tedd; Caucasus, by U.S.S.R. Society for cultural relations with foreign

countries (coll. E. A. Bush), Baku University, *Plantae orientales exsiccatae* (1928), Cent. iii, iv, by A. A. Grossheim and B. Schischkin (per Prof. A. A. Grossheim); Jugoslavia and Thessaly, by Dr. R. Giuseppi; Czechoslovakia, *Flora Exsiccata Reipublicae Bohemicae Slovenicae*, Cent. iv and v with Schedae, by Prof. D. J. Podpera.

Purchased: Mr. R. Findlay, British plants; Mr. F. P. Knight, British plants; Mr. T. O. Weigel, Spanish plants (coll. Sennan); Fr. Verdoorn, *Bryophyta Arduennae Exsiccata* Nos. 31-50.

ORIENT.—*Presented*: Palestine, by the Department of Agriculture, Palestine, and Col. R. Meinertzhagen; Iraq, by the Rev. F. A. Rogers; Persia, by Mr. B. Gilliat-Smith, the Botanical Museum, Lund (duplicates from Sintenis Herbarium Orientale, per Dr. T. C. E. Fries), and Capt. B. Stuart Horner; Cyprus, by the Agricultural Department (coll. C. B. Ussher).

Collected: Persia, Dr. J. M. Cowan and Dr. C. D. Darlington.

NORTH ASIA.—*Presented*: Central Asia, by the Botanical Institute of the University of Central Asia, Tashkent (Herbarium *Florae Asiae Mediae*, fasc. xiv-xx, per Dr. S. Vedenky).

CHINA AND JAPAN.—*Presented*: by the late Dr. Eryl Smith, Mr. D. Macgregor (coll. R. E. Chang), Nanking University (per Mr. C. Y. Chiao), the National Central University, Nanking (per Mr. Chao-chien Chang), the University of Amoy (per Mr. H. H. Chung), Dr. H. Handel-Mazzetti, Dr. C. Christensen (coll. E. E. Maire), the University of California, Berkeley (per Dean E. D. Merrill).

Purchased: Nanking University, Chinese plants.

INDIA AND CEYLON.—*Presented*: Assam, by Capt. F. Kingdon Ward, and Mrs. A. D. Parry; Burma, by Mr. D. Rhind, and Mr. C. E. Parkinson; Lushai Hills, by the Rev. W. J. L. Wenger; Ceylon, by Dr. J. Burt Davy (coll. Mr. F. W. de Silva), and the Department of Agriculture, Peradeniya (coll. Mr. A. H. G. Alston); various, by Mr. R. N. Parker, Mr. R. D. Anstead, Mr. M. Alam, Dr. F. H. Gravely, Dr. W. Youngman, Mr. D. N. Mahta, and Mr. W. Burns.

MALAY PENINSULA.—*Presented*: Various, by the Director, Botanic Gardens Department, Straits Settlements.

INDO-CHINA.—*Presented*: Siam, by the late Dr. Eryl Smith, Mr. H. N. Dixon (Mosses, coll. Dr. A. F. G. Kerr), Dr. A. F. G. Kerr (coll. Dr. A. F. G. Kerr, Nai Noe Rabil, Noi Put), Mr. H. B. G. Garrett.

Purchased: coll. Chaplain and Mrs. J. Clemens.

MALAY ISLANDS.—*Presented* : North Borneo (coll. D. D. Wood), by University of California, Berkeley (per Dean E. D. Merrill); Philippine Islands, by University of California, Berkeley (Pteridophyta Philippinensis Exsiccata, Cent. ii, per Prof. E. B. Copeland); various, by the Director, Botanic Garden, Buitenzorg; New Guinea, by Arnold Arboretum (coll. L. J. Brass).

POLYNESIA.—*Presented* : Fiji, by Mr. W. Greenwood, Dr. and Mrs. J. D. Tothill; Rarotonga, by Mr. Gerrit P. Wilder; Easter Island, by Messrs. Balfour, Williamson & Co., Ltd. (per Prof. R. G. Stapledon); Hawaii, by Dr. Earl E. Sherff.

Collected : Solomon Islands, by Mr. J. H. L. Waterhouse.

AUSTRALIA.—*Presented* : New South Wales, by Dr. F. A. Rodway, Mr. J. N. Whittet, and the Director, Botanic Gardens, Sydney; Queensland, by Mr. C. T. White, Government Botanist; South Australia, by Mr. J. M. Black, and Mr. E. W. Pritchard; Victoria, by the Director, National Herbarium, South Yarra, and Mr. C. French; Western Australia, by Mr. C. A. Gardner, Government Botanist.

Purchased : Tasmania (per Tasmanian Museum and Art Gallery, Hobart).

NEW ZEALAND.—*Presented* : by Dr. L. Cockayne, Dr. H. H. Allan, Mr. H. Carse, and Mr. W. R. B. Oliver.

WEST TROPICAL AFRICA.—*Presented* : Nigeria, by Capt. A. S. Thornehill, Mr. H. V. Lely, Mr. A. Glendon Hill, and the Agricultural Department, Ibadan (coll. Mr. A. F. Findlay and Mr. H. G. Poynter); Sierra Leone, by the Lands and Forests Department (coll. Messrs. F. C. Deighton and H. H. Glanville); Liberia (coll. Mr. G. Procter Cooper), by Yale University School of Forestry, per Prof. S. J. Record; Gambia, by the Department of Agriculture; Gold Coast, by Mr. F. R. Irvine, Dr. J. Burt Davy, and the Forestry Department (coll. Mr. C. Vigne); Belgian Congo, by Prof. E. De Wildeman, Dr. A. B. Rendle, and Dr. W. Robyns.

NORTH-EAST TROPICAL AFRICA.—*Presented* : Sudan, by Lady Maffey, Mrs. Rugman, Mr. N. Douglas Simpson, Dr. Olaf Hagerup; Somaliland, by Mrs. E. Burne; Abyssinia, by Mr. R. A. Farquharson.

Collected : Sudan, by Major T. F. Chipp; Somaliland, by Mr. C. N. Colletette.

EAST TROPICAL AFRICA.—*Presented* : Uganda, by the Department of Agriculture (coll. Mr. L. C. C. Liebenberg), and Mr. J. D. Snowden; Tanganyika Territory, by the Department of Agriculture (coll. Mr. A. E. Haarer), Miss Eva Stuart-Watt, and the East African Agricultural Research Station, Amani (coll. Mr. P. J. Greenway and others);

Kenya, by the Agricultural Department (coll. Mr. H. J. Taylor and Mr. J. McDonald), Dr. R. E. Fries, and the Forestry Department (coll. Mr. H. M. Gardner); Nyasaland Protectorate, by Mr. Frank Barker; Rhodesia, by the Department of Agriculture (coll. Mr. F. Eyles), Mr. R. G. N. Young, Miss Joyce M. Marks, and Mrs. C. Sandwith.

Collected : Tanganyika Territory, by Mr. A. D. Cotton.

MASCARENE ISLANDS.—*Presented* : Mauritius, by Mr. R. E. Vaughan; Madagascar, by Mr. J. Groves (coll. Mr. T. B. Blow).

SOUTH AFRICA.—*Presented* : Cape Province, by Mr. A. H. Maude, Prof. C. E. Moss, and the Division of Plant Industry, Pretoria; various, by Commander T. M. Salter, R.N., Dr. J. Burt Davy, Mr. N. E. Brown, the Albany Museum, Grahamstown, and Dr. A. U. Däniker (coll. Schlechter).

Purchased : Mr. E. G. Bryant, miscellaneous African specimens.

Collected : various, by Mr. J. Hutchinson.

NORTH AMERICA.—*Presented* : Canada, by Dr. E. H. Moss; United States, by U.S. Department of Agriculture, Dr. A. S. Hitchcock (North American grasses, Cent. x.), U.S. National Museum (per Dr. W. R. Maxon), Pomona College, Claremont, California (per Dr. Philip A. Munz), Mr. F. Rilstone (mainly Ex Herb. F. K. S. Beatty); various, by the Field Museum of Natural History, Chicago.

CENTRAL AMERICA.—*Presented* : Yucatan, by the Field Museum of Natural History, Chicago (coll. Gaumer), Dr. J. Burt Davy (coll. Gaumer), and Dr. Woronoff.

Purchased : Mr. W. A. Schipp, British Honduras plants.

WEST INDIES.—*Presented* : Trinidad, by the Department of Agriculture (coll. Mr. R. O. Williams).

Purchased : Mr. W. E. Broadway, British West Indies plants.

EAST TROPICAL SOUTH AMERICA.—*Presented* : Brazil, by Dr. A. Ducke, Director of the Botanic Garden, Rio de Janeiro, Dr. H. A. Gleason, and Dr. G. Samuelsson; British Guiana, by the Department of Agriculture (coll. Mr. E. B. Martyn).

Collected : British Guiana, by Mr. N. Y. Sandwith.

WEST TROPICAL SOUTH AMERICA.—*Presented* : Venezuela, by Dr. H. Pittier; various, by the U.S. Department of Agriculture (per Dr. A. S. Hitchcock), and Major R. H. Thomas.

Purchased : Dr. José Steinbach, Bolivian Plants.

TEMPERATE SOUTH AMERICA.—*Presented* : Patagonia, by Mr. A. H. Hunter; various, by the Gray Herbarium, Harvard University.

Purchased: Prof. Gilberto Montero, Chilian plants; Señor S. Venturi, N. Argentine plants; Dr. Donat, Patagonian plants.

DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed:—

Great Britain and Irish Free State.—Aberdeen, Cruickshank Botanic Garden; Cambridge University, Botany School; Dublin, Trinity College, Botany Department; Edinburgh, Royal Botanic Garden; London, British Museum (Natural History); Oxford, Imperial Forestry Institute.

Europe.—Berlin, Botanic Gardens and Museums; Brno, Masaryk University; Brussels, Botanic Gardens; Copenhagen, University Botanic Museum; Geneva, Delessert Herbarium; Leningrad, Principal Botanic Garden; Paris, École des Hautes Études; Riga, Latvian Plant Disease Research Institution; Sofia, University, Department of Botany; Stockholm, Riksmuseet.

Africa.—Amani, East African Agricultural Research Station; Cape Town, South African Museum, Bolus Herbarium; Khartoum, Department of Agriculture and Forests; Pretoria, Division of Plant Industry.

Asia.—Amoy, University; Baku, University; Nanking, National Central University; Singapore, Botanic Gardens; Tokyo, University.

Australia and New Zealand.—Brisbane, Queensland Herbarium; Canberra, Federal Capital Commission; Palmerston North, Department of Agriculture.

America.—University of California, Berkeley; Chicago, Field Museum; Harvard University, Gray Herbarium; New York, Botanical Garden; Washington, D.C., U.S. National Museum.

The Library.

The following remarks refer to the more important additions received as presentations during the year.

Books presented by the Bentham Trustees:—J. A. Schultes, *Grundriss einer Geschichte und Literatur der Botanik von Theophrastos Eresios bis auf die neuesten Zeiten*, etc., Wien, 1817; W. Houstoun, *Reliquiae Houstounianae* . . . juxta exemplar Londinense, editio in Germania prima, Norimbergae, 1794; C. Singer, *The Herbal in Antiquity* (in *Journal of Hellenic Studies*, vol. xlvii, 1897); John Evelyn, *Silva* . . . with notes by A. Hunter, ed. 4, London, 1812; W. B. Turrill, *The plant-life of the Balkan Peninsula*, Oxford, 1929; two scarce works of C. H. Persoon, *Icones et descriptiones fungorum*, Paris, 1798-1800, and *Icones pictae rariorum fungorum*, Paris, 1803-08; and a complete set so far as published of the *Flora of Tropical Africa*. Several periodicals received in exchange for Hooker's *Icones Plantarum* have also been presented by the Bentham Trustees.

The following have been presented by the Carnegie Institution of Washington:—*Studies in the fossil flora and fauna of the Western United States*, by R. W. Chaney, L. Miller, and L. R. Dice, 1925 (Publ. no. 349); *The Marine Algae of Florida with special reference to the Dry Tortugas*, by W. R. Taylor, 1928 (Publ. no. 379); *The hydrostatic-pneumatic system of certain trees: movements of liquids and gases*, by D. T. MacDougal, J. B. Overton, and G. M. Smith, 1929 (Publ. no. 397); and *Plant competition: an analysis of community functions*, by F. E. Clements, J. E. Weaver, and H. C. Hanson, 1929 (Publ. no. 398).

From the Czech Academy of Sciences and Arts, Prague, several of its publications have been received. These include: *Bulletin International*, Classe des Sciences Mathématiques, Naturelles, etc., xxviii^e Année (1926); *Fauna et Flora Českoslovenica*, I-II (1926-28); and *Palaeontographica Bohemiae*, xi-xii (1928).

The United States Department of Agriculture has continued to send many of its useful publications including the *Experiment Station Record*, *Journal of Agricultural Research*, the *Yearbook of Agriculture*, *Farmers' Bulletins* and numerous *Technical Bulletins* and *Miscellaneous Publications*, among the latter (no. 36) being *A history of agricultural education in the United States, 1785-1925*, by A. C. Trew. The library is also especially indebted to the Department of Agriculture, Industry and Commerce in the Dutch East Indies, the Botanic Garden, Buitenzorg, and the Bureaux of Science, Agriculture and Forestry of the Philippine Islands for liberal contributions.

Lieut.-Col. Sir David Prain has presented numerous issues in continuation of several periodicals, including:—*Bulletin de la Société Botanique de France*, *Berichte der Deutschen Botanischen Gesellschaft*, *South African Journal of Natural History*, *The South Eastern Naturalist and Antiquary*, *The Quarterly Journal of Pharmacy*, *Proceedings of the American Philosophical Society*, and *Comptes-Rendus des Séances de l'Académie des Sciences Coloniales, Paris*.

Mr. W. F. Wilson has presented a number of valuable publications of the Bernice P. Bishop Museum, Honolulu, among which are the following Memoirs by W. T. Brigham:—*Index to the Islands of the Pacific Ocean* (vol. i, no. 2, 1900); *Mat and basket weaving by the ancient Hawaiians* (vol. ii, no. 1, 1906); and *Ka Hana Kapa: the making of bark cloth in Hawaii* (vol. iii, 1911, text and plates).

The first volume of the *Index Londinensis*, the new edition of G. A. Pritzel's *Iconum botanicarum Index*, which is being prepared under the auspices of the Royal Horticultural Society of London at the Royal Botanic Gardens, Kew, by Dr. Otto Stapf, and published by the Clarendon Press, Oxford, was issued in October and is the subject of reviews in the *Kew Bulletin*, 1929, p. 305, and *Nature* of January 11, 1930, p. 42. A copy has been presented by the Royal Horticultural Society.

Books received from the Editor of *Nature* are:—F. I. Oakley, *Long vegetable fibres*, 1928; J. F. Rayner, *A supplement to Frederick*

Townsend's *Flora of Hampshire and the Isle of Wight*, 1929; and 4 small works on gardening.

Books received from their publishers:—J. W. Bews, *The world's grasses: their differentiation, distribution, economics and ecology*, from Messrs. Longmans, Green & Co.; M. Büsgen, *The structure and life of forest trees*, third edition by E. Münch, translated into English by T. Thomson, from Messrs. Chapman & Hall; J. D. Gimlette, *Malay Poisons and charm cures*, third edition, from Messrs. J. & A. Churchill; *Index Kewensis*, Supplementum VII (10 copies), from the Clarendon Press, Oxford; Mrs. S. D. McKelvey, *The Lilac: a Monograph*, 1928, Sir H. A. Nicholls, *A text-book of tropical agriculture*, revised by J. H. Holland, and W. J. Robbins & H. W. Rickett, *Botany: a Textbook*, etc., from Messrs. Macmillan; H. H. W. Pearson, *Gnetales*, from the Cambridge University Press; H. Hamel Smith, *Sisal: production and preparation*, from Messrs. John Bale, Sons & Danielsson, and W. B. Turrill, *The plant-life of the Balkan Peninsula*, from the Clarendon Press, Oxford. All except Mrs. McKelvey's work were published in 1929.

The Empire Cotton Growing Corporation and the Empire Marketing Board have presented a number of the publications issued by them, and a set of the publications issued in connection with the Conference of Empire Meteorologists, 1929, Agricultural Section, has been received from the Ministry of Agriculture and Fisheries.

The following are independent works or in some cases separates from periodicals and other publications which have been presented by their authors unless otherwise stated:—S. Fróes Abreu, *O côco barbaçu e o problema do combustível*, published by the Estação Experimental de Combustíveis e Minerios, Ministerio da Agricultura, Rio de Janeiro; R. S. Adamson and others, *The botanical features of the South Western Cape Province* (from Dr. A. W. Hill); Y. Asami, *The crab-apples and nectarines of Japan*, 1927 (from the Marquis Nabeshima); L. H. Bailey, *Gentes herbarum*, vol. ii, fasc. 1-2, 1928-29; J. M. Black, *Flora of South Australia*, part IV, completing the work; E. Blatter, C. McCann, and T. S. Sabnis, *The flora of the Indus Delta*, reprinted from the *Journal of the Indian Botanical Society*, 1927-29; Mrs. Frank Bolus, *Notes on Mesembrianthemum and allied genera*, part 2, pp. 33-146 (3 copies), 1928-29; *Third British Empire Forestry Conference, Australia and New Zealand*, 1928, 4 publications (from the Commonwealth Forestry Bureau, Canberra); V. F. Brotherus, *Symbolae Sinicae*, Teil. IV, Musci (from Mr. George Brotherus); A. F. Broun and R. E. Massey, *Flora of the Sudan* (from Director of Agriculture and Forests, Sudan Government); O. Buchtien, *Contribuciones a la flora de Bolivia*, pt. 1, 1910 (from Dr. E. Asplund); H. A. Chilvers, *The seven wonders of South Africa* (from Director, Publicity Bureau, South Africa House); L. Cockayne and E. Phillips Turner, *The trees of New Zealand*, 1928; *Letters of John Cockburn of Ormistoun to his gardener, 1727-1744*, edited by James Colville, 1904 (from Mr. T. Hay);

Willemina M. Coelingh, *Over stoffen die invloed uitoefenen op de aggregatie bij Drosera* (Proefschrift); Grace M. Crowfoot, *Flowering plants of the Northern and Central Sudan*, 1928 (from Director of Agriculture and Forests, Sudan Government); É. De Wildeman, (1) *Contribution à l'étude de la flore du Katanga*, supplément II (from Comité Spécial du Katanga); (2) *Plantae Bequaertianae*, vol. iv, fasc. 4; J. F. Duthie, *Flora of the Upper Gangetic Plain*, etc., vol. iii, pt. 3 (3 copies) (from the Government of India Central Publication Branch, Calcutta); A. Edwards, *Rock gardens: how to plan and plant them*; B. Fedtschenko, *Flora Transbaicalica*, pars 1; *Field notes of trees, shrubs and plants other than Rhododendrons, collected in Western China by Mr. George Forrest*, 1917-19 (from the Royal Horticultural Society); W. G. Freeman and R. O. Williams, *The useful and ornamental plants of Trinidad and Tobago*, ed. 2, 1928 (from Director of Agriculture, Trinidad and Tobago); E. E. Galpin, *Botanical Survey of South Africa*, Memoir no. 12: *Botanical Survey of Springbok Flats, Transvaal*, 1928 (from Dr. E. J. Butler); G. Glas, *The history of the discovery and conquest of the Canary Islands*, 1764 (from Sir Daniel Morris); S. Grieve, *Physical changes brought about by the floating power of seaweed*, reprinted from *Trans. Bot. Soc. Edinb.* xiv, pt. 2, and xxx, pt. 2; U. P. Hedrick and others, *The vegetables of New York*, vol. i, pt. 1: *Peas of New York*, 1928; E. Hultén, *Flora of Kamtschatka and the adjacent islands*, III, in *K. Svenska Vet.-Akad. Handl.* 3, viii, no. 1; E. Julius and A. L. Pinches, *Forestry Handbook, South Australia*, 1928 (from Conservator of Forests, South Australia); F. Kraenzlin, *Beiträge zur Kenntnis der Familie der Myoporinae R. Br.*, in *Fedde, Repertorium, Beihefte*, Bd. liv; A. Lemée, *Dictionnaire descriptif et synonymique des genres de plantes phanérogames*, tome 1; Mrs. M. R. Levyns, *A Guide to the flora of the Cape Peninsula*; J. C. Liu, *Enumeration of plants collected by the late Mr. N. H. Cowdry in Chihli Province (and Chefoo)*, 1928, in *Bull. Peking Soc. Nat. Hist.* vol. ii, pt. 3 (from Mr. S. T. Dunn); C. Luerksen, *Grundzüge der Botanik*, Auflage 4, 1885 (from Mr. I. H. Burkill); Mrs. S. D. McKelvey, *The Lilac: a Monograph*, 1928; A. H. Magnusson, *A Monograph of the Scandinavian species of the genus Acarospora*, 1924, in *Göteborgs Kgl. Viten-skaps- och Vitterhets- Samhälles Handl.* xxviii, 2; J. H. Maiden, *A critical revision of the genus Eucalyptus*, parts 70 to 72, 1928-29 (from Director, Botanic Gardens, Sydney); S. Mangham and W. Rae Sherriffs, *A first biology*, 1928 (from Prof. S. Mangham); K. Mason, *Exploration of the Shaksgam Valley and Aghil Ranges*, 1928 (from Mr. C. E. C. Fischer); T. Nakai, *Flora sylvatica Koreana*, pars XVII, 1928 (from Director, Forestal Experiment Station, Chosen); *Descriptive guide to the . . . New York Botanical Garden*, 1920 (from Mr. I. H. Burkill); *North American Flora*, vol. 23, pt. 3, 1928, vol. 24, pts. 5-7 (from Dr. N. L. Britton); *Report of the Scientific Results of the Norwegian Expedition to Novaya Zemlya*, 1921: Botany, edited by B. Lynge, 1928 (from the Editor); *Nova Guinea: Résultats des Expéditions scientifiques à la Nouvelle*

Guinée, vol. xiv, Botanique, livr. 3 (from Maatschappij ter Bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën); Mrs. Richenda Parham, *Some medicinal plants of Vanua Levu* [Fiji], printed for private circulation, not dated; H. Pittier, *Arboles y arbustos nuevos de Venezuela*, dec. 4 and 5, 1925; H. S. Redgrove and G. A. Foan, *Blonde or brunette? A complete account of the theory and practice of hair-dyeing in all its branches* (from Mr. H. S. Redgrove); L. Rodway, *The Tasmanian flora*, 1903, with a few MS. additions, copy serving as an index to the Tasmanian Museum Herbarium (from Mr. A. V. Giblin); A. S. Sabrae, *Forestry in Denmark: a guide to foreigners*, 1926 (from Mr. C. S. Larsen); A. M. Sawyér and D. Nyun, *A classified list of the plants of Burma*, 1927 (from Mr. F. N. Howes); *Festschrift Hans Schinz*, 1928, forms *Beiblatt zur Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich*, Jahrg. 73 (from Dr. Hans Schinz); S. Schonland, *Materials for a critical revision of Crassulaceae: the South African species of the genus Crassula L.*, in *Trans. R. Soc. S. Africa*, vol. xvii; J. J. Smith, *Orchidaceae* [of New Guinea], in *Nova Guinea*, vol. xiv, livr. 3; M. Sokolowski, *O górnej granicy lasu w Tatrach* (*La limite supérieure de la forêt dans le massif des Tatra*), 1928; K. Starcs, (1) *Koku un krumu noteicejs*, 1925 (*Handbook of the trees and shrubs of Latvia*); (2) *Latvijas pavasaraugu noteicejs*, 1924-27 (*Handbook of the spring-flowering plants of Latvia*); N. Stoianov and B. Stefanov, *Flore de Bulgarie* (in Bulgarian), 1924-25, in 2 vols. (from Mr. R. A. C. Sperling); M. H. F. Sutton, *Red Clover: comparative trials*, etc.; H. Trotter, *The common commercial timbers of India and their uses*; H. Uittien, *Ueber den Zusammenhang zwischen Blattneratur und Sprossverzweigung*; N. I. Vavilov and D. D. Bukinich, *Agricultural Afghanistan*, forms Suppl. 33 to the *Bulletin of Applied Botany*, etc., Leningrad; *Field notes of Rhododendrons and other plants collected by Kingdon Ward in 1927-28*, 3 copies (from Mr. Lionel de Rothschild); Johanna Westerdijk and Christine Buisman, *De iepenziekte: rapport over het onderzoek verricht op verzoek van de Nederlandsche Heidemaatschappij*; E. H. Wilson, *China: Mother of Gardens*, the subject matter of which has been taken from the author's *A Naturalist in Western China*, 1913; H. Wirz-Luchsingef, *Erhebungen über die Verbreitung der wildwachsenden Holzarten in der Schweiz*, Lieferung 5, Kanton Glarus, 1928 (from Sekretariat der Eidgen. Inspection für Forstwesen, Jagd und Fischerei in Bern); and Z. Yoshino, *Florula Bitchuenensis*.

The periodical and serial publications presented during the year include the following, which have been received from their editors or from the societies or institutions issuing them, unless otherwise stated:—*Acta Botanica Fennica*, 4-5; *Acta Horti Bergiani*, vol. ix; *Acta Horti Botanici Universitatis Latviensis*, vol. iii, nos. 1-3; *Acta Horti Gothoburgensis*, vol. iv; *Acta Instituti et Horti Botanici Universitatis Tartuensis* (*Dorpatensis*), vol. i, fasc. 4 and vol. ii, fasc. 1-2; *Acta Phytochimica* (Tokyo), vol. iv, nos. 2-3; *Agros*:

Boletim da Associação dos Estudantes do Instituto Superior de Agronomia (Lisbon), numero, especial, 1929; *Anales del Museo Nacional de Historia Natural Bernardino Rivadavia* (Buenos Aires), tomo xxxiv; *Annales de la Société Linnéenne de Lyon*, 1928 (from Dr. A. W. Hill); *Annals of the Agricultural Experiment Station, Chosen*, vol. iv, nos. 3-4; *Annals of the Royal Botanic Gardens, Peradeniya*, vol. xi, pt. 2; *Arbejder fra den Botaniske Have i København*, nos. 114-115; *Archief voor de Theecultuur in Nederlandsch-Indië*, 1928, nos. 3-4 and 1929, nos. 1-4; *Archives du Muséum d'Histoire Naturelle* (Paris), 6^{me} série, tome iii; *Australasian Association for the Advancement of Science, Report of the 19th Meeting*, 1929; *Bernice P. Bishop Museum, Honolulu, Bulletin* 55 and 65; *Boyce Thompson Institute for Plant Research* (Yonkers, New York), *Contributions*, vol. i, nos. 7-8 and vol. ii, nos. 1-3, and *Professional Papers*, nos. 10-13; *British Association for the Advancement of Science, Report of the 96th Meeting*, 1928 (from Miss E. M. Wakefield); *British Fern Gazette*, vol. v, nos. 11-12 (from Mr. C. H. Wright); *Bulletin de l'Institut et du Jardin Botaniques de l'Université de Belgrade*, tome i, no. 2; *Bulletin of the Kagoshima Imperial College of Agriculture and Forestry*, no. 7; *Bulletin of the Miyazaki College of Agriculture and Forestry*, 1929, no. 1; *Bulletin of Popular Information* (Arnold Arboretum), series 3, vol. iii; *Bulletin of the Rubber Growers' Association*, vol. xi; *Bulletin de la Société Botanique de Genève*, vol. xx, fasc. 2; *Bulletin de la Société Linnéenne de Lyon*, 1929 (from Dr. A. W. Hill); *Canadian Alpine Journal*, vol. xvi; *Chanousia: Giardino Botanico Alpino dell'Ordine Mauriziano al Piccolo S. Bernardo, Annuario*, no. 1, 1922-27; *Contributions from the Gray Herbarium of Harvard University*, 83-84; *Contributions du Laboratoire de Botanique de l'Université de Montréal*, nos. 12-13; *Contributions from the Osborn Botanical Laboratory* (Yale University), 10 papers; *Curtis's Botanical Magazine*, Index to volumes for 1905 to 1925 (except 1921), prepared by R. C. Notcutt (typed copy from Mr. W. Cuthbertson); *Darwiniana: Carpeta del "Darwinion," Laboratorio particular del Doctor C. M. Hicken* (Buenos Aires), tomo i, nos. 3-8 and tomo ii, no. 1; *East Mallang Research Station, Annual Reports*, 1926-28; *Erdészeti Kísérletek* (*Forest Researches*, Sopron, Hungary), xxx, pt. 4 and xxxi, pts. 1-2; *The Empire Cotton Growing Review*, vol. vi; *Estación Agronómica de Moca, Republica Dominicana*, several botanical publications; *Forestry: the Journal of the Society of Foresters of Great Britain*, vol. iii, no. 1; *Hardy and Half-hardy Plants: a Monthly Magazine*, etc., edited and published by A. W. Darnell, vol. i, nos. 1-3; *Indian Forester*, vol. lv; *Indian Tea Association, Quarterly Journal*, 1928, pt. 4 and 1929, pts. 1-3; *Japanese Journal of Botany*, vol. iv, nos. 3-4; *Journal of the Council for Scientific and Industrial Research* (Commonwealth of Australia), vol. ii, nos. 1-3; *Journal of the Department of Agriculture of Victoria*, vol. xxvii; *Journal of the Federated Malay States Museums*, vol. viii, pt. 3 and vol. xiv, pts. 3-4; *Kungl. Svenska Vetenskapsakademiens Handlingar*, ser. 3, Bd. vi; *Long Ashton Agricultural and Horticultural*

Research Station, Annual Report, 1928; *Malayan Forest Records*, no. 6: *Mangrove forests of the Malay Peninsula*, by J. G. Watson; *Mededeelingen van 's Rijks Herbarium, Leiden*, no. 58: *Monograph of Aristida*, by J. Th. Henrard; *Mémoires de l'Académie Malgache*, fasc. v-vi (from the Rev. Dr. James Sibree); *Memoirs of the College of Agriculture, Kyoto Imperial University*, no. 7; *Natural History Magazine* (British Museum, Natural History), vol. ii, no. 9-12; *Nederlandsch Kruidkundig Archief*, 1927-29; *Notes from the Royal Botanic Garden, Edinburgh*, nos. 81-82; *Oxford Forestry Memoirs*, nos. 8-9; *Orchid Review*, 1929; *Proceedings of the Imperial Academy* (Japan), vol. iv, no. 10 and vol. v, nos. 1-8; *Proceedings of the Isle of Wight Natural History and Archaeological Society*, 1928 (containing: *The cliff-founder and landslide at Gore Cliff, Isle of Wight*, by G. W. Colenutt); *Proceedings of the Royal Irish Academy*, Sect. B, vol. xxxviii, no. 15, and vol. xxxix, nos. 1-2; *Publications de la Faculté des Sciences de l'Université Masaryk* (Brno), nos. 79, 96, 110-111; *Publications of the Hartley Botanical Laboratories* (University of Liverpool), nos. 3-6; *Quarterly Journal of Forestry*, vol. xxiii; *Queensland Agricultural Journal*, vol. xxxi-xxxii; *Recueil des Travaux Botaniques Néerlandais*, vol. xxv and vol. xxva (*Volume jubilaire Hugo de Vries*); *Research Studies of the State College of Washington*, vol. i, nos. 1-2; *The Rose Annual of the National Rose Society*, 1929; *Rubber Research Institute of Malaya, Quarterly Journal*, vol. i, nos. 1-3, and *Annual Report*, 1928; *Science Reports of the Tohoku Imperial University* (Sendai, Japan), 2nd series, vol. xii, no. 1 and vol. xiii, nos. 1-2; 4th series, vol. iii, no. 4, fasc. 2, and vol. iv, nos. 1-3; *Sinensia: Contributions from the Metropolitan Museum of Natural History, National Research Institute, Nanking*, vol. i, no. 1; *The Singapore Naturalist*, nos. 1-5 and continuation as *The Malayan Naturalist*, vol. ii, no. 1 (from Mr. I. H. Burkill); *Studies from the Tokugawa Institute* (Tokyo), vol. i, no. 3; *Sudan Notes and Records*, vol. i-xii, pt. 1 (a few parts missing); *Suomen Metsätieteellinen Seura* (Society of Forestry in Finland), *Silva Fennica*, 9-12, and *Commentationes forestales*, 1-2; *The Tea Quarterly: the Journal of the Tea Research Institute of Ceylon*, vol. ii, pts. 1-3; *Transactions of the Agricultural Land Branch, Land Department, Chinese Eastern Railway, Bulletin*, nos. 1, 3-4; *Transactions of the Royal Society of Canada*, ser. 3, sect. v, vol. xxii, pt. 2; *Transactions of the Royal Society of South Africa*, vol. xviii, pts. 1-3; *Travaux de l'Institut Botanique Léo Errera*, 1928 (11 reprints); *Travaux des Laboratoires de Matière Médicale et de Pharmacie Galénique de Paris*, tome xix (from Prof. É. Perrot); *Tropical Woods*, nos. 17-20; *The Ukrainian Botanical Review*, vol. iii-v; *University of California Publications in Botany*, vol. 14, nos. 19-20 and vol. 15; *University of Colorado Studies*, vol. xvi, no. 4, and vol. xvii, nos. 1-2; *Watson Botanical Exchange Club, 45th Annual Report* (from Mr. H. Stuart Thompson); *Year-Book of Pharmacy and Transactions of the British Pharmaceutical Conference*, 1923; *Year-Book of the Rhododendron Association*, 1929; and *The Yellow Dragon* (Queen's College, Hong Kong), vol. xxx.

Numerous pamphlets, usually separates from periodicals, have been received. The principal contributors were:—Dr. P. Aellen, Dr. Agnes Arber, Dr. F. Börgesen, Mrs. Frank Bolus, Dr. J. F. Buchholz, Dr. P. Bugnon, Prof. P. A. van der Byl, Prof. C. J. Chamberlain, Dr. H. Chermezon, Dr. C. Christensen, Dr. L. Cockayne, Prof. T. D. A. Cockerel, Dr. E. B. Copeland, Mr. H. Dahlstedt, Prof. É. De Wildeman, Mr. H. N. Dixon, Prof. K. Domin, Prof. Paul Dop, Mr. W. D. Francis, Mr. C. A. Gardner, Dr. A. W. Hill, Major C. C. Hurst, Prof. D. S. Johnson, Col. H. H. Johnston, Dr. K. Keissler, Dr. R. Lemesle, Dr. W. R. Maxon, Dr. J. F. Molino, Prof. P. A. Munz, Mr. W. R. B. Oliver, Dr. C. H. Ostenfeld, Dr. F. W. Pennell, Dr. Janet Perkins, Dr. W. Robyns, Prof. E. Rübel, Prof. G. Samuelsson, Prof. C. Skottsberg, Dr. J. J. Smith, Dr. C. G. G. J. van Steenis, Miss E. L. Stephens, Dr. J. Valckenier Suringar, Prof. T. Tanaka, Mr. I. Thériot, Dr. C. W. Wardlaw, Dr. E. E. Watson and Mr. R. P. Wodehouse. Collections of pamphlets have also been received from the Wellcome Chemical Research Laboratories, the Botanical Department of Queen's University, Belfast, Botanical Laboratory of the University of Utrecht, Botanical Institute of the Jagellonian University, Cracow, Institute of Botany of the University of Geneva, Botanical Institute of Kyoto Imperial University, Technological Museum, Sydney, Botanical Department of the University of Melbourne, Department of Plant Pathology of Cornell University Agricultural Experiment Station, and the Missouri Botanical Garden, St. Louis.

A large collection of letters relating to the flora of the Near East, addressed to Dr. W. B. Turrill, after being arranged, mounted and indexed, has been presented by him and has now been bound in two foolscap folio volumes.

Mr. N. E. Brown has presented a copy of W. J. Burchell's map of the extratropical part of Southern Africa, published in 1822, mounted on linen. It was given by Burchell to Mr. Thomas Cooper before the latter started on his journey to South Africa in 1859. Two maps of Eastern Bolivia, illustrating his travels, have been received from Mr. D. Bourke-Borrowes.

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Professor of Forestry—J. M. Gibson, B.Sc.

Manitoba. Winnipeg.—

Deputy Minister of Agriculture—J. H. Evans.
Provincial Forester—H. I. Stevenson, D.S.O.

CANADA.—contd.**Manitoba.—contd.**

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 F.R.S., H. F. Roberts, B.A., M.Sc. *Lecturer*—C. W. Lowe, M.Sc.
 Manitoba Agricultural College.—
Professors.—Botany and Biology—V. W. Jackson, B.A., M.Sc.
Horticulture and Forestry—F. W. Brodrick, B.S.A. *Plant*
Pathology—G. R. Bisby, B.S., Ph.D.
Dominion Rust Research Laboratory, Senior Plant Pathologist—
 Miss M. Newton, Ph.D.

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Department of Agriculture, Victoria.—
Deputy Minister—J. B. Munro, B.S.A. *Provincial Plant Patho-*
logist—J. W. Eastham, B.Sc. (Vancouver). *Assistant Plant*
Pathologist—W. R. Foster, B.S.A. (Victoria). *Director of Plant*
Industry—W. H. Robertson, B.S.A. (Victoria). *Chief Plant*
Quarantine Officer—W. H. Lyne (Vancouver).
 Department of Lands, Victoria.—
 Forest Service.—
Chief Forester—P. Z. Caverhill, M.Sc.F.
 University of British Columbia, Vancouver.—
Professor of Botany—A. H. Hutchinson, Ph.D. *Associate Professors*
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Saskatchewan. Regina.—

Deputy Minister of Agriculture—F. H. Auld.
District Forest Inspector—J. Smart.

Alberta. Edmonton.—

Deputy Minister of Agriculture—H. A. Craig.
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 University of Alberta.—
Professor of Botany—F. J. Lewis, D.Sc., F.R.S.E., F.L.S.

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 A.I.C.T.A. *Systematic Botanist*———. *Economic*
Botanist—L. Lord, M.A. *Manager, Experiment Station, Peradeniya*
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Assistant Curator, Botanic Gardens, Heneratgodā—K. J. A. Sylva.

Forest Department.—
Conservator—J. D. Sargent, B.A.
 University College, Colombo.—
Professor of Botany—N. G. Ball, M.A., Sc.D.

CEYLON—contd.

Rubber Research Scheme.—

Chief Technical Officer—T. E. H. O'Brien, M.Sc. *Physiological Botanist*—R. A. Taylor, B.Sc. *Mycologist*—R. K. S. Murray, A.R.C.S.

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Forestry Department, Accra.—

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Auckland Institute and Museum.—
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Sandakan.—

Conservator of Forests and Director of Agriculture—D. D. Wood,
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Livingstone.—

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Research Station, Mazabuka.—

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 Moffat, B.Sc. (Abercorn). *Instructional Officer*—T. C. Moore.
Assistant Agriculturist—G. Walton. *Farm Foreman*—R. J. Hart.
Cotton Plant Breeder—A. C. Bebbington, B.Sc. *Tobacco Advisers*—
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Senior Assistant Conservator of Forests—D. Stevenson, B.Sc.

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Forestry Department, Zomba.—

Conservator of Forests—J. B. Clements, B.Sc. F.

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SARAWAK.

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Forestry Department, Freetown.—

Conservator—E. Macdonald.

SOUTH AFRICA.

Union of South Africa.—

Department of Agriculture.—

Division of Plant Industry, Pretoria.—

Chief of Division and Director, Botanical Survey—I. B. Pole Evans, C.M.G., M.A., D.Sc., F.L.S. *Principal Botanist*—E. P. Phillips, M.A., D.Sc., F.L.S. *Botanists*—A. O. D. Mogg, M.A., C. D. B. Liebenberg, B.Sc., C. A. Smith, B.Sc. (*Kew*), A. P. G. Goossens, B.Sc., R. A. Dyer, M.Sc. (*Grahamstown*), Miss M. Henrici, Ph.D. (*Fauresmith*), Miss H. Forbes (*Durban*). *Botanical Survey Officer, Cape Town*—R. Marloth, M.A., Ph.D. *Botanical Assistant*—Miss I. C. Verdoorn. *Principal Plant Pathologist*—Miss E. M. Doidge, M.A., D.Sc. *Cryptogamic Herbarium, Mycologist-in-Charge*—Miss A. M. Bottomley, B.A. *Mycologists*—Miss E. S. Moore, D.I.C., Ph.D., A. Leeman, D.Sc., J. E. van der Plank, M.Sc., V. A. Wager, M.Sc. (*Pretoria*), R. Davies, B.Sc. (*Cape Town*), A. P. D. McClean, M.Sc. (*Durban*).

SOUTH AFRICA.—contd.

Union of South Africa.—*contd.*

Department of Forests, Pretoria.—

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University of South Africa.—

Bloemfontein (Grey University College).—

Professor of Botany—G. Potts, B.Sc., Ph.D.

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Professor of Botany—N. J. G. Smith, B.Sc., Ph.D.

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Professor of Botany—J. W. Bews, M.A., D.Sc., F.L.S.

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Lecturer in Botany—Miss S. Maritz, M.Sc.

Potchefstroom (School of Agriculture).—

Botanist—G. C. Theron, Ph.D.

University of Pretoria.—

Professor of Botany—C. E. B. Bremekamp, Ph.D.

Cape of Good Hope Province.—

Cape Town.—

National Botanic Gardens, Kirstenbosch, Newlands.—

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University of Cape Town.—

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South African Museum, Herbarium.—

Assistant-in-Charge—Miss S. Garabedian, B.A.

Bolus Herbarium.—

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Stellenbosch.—

University of Stellenbosch.—

Professors.—*Botany*—G. C. Nel, B.A., Ph.D. *Phytopathology*

and Mycology—P. A. van der Bijl, M.A., D.Sc.

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 Magennis Park.—
Curator—G. Cartwright.

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Botanist—J. Morris, B.Sc.

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Plant Physiologist—W. N. C. Belgrave, B.A.

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TANGANYIKA TERRITORY.—contd.

Department of Agriculture, Morogoro.—

Director—E. Harrison, M.S.A., B.Sc. *Deputy Director*—H. Wolfe, M.Sc. *Senior Agricultural Officers*—J. F. C. O'Brien, C. K. Latham, B.Sc., A. S. Richardson, B.Sc., A. J. Wakefield, B.Sc. *Agricultural Economist*—R. R. Staples, M.A.(Agr.). *Mycologist*—G. B. Wallace, B.Sc.(Agr.), Ph.D. *Agricultural Lecturer*—A. E. Haarer. *Plant Breeder*—District Agricultural Officers—L. C. Edwards, D. G. Burns, B.A., C. M. H. Sutherland, B.Sc., W. J. Hill, C. B. Garnett, B.A., D. Sturdy, B.A., H. Musk*, A.I.C.T.A., A. S. Stenhouse, B.Sc., C. Harvey, B.Sc., A.I.C.T.A., C. J. McGregor, A. H. Savile, A.I.C.T.A., N. V. Rounce, A.I.C.T.A., J. E. Bruce, A.I.C.T.A., R. M. Maynard, B.Sc., B. J. Hartley, A.I.C.T.A., W. B. Hutchinson, R. D. Linton, B.Sc., A.I.C.T.A., J. Robertson, B.Sc., A.I.C.T.A., F. R. Sanders, B.A., R. B. Allnutt, R. M. Davies, B.Sc. *Cotton Investigators*—H. Marsland, B.Sc., T. C. Cairns, B.Sc. *Head Gardener, Dar-es-Salaam*—T. H. Marshall*.

Forestry Department, Lushoto.—

Conservator—D. K. S. Grant.

Department of Tsetse Research, Kondoa Irangi.—

Director—C. F. M. Swynnerton, F.L.S. *Deputy Director and Ecologist*—J. F. V. Phillips, D.Sc., F.L.S. *Botanists*—G. W. St. C. Thompson, B.A., B. D. Burt.

UGANDA PROTECTORATE.

Agricultural Department, Kampala.—

Director—J. D. Tothill, B.Sc., D.Sc. *Deputy Director*—L. Hewett. *Mycologist*—C. G. Hansford, M.A. *Botanist*—J. D. Snowden*. *Cotton Botanist*—G. W. Nye, B.Sc. *Assistant Cotton Botanist*—H. R. Hosking, B.Sc., A.R.C.S., A.I.C.T.A. *Senior Agricultural Officers*—G. F. Clay, M.C., B.Sc. *Superintendent of Agricultural Education*—E. G. Staples, M.A. *Agricultural Officers*—C. E. J. Biggs, B.Sc., D. S. Davies, B.Sc., A. B. Killick, B.Sc., N. S. Haig, B.Sc., E. F. Martin, R. W. Stuckey, B.A., B.S.A., A.I.C.T.A., C. W. L. Fishlock, B.Sc., A.I.C.T.A. M. G. De Courcy-Ireland, B.A., O. E. Whitehead. *Plantation Managers*—P. Chandler*, J. S. Harmsworth, M.C., C. Hazel*, E. A. Ruck*. *Coffee Officer*—W. L. Munn. *Tobacco Officer*—G. T. Philpott*.

Forestry Department, Entebbe.—

Conservator—N. V. Brasnett, M.A.

WEST INDIES.

Imperial College of Tropical Agriculture, Trinidad.—

Principal—G. Evans, C.I.E., M.A. *Commissioner of Agriculture for the West Indies*—H. A. Ballou, M.Sc. *Assistant Commissioner*—G. A. Jones. *Professors*—*Botany and Genetics*—E. E. Cheesman, M.Sc., A.R.C.S. *Mycology and Bacteriology*—H. R. Briton-Jones, Ph.D., D.Sc., D.I.C., A.R.C.S. *Agriculture*—R. Cecil Wood, M.A. *Lecturers*—*Botany*—R. E. Hunter, B.Sc. *Mycology*—A. K. Briant, M.A., A.I.C.T.A. *Agriculture*—D. H. Brown. *Banana Research Officers*—*Pathologist*—C. W. Wardlaw, Ph.D., D.Sc., F.R.S.E. *Physiologist*—L. P. McGuire, M.Sc., Ph.D., D.I.C.

WEST INDIES.—contd.

Barbados.—

Department of Science and Agriculture.—

Director—R. W. R. Miller, B.A. *Assistant Director*—C. C. Skeete, B.A. *Geneticist*—A. E. S. McIntosh, B.Sc., Ph.D.

Jamaica.—

Department of Science and Agriculture.—

Director—H. H. Cousins, M.A. *Microbiologist*—F. E. V. Smith, B.Sc. *Travelling Instructors*—L. A. Wates, J. Briscoe. *Superintendent of Agriculture*—M. S. Goodman (acting). *Public Gardens and Plantations*—*Superintendent*—M. S. Goodman. *Horticulturist*—E. Downes*. *Farm Superintendent*—R. S. Martinez.

Agricultural Society.—

Secretary and Treasurer—L. L. Carrington.

Leeward Islands.—

Federal (Antigua). Department of Agriculture.—

Government Chemist and Superintendent of Agriculture—A. E. Collens.

Antigua. Agricultural Department.—

Agricultural Superintendent—F. H. S. Warneford, M.A., B.Sc. *Agricultural Assistant*—A. Gallwey.

St. Kitts—Nevis. Agricultural Department.—

Agricultural Superintendent—R. E. Kelsick. *Agricultural Instructor (Nevis)*—W. I. Howell.

Dominica. Botanical Department.—

Curator, Botanical Gardens and Agricultural Superintendent—F. G. Harcourt*. *Assistant Agricultural Officers*—F. L. Squibbs*, H. P. Pidduck, R. A. Kitching.

Montserrat. Agricultural Department.—

Curator—C. A. Gomez.

Virgin Islands. Agricultural Department, Botanic Station.—

Curator—J. L. Illingworth, M.A.

Trinidad and Tobago. Department of Agriculture.—

Director—E. J. Wortley, O.B.E., F.L.S. *Assistant Director*—S. M. Gilbert, B.Sc.(Agr.). *Mycologist*—F. Stell, B.Sc., A.R.C.S. *Assistant Botanist*—R. O. Williams*.

Forest Department.—

Conservator—R. C. Marshall, M.A.

Windward Islands.

Grenada. Agricultural Department.—

Superintendent of Agriculture—K. T. Rae. *Agricultural Officer*—W. O'B. Donovan.

St. Lucia.—Agricultural Department.—

Superintendent—E. A. Walters*. *Assistant Agricultural Superintendent*—R. W. Niles. *Agricultural Officer*—G. M. Glasgow.

St. Vincent. Agricultural Department.—

Superintendent—T. Jackson*.

WESTERN PACIFIC.

Tonga Islands.—

Department of Agriculture.—

Director—H. P. Ritchie.

ZANZIBAR.

Agricultural Department.—

Director and Government Chemist—V. H. Kirkham, B.Sc. *Assistant Director*—H. Waterland. *Manager of Plantations*—G. Tomson. *Agricultural Officers*—J. E. Baker, J. R. P. Soper, B.A., T. D. Rutter, B.Sc.

INDIA AND BURMA.

Government of India.†

Botanical Survey of India, Calcutta.—

Director—C. C. Calder, B.Sc., B.Sc. (Agr.), F.L.S. *Assistants for Systematic Work*—T. D. Srinivasan, M.A., R. L. Badhwar, M.Sc. *Curator, Industrial Section*—S. N. Bal, M.Sc., Ph.C., F.L.S.

Forest Department.—

Inspector-General and President, Forest Research Institute and College, Dehra Dun—A. D. Blascheck, Oec.D. *Botanist*—R. N. Parker.

Department of Agriculture.—

Imperial Institute of Agricultural Research, Pusa.—

Director—W. H. Harrison, D.Sc. (offg.). *Economic Botanist*—F. J. F. Shaw, D.Sc., A.R.C.S., F.L.S. *Mycologist*—W. McRae, M.A., D.Sc., F.L.S.

Bengal.—

Forest Department, Darjeeling.—

Conservator—E. O. Shebbeare.

Department of Agriculture, Dacca.—

Director—R. S. Finlow, C.I.E., B.Sc. *Economic Botanist*—G. P. Hector, M.A., D.Sc.

Royal Botanic Gardens, Calcutta.—

Superintendent—C. C. Calder, B.Sc., B.Sc. (Agr.), F.L.S. *Curator of Herbarium*—K. P. Biswas, M.A. *Curator of Garden*—N. Mitra. *Assistant Curator*—M. Jones. *Assistant Curator, Calcutta Gardens*—S. N. Basu.

Agri-Horticultural Society of India, Calcutta.—

Secretary—S. Percy-Lancaster, F.L.S.

Lloyd Botanic Garden, Darjeeling.—

Superintendent—C. C. Calder, B.Sc., B.Sc. (Agr.), F.L.S. *Curator*—J. E. Leslie*.

Cinchona.—

Superintendent of Cinchona Cultivation—C. C. Calder, B.Sc., B.Sc. (Agr.), F.L.S. *Managers*—(Mungpoo) P. V. Osborne*, (Munsong) H. Thomas*. *Assistant Managers*—(Mungpoo) G. H. Fothergill, (Munsong) L. G. Richards*, P. W. Cresswell.

Government House Gardens, Darjeeling.—

Curator—J. T. Johnson*.

† Officers of the various Departments will be found under the Provinces and Administrations to which they are attached.

INDIA AND BURMA.—contd.

Madras.—

Forest Department, Madras.—

Chief Conservator—R. D. Richmond.

Department of Agriculture, Madras.—

Director—G. R. Hilson, B.Sc. *Economic Botanists*—K. Ramayya, M. Sc. (Paddy), V. Ramanatha Ayyar (Cotton), G. N. Rangaswami Ayyangar, B.A. (Millets), D. G. Munro (Oilseeds). *Mycologist*—S. Sundararaman, M.A. *Systematic Botanist*—V. Narayanaswami, M.A.

Government Botanic Gardens and Parks, Ootacamund.—

Curator—F. H. Butcher*.

Agri-Horticultural Society, Madras City.—

Secretary—B. S. Nirodi, M.Sc.

Cinchona Department.—

Deputy Director of Agriculture, Cinchona, Ootacamund—A. Wilson, M.A., B.Sc. *Superintendents*—(Dodabetta) ———, (Nedivattam and Hooker) W. H. P. Collins, (Valparai Anamallais) D. M. Gall.

Bombay.—

Forest Department, Poona.—

Chief Conservator—H. L. Newman.

Agricultural Department, Poona.—

Director—T. F. Main, O.B.E., B.Sc. *Economic Botanist*—W. Burns, D.Sc.

Municipal Gardens, Bombay City.—

Superintendent—D. S. Laud.

Empress Botanical Garden, Poona.—

Superintendent—N. M. Bhagawat.

Government Gardens, Poona.—

Superintendent—E. Little*.

United Provinces of Agra and Oudh.—

Forest Department, Naini Tal.—

Chief Conservator—F. Canning.

Department of Agriculture, Lucknow.—

Director—G. Clarke, C.I.E. *Economic Botanists*—R. L. Sethi, M.Sc., B. Ram Parshad. *Plant Pathologist*—P. K. Dey, M.Sc. *Deputy Director of Gardens, Saharanpur*—W. Head* (offg.). *Superintendents of Gardens; Agra*—S. M. Kazrin (offg.), Allahabad—W. S. Smith, M.C. (offg.), Saharanpur—F. H. Johnson (offg.), Kumaon—L. F. Ruse*, Lucknow—R. D. Fordham.

Punjab.—

Forest Department, Lahore.—

Chief Conservator—C. G. Trevor.

Department of Agriculture, Lahore.—

Director—D. Milne, C.I.E., B.Sc. *Associate Professor of Botany, Agricultural College, Lyallpur*—Rai Sahib L. Jai Chand Luthra.

Delhi.—

Superintendent, Horticultural Department, Old Delhi—R. H. Locke*.

Superintendent, Horticultural Division, New Delhi—W. R. Mustoe*, O.B.E.

Lahore, Government Lawrence Gardens.—

Superintendent—A. Hardie*.

Simla, Mashobra, and New Delhi, Viceregal Estate Gardens.—

Superintendent—E. Long*.

INDIA AND BURMA.—contd.**Bihar and Orissa.—**

Forest Department, Ranchi.—
Conservator—E. Benskin, M.A.
 Agricultural Department, Sabour.—
Director—G. S. Henderson.

Burma.—

Forest Department, Rangoon.—
Chief Conservator—S. F. Hopwood. *Forest Botanist*—C. E. Parkinson.
 Agricultural Department, Rangoon.—
Director—A. McKerral, M.A., B.Sc. *Economic Botanist*—
 D. Rhind, B.Sc. *Mycologist*—U. Thet Su, B.Agr., D.I.C.
 Government Botanic Gardens, Maymyo.—
Superintendent—C. T. Bogg.
 Agri-Horticultural Society.—
Superintendent—C. A. Giffening.
 Cinchona.—
Superintendent, Cinchona Cultivation, Burma—P. T. Russell*.

Central Provinces.—

Forest Department, Pachmarhi.—
Chief Conservator—C. A. Malcolm.
 Department of Agriculture, Nagpur.—
Director—F. J. Plymen, C.I.E. *Economic Botanist for Cotton*—
Mycologist—J. F. Dastur, M.Sc., D.I.C.
Second Economic Botanist—D. N. Mahta, B.A., F.L.S.
 Nagpur Public Gardens.—
Officer-in-Charge—D. N. Mahta, B.A., F.L.S.

Assam.—

Forest Department, Shillong.—
Chief Conservator—W. R. de G. Jacob.
Director of Agriculture and Industries and Registrar of Co-operative
Societies—Rai Bahadur Kanak Lal Barua.
 Shillong, Government Gardens.—
Superintendent—R. Badgery*.

North West Frontier Province.—

Deputy Conservator of Forests—G. R. Henniker-Gotley, D.S.O., B.A.
Agricultural Officer—W. Robertson Brown.

Port Blair and Nicobars, Port Blair.—

Chief Forest Officer—G. H. R. Golding.

Indian States.—**Mysore. Bangalore.—**

Director of Agriculture—Leslie C. Coleman, M.A., Ph.D. *Director*
of Horticulture—G. H. Krumbiegel*. *Superintendent of Govern-*
ment Gardens—H. C. Javaraya, F.L.S.
 Forest Department, Bangalore.—
Chief Conservator—B. V. Ramaiengar.

Baroda.

State Gardens.—
Superintendent—T. R. Kothavala.

INDIA AND BURMA.—contd.**Kashmir and Jammu.—**

Forest Department.—
Chief Conservator—H. L. Wright, B.A.

Gwalior.—

State Gardens.—
Director—C. M. Tembe, F.L.S.

Central India and Rajputana.—

Indore, Institute of Plant Industry.—
Director—A. Howard, C.I.E., M.A.
 Udaipur.—
Superintendent of Gardens—M. L. Bohra.

Madras.—

Travancore, Trivandrum.—
Director of Agriculture and Fisheries—N. Kunjan Pillai, M.A.,
 B.Sc., Ph.D. *Superintendent, Museum and Public Gardens*—
 G. N. Tampi, B.A.

BULLETIN OF MISCELLANEOUS INFORMATION Appendix III 1930 ROYAL BOTANIC GARDENS, KEW

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs, which, for the most part, have ripened at Kew during the year 1930. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew.

HERBACEOUS PLANTS.

Acaena adscendens
argentea
glabra
laevigata
macrostemon
microphylla
myriophylla
Sanguisorbae
novae-zelandiae
trifida

Acantholimon acerosum
androsaceum
Fominii
glumaceum

Acanthus longifolius
Perringii

Achillea ageratifolia
— var. tomentosa
x argentea
chrysocoma
Clavennae
conjuncta

Achillea—*cont.*
crithmifolia
filipendulina
grandiflora
x Grisebachii
impatiens
impunctata
Kellereri
ligustica
lingulata var. buglossis
magna
Millefolium
nana
nobilis
Ptarmica
pyrenaica
rupestris
taygetea
tomentosa
umbellata
Wilczekii

Aconitum Fischeri
Forrestii
Lycoctonum

Aconitum—*cont.*
 Lycoctonum var. ranunculifolium
 Napellus
 — var. carneum
 — var. giganteum
 — var. tauricum
 orientale
 volubile
 vulparia.

Actaea alba
 spicata
 — var. arguta
 — var. rubra

Actinomeris squarrosa

Adenophora diploidonta
 latifolia
 polymorpha
 Potaninii

Adenostyles glabra

Adlumia cirrhosa

Adonis annuus
 vernalis

Aethionema amoenum
 armenum
 cappadocicum
 diastrophis
 grandiflorum
 pulchellum
 schistosum

Agrimonia Eupatoria
 leucantha
 odorata

Agropyron caninum
 cristatum
 prostratum
 tenerum

Agrostis alba
 — var. stolonifera

Agrostis—*cont.*
 canina
 capillaris
 nebulosa
 pulchella

Alchemilla acutiloba
 alpina
 — var. subsericea
 Hoppeana
 vulgaris

Alisma Plantago-aquatica

Allium Ampeloprasum
 angulosum
 atropurpureum
 Beesianum
 carinatum
 caspium
 coeruleum
 cyaneum
 grande
 Heldreichii
 hymenorrhizum
 kansuense
 karataviense
 macranthum
 Moly
 narcissiflorum
 neapolitanum
 odorum
 oleraceum
 Ostrowskianum
 Przewalskianum
 Rosenbachianum
 roseum
 Schoenoprasum
 senescens
 sphaerocephalum
 Stellerianum
 subangulatum
 subhirsutum
 ursinum
 zebdanense

Alonsoa Warscewiczii

Alopecurus arundinaceus
 brachystachyus
 lanatus
 myosuroides
 pratensis
 — var. foliis variegatis

Alstroemeria aurantiaca
 haemantha
 — var. rosea

Althaea cannabina
 ficifolia
 officinalis
 rosea
 sulphurea
 taurinensis

Alyssum argenteum
 desertorum
 maritimum
 rostratum
 saxatile
 spinosum
 Wulfenianum

Amarantus caudatus
 chlorostachys
 hypochondriacus
 polygamus
 retroflexus

Ambrosia trifida

Ammophila arenaria

Amsinckia intermedia

Anagallis arvensis
 grandiflora
 — var. coccinea
 — var. coerulea

Anaphalis cinnamomea
 margaritacea
 nubigena var. intermedia

Anchusa hybrida
 italica
 officinalis

Andropogon distachyus

Androsace acaulis
 lanuginosa
 sarmentosa

Andryala Agardhii
 varia

Anemone altaica
 caroliniana
 japonica var. hupehensis
 multifida
 — var. magellanica
 polyanthes
 pratensis
 — var. montana
 Pulsatilla
 rivularis
 slavica
 sylvestris
 — var. grandiflora
 virginiana

Angelica ampla

Anoda hastata
 Wrightii

Antennaria dioica
 — var. tomentosa
 imbricata var. rosea

Anthemis arvensis
 carpathica
 Cotula
 Cupaniana
 nobilis
 Sancta-Johannis
 tinctoria
 — var. alba
 Triumphettii

Anthericum Halleri
Liliago
 — var. *algeriense*

Anthyllis Vulneraria
 — var. *Dillenii*

Antirrhinum Asarina
majus
Orontium
Orontium x majus

Apera Spica-venti

Apium graveolens

Aplopappus coronopifolius
croceus
pectinatus

Aquilegia alpina
Buergeriana
canadensis var. *oxysepalus*
chrysantha
 — var. *Jaeschkaui*
formosa
 — var. *truncata*
glandulosa
lactiflora
Moorcroftiana
nevadensis
sibirica
Skinneri,
vulgaris
 — var. *olympica*
 — var. *stellata*

Arabis albida
Allionii
arenosa
Breweri
hirsuta
muralis
 — var. *rosea*
Turrita

Archangelica officinalis

Arctium Lappa
minus
nemorosum
tomentosum

Arctotis acaulis
stoechadifolia

Arenaria aretioides
foliosa
graminifolia
grandiflora
Kingii
Koriniana
laricifolia
longifolia
pinifolia
saxatilis
serpyllifolia
Steveniana

Argemone mexicana
 — var. *ochroleuca*
platyceras
 — var. *hispida*

Arisaema amurense

Armeria allioides
canescens
chilensis
elongata
juncea
leucocephala
maritima
 — var. *alba*

Arnica Chamissonis
foliosa
longifolia
montana

Arrhenatherum elatius var.
bulbosum

Artemisia coerulescens
integrifolia
lanata

Artemisia—cont.
ludoviciana
maritima
parviflora
procera
Purshiana
rupestris
Siversiana
vulgaris

Arum maculatum

Asclepias syriaca

Asperella Hystrix

Asperula azurea
odorata
tinctoria

Asphodeline liburnica
lutea

Asphodelus albus
fistulosus

Aster acris
alpinus
amethystinus
Borreri
brachytrichus
carolinianus
commutatus
cordifolius
Curtisii
Douglasii
Drummondii
ericoides
Farreri
foliaceus
furcatus
gayanus
glaucus
Glehnii
Herveyi
heterochaetus
heterophyllus
himalaicus
laevis

Aster—cont.
lateriflorus
likiangensis
linariifolius
Lipskyi
longifolius
Lowianus
macrophyllus
Novae-angliae
 — var. *pulchellus*
 — var. *roseus*
 — var. *ruber*
Novi-belgii
oreophilus
Piccolii
puniceus
 — var. *pulcherrimus*
Purdomii
pyrenaeus
Radula
sagittifolius
spectabilis
stellaris
subcoeruleus
tataricus
Thomsonii
tricephalus
trinervis
Tripodium
umbellatus
undulatus
VahlII
vimineus

Astilbe chinensis ·
Davidii
Thunbergii

Astragalus alopecuroides
ambigua
aristatus
chinensis
chlorostachys
Christianus
Cicer
danicus var. *albus*
Echinus
falcatus
frigidus

Astragalus—*cont.*
Glycyphyllos
hamosus
pentaglottis
purpureus
Roemeri
sulcatus
Wulfenii
xiphocarpus
Zingeri

Astrantia Biebersteinii
gracilis
helleborifolia
major

Athamanta Haynaldii
Matthiolii
— var. *hungarica*

Atriplex hastatum
hortense
— var. *rubrum*
littorale
sibiricum

Atropa Belladonna

Aubrietia deltoidea

Avena barbata
brevis
fatua
nuda
pratensis
pubescens
sativa

Baeria coronaria
macrantha

Baldwinia uniflora

Ballota acetabulosa
rupestris

Baptisia australis
leucantha

Barbarea arcuata
stricta
vulgaris

Beckmannia eruciformis

Berkheya Adlamii

Berteroa incana

Beta maritima
trigyna
vulgaris

Bidens grandiflora
pilosa
tripartita

Biscutella auriculata
didyma

Biserrula Pelecinus

Blumenbachia insignis

Boehmeria japonica

Boltonia asteroides
— var. *decurrens*

Bouteloua racemosa

Brachycome iberidifolia

Brachypodium distachyum
pinnatum
silvaticum

Brassica alba
balearica
campestris
Erucastrum
nigra
oleracea

Briza maxima
minor
— var. *gracilis*

Brodiaea congesta
lactaea

Bromus carinatus
hordeaceus
inermis
japonicus
macrostachys
madritensis
maximus
patulus
racemosus
rubens
secalinus
sterilis
tectorum
unioloides

Bruckenthalia spiculifolia

Brunnea macrophylla

Byronia alba

Bulbine annua

Bulbinella Hookeri

Bulbocodium vernum

Buphthalmum salicifolium

Bupleurum Candollei
commutatum

Butomus umbellatus

Cakile maritima

Calamagrostis pseudo-phragmites

Calamintha Clinopodium
grandiflora
Nepeta
officinalis

Calandrinia grandiflora
Menziesii
pilosiuscula

Calceolaria acutifolia
biflora
gracilis
tenella
valdiviana

Calendula arvensis
officinalis
parviflora

Calla palustris

Callistephus chinensis

Caltha palustris
— var. *alba*
radicans

Calystegia sepium

Camassia esculenta
Leichtlinii

Camelina Alyssum
microcarpa
sativa

Campanula alliariaefolia
alpina
barbata
bononiensis
carpatica
— var. *alba*
— var. *pelviformis*
— var. *turbinata*
cochlearifolia
— var. *alba*
— var. *pallida*
collina
excisa
garganica
glomerata
— var. *alba*
— var. *superba*
Grossekii
imeretina
lactiflora
— var. *coerulea*
latifolia

Campanula—*cont.*
latifolia var. *macrantha*
 — var. *versicolor*
latiloba
Leutweinii
linifolia
macrorrhiza
Marchesettii
Medium
persicifolia
 — var. *alba*
Portenschlagiana
 — var. *major*
pseudo-Raineri
psilostachya
Raddeana
rapunculoides
Rapunculus
rhomboidalis
speciosa
Stevenii
Trachelium
Tymonsii
versicolor

Cannabis sativa

Capsella Bursa-pastoris
grandiflora

Cardamine chenopodifolia
Impatiens

Carduncellus coeruleus

Carduus arctioides
defloratus
stenolepis
tenuiflorus

Carex crinita
depauperata
distans
divulsa
flacca
flava
fulva
Grayii
helodes

Carex—*cont.*
hordeistichos
pendula
pseudo-Cyperus
straminea
tomentosa

Carlina acanthifolia
acaulis
 — var. *caulescens*
vulgaris

Carthamus leucocaulos
tinctorius

Carum Carvi

Catananche coerulea

Caulophyllum thalictroides

Cedronella cana

Cenchrus tribuloides

Cenia turbinata

Centaurea amara
aspera
atropurpurea
 — var. *sulphurea*
babylonica
Cyanus
cynaroides
dealbata
hypoleuca
Jacea
macrocephala
melitensis
montana
 — var. *alba*
moschata
nigra
nigrescens
 — var. *vochinensis*
phrygia
pulchra
ruthenica
Sadleriana

Centaurea—*contd.*
Scabiosa
 — var. *alba*
spinulosa
Triumfettii

Cephalaria alpina
graeca
leucantha
syriaca
tatarica
transylvanica

Cerastium alpinum
 — var. *lanatum*
arvense
Biebersteinii
Boissieri
grandiflorum
perfoliatum
tomentosum

Cerinth aspera
glabra
major
minor

Chaerophyllum aromaticum
nodosum

Chaeturus fasciculatus

Chamaelirium luteum

Charieis heterophylla

Cheiranthus Cheiri
semperflorens

Chelidonium majus
 — var. *laciniatum*

Chelone obliqua

Chenopodium album
Bonus-Henricus
Botrys
murale
serotinum

Chenopodium—*cont.*
urbicum
virgatum
Vulvaria

Chionodoxa Luciliae
 — var. *gigantea*

Chondrilla juncea

Chorispota tenella

Chrysanthemum arcticum
Aucherianum
Balsamita
 — var. *tomentosum*
caucasicum
ceratophylloides
cinerariaefolium
coccineum
coronarium
corymbosum
densum
lacustre
macrophyllum
maximum
monspeliense
montanum
Parthenium
rotundifolium
segetum
Zawadskii

Chrysopogon Gryllus

Cicuta maculata
virosa

Cimicifuga americana
cordifolia
dahurica

Cirsium acaule
arachnoideum
canum
Diacantha
eriphorum
lanceolatum
monspessulanum
ochroleucum

Cirsium—*cont.*
oleraceum
tuberosum

Cladium Mariscus

Clarkia elegans
pulchella

Claytonia sibirica

Cleome graveolens
spinosa
violacea

Clypeola Jonthlaspis

Cochlearia glastifolia
officinalis

Codonopsis ovata
sylvestris

Colchicum umbrosum

Collinsia bicolor
grandiflora

Collomia coccinea
grandiflora
linearis

Commelina coelestis

Conium maculatum

Conringia orientalis

Convallaria majalis

Convolvulus sicalus
tricolor
undulatus

Coreopsis grandiflora
lanceolata
latifolia
rosea
tinctoria
verticillata

Corethrogyne filaginifolia

Coriandrum sativum

Corispermum hyssopifolium

Coronilla elegans
scorpioides
vaginalis

Corydalis cheilanthifolia
glauca
latifolia
lutea
sibirica

Corynephorus canescens

Cosmos bipinnatus

Cotula coronopifolia

Cotyledon chrysantha

Crambe cordifolia
maritima
orientalis
pinnatifida

Craspedia uniflora

Crepis alpina
biennis
Dioscoridis
foetida
rubra
setosa
sibirica

Crocus asturicus
laevigatus
longiflorus
medius
pulchellus
reticulatus var. micranthus
speciosus
stellaris
Tommasinianus
vernus

Cryptostemma calendulaceum

Cucubalus baccifer

Cuphea lanceolata
Llavia

Cyclanthera explodens

Cynara Cardunculus
Scolymus

Cynoglossum amabile
officinale
Wallichii

Cynosurus cristatus

Cyperus esculentus

Cypripedium pubescens
spectabile

Dactylis glomerata

Dahlia coccinea
Merckii
variabilis

Dalea Lagopus

Datisca cannabina

Daucus maximus
pulcherrimus

Datura inermis
Metel
Stramonium
Tatula

Delphinium altissimum
amoenum
atropurpureum
Brunonianum
carolinianum
cashmirianum
caucasicum
decorum

Delphinium—*cont.*

Delavayi
Duhmbergii
dyctiocarpum
elatum
— var. alpinum
exaltatum
flexuosum
formosum
Gayanum
Geyeri
grandiflorum
— var. album
occidentale
scopulorum
speciosum
— var. glabratum
sulphureum
tatsienense
vestitum

Deschampsia caespitosa
— var. vivipara
flexuosa

Desmazeria sicula

Desmodium canadense
canescens
marilandicum

Dianthus anatolicus
arenarius
Armeria
arvernensis
atrorubens
— var. croaticus
banaticus
caesius
callizonus
chinensis
cinnabarinus
deltoides
— var. superbus
fragrans
gallicus
giganteus
glutinosus
hirtus

Dianthus—*cont.*
hyssopifolius
Knappii
leptopetalus
Liboschitzianus
neglectus
pallens
petraeus
 — var. *spiculifolius*
plumarius
pungens
Requienii
Seguieri
serotinus
squarrosus
strictus
superbus
 — var. *Wimmeri*
tener
tenuiflorus
Waldsteinii

Dictamnus albus
 — var. *caucasicus*

Digitalis dubia
lutea
obscura
purpurea
sibirica

Dimorphotheca dentata
hybrida
pluvialis

Diplachne fusca

Diplotaxis muralis
tenuifolia

Dipsacus asper
chinensis
laciniatus
pilosus
silvester

Disporum trachycarpum

Dodecatheon Lemoinei
Meadia

Doronicum hungaricum
Pardalianches
plantagineum

Downingia elegans

Draba hirta
incana
 — var. *Adamsii*
stellata

Dracocephalum Forrestii
Isabellae
Moldavica
nutans
Ruyschiana var. *japonicum*
tanguticum

Dracunculus vulgaris

Dryas Drummondii
octopetala
 — var. *lanata*
 — var. *minor*
Sundermanni

Eatonia obtusata

Ecballium Elaterium

Echinacea purpurea

Echinaria capitata

Echinocystis lobata

Echinops banaticus
dahuricus
sphaerocephalus

Echium plantagineum
vulgare

Eleocharis palustris

Eleusine coracana

Elsholtzia cristata

Elymus arenarius
europaeus
sabulosus
sibiricus
virginicus

Emilia flammea

Epilobium adenocaulon
angustifolium
Dodonaei
glabellum
hirsutum
 — var. *album*
Lamyi
latifolium
montanum
roseum
rosmarinifolium
sericeum

Epipactis palustris
Royleana

Eragrostis abyssinica
maxima
pilosa

Eranthis cilicica
hyemalis

Eremurus altaicus
Bungei
himalaicus
robustus
spectabilis

Eremostachys laciniata

Erigeron armerifolius
bellidifolius
glabellus
glaucus
grandiflorus
Howellii
macranthus
mucronatus

Erigeron—*cont.*
multiradiatus
pulchellus

Erinacea pungens

Erinus alpinus

Eriogonum flavum
subalpinum
 — var. *major*
umbellatum

Eriophorum latifolium
Scheuchzeri
vaginatum

Erodium alpinum
Botrys
carvifolium
chamaedryoides
 — var. *roseum*
cheilanthifolium
cicutarium
corsicum
gruinum
hymenodes
macradenum
malacoides
Manescavii
petraeum
Salzmännii
supracanum
supradenum x
tordilioides

Eruca sativa

Eryngium alpinum
amethystinum
campestre
giganteum
Oliverianum
planum
serbicum

Erysimum asperum
cheiranthoides
hieracifolium

Erysimum—*cont.*
 linifolium
 Perofskianum
 rupestre

 Erythronium Dens-Canis

 Eschscholzia caespitosa
 californica
 Douglasii

 Eupatorium cannabinum
 purpureum

 Euphorbia coralloides
 epithymoides
 Esula
 exigua
 helioscopia
 Lathyris
 heterophylla
 hiberna
 palustris
 Peplus
 Preslii
 sikkimensis
 stricta
 uralensis
 virgata

 Farsetia eriocarpa

 Felicia Bergiana
 fragilis
 rotundifolia
 tenella

 Festuca arundinacea
 bromoides
 duriuscula
 Eskia
 glauca
 heterophylla
 montana var. altissima
 Myuros
 ovina
 — var. tenuifolia
 pratensis
 rubra

Festuca—*cont.*
 scoparia
 silvatica
 spectabilis
 uniglumis
 vaginata

 Filipendula hexapetala

 Foeniculum vulgare

 Fragaria viridis

 Frankenia pulverulenta

 Fritillaria acmopetala
 Elwesii
 Meleagris
 — var. alba
 latifolia
 libanotica
 Olivieri
 pallidiflora

 Fumaria officinalis
 parviflora
 Vaillantii

 Funkia decorata
 Fortunei
 — var. gigantea
 ovata
 Sieboldiana

 Gaillardia aristata
 lanceolata
 spathulata

 Galega officinalis
 — var. alba
 orientalis
 patula
 — var. Hartlandii

 Galeopsis dubia
 pyrenaica
 speciosa
 Tetrahit

Galinsoga brachystephana
 parviflora

 Galium angustifolium
 Aparine
 boreale
 erectum
 Mollugo
 purpureum
 tricorne
 verum

 Galtonia candicans

 Gentiana asclepiadea
 — var. alba
 cruciata
 dahurica
 decumbens
 — var. alba
 Freyniana
 frigida
 Grombezewskii
 Kesselringii
 lagodechiana
 linearis
 macrophylla
 septemfida
 — var. latifolia
 straminea
 tibetica
 verna
 Waltonii

 Geranium albanum
 albiflorum
 anemonaefolium
 armenum
 collinum
 dissectum
 Endressii
 eriosomon
 grandiflorum
 ibericum
 — var. brachytrichum
 incisum
 macrorrhizum
 maculatum

Geranium—*cont.*
 nodosum
 palustre
 phaeum var. lividum
 pratense
 — var. album
 pusillum
 rivulare
 Robertianum
 — var. album
 rotundifolium
 sanguineum
 — var. album
 — var. lancastriense
 sibiricum
 silvaticum
 versicolor
 Wallichianum
 Wilfordii
 Wlassovianum

 Gerbera Anandria

 Geum album
 Boissieri
 bulgaricum
 chiloense
 coccineum
 elatum
 Heldreichii
 intermedium
 Jankae
 japonicum
 molle
 pallidum
 parviflorum
 Purdomii
 pyrenaicum
 radiatum
 reptans
 rhaeticum
 rivale
 Rossii
 triflorum
 urbanum
 vernum

 Gilia abrotanifolia
 achilleaefolia

Gilia—*cont.*
aggregata
capitata
densiflora
laciniata
liniflora
multicaulis
squarrosa
tricolor
— *var. alba*

Gladiolus communis

Glaucium corniculatum
flavum
— *var. tricolor*

Globularia cordifolia
trichosantha

Glyceria nervata

Glycine Soja

Glycyrrhiza echinata
glabra
lepidota

Grindelia speciosa
robusta
squarrosa

Gunnera chilensis
manicata

Gymnolomia multiflora

Gynandropsis pentaphylla

Gypsophila acutifolia
elegans
paniculata
perfoliata

Habenaria conopsea

Hebenstretia comosa
dentata

Hedysarum coronarium
— *var. album*
esculentum
flavescens
Hedysaroides

Helenium autumnale
— *var. pumilum*
— *var. striatum*
Bolanderi
Hoopsii
puberulum
tenuifolium

Heleochoa schoenoides

Helianthella quinquenervis

Helianthemum alpestre
libanotis
Tuberaria

Helianthus annuus
coloradensis
decapetalus
giganteus
mollis
Nuttallii
occidentalis
rigidus
tomentosus

Helichrysum bracteatum
— *var. roseum*
frigidum

Heliopsis laevis
scabra

Helipterum Humboldtianum
Manglesii *var. maculatum*
roseum

Helleborus Baumgartenii
foetidus
orientalis
viridis

Hemerocallis aurantiaca *var.*
major
citrina
flava
luteola
Thunbergii

Heracleum candicans
flavescens
granatense
Lehmannianum
villosum

Herniaria hirsuta

Hesperis matronalis

Heuchera glabra
hispida
micrantha
pubescens
undulata
villosa

Hibiscus Trionum

Hieracium amplexicaule
aurantiacum
bombycinum
cappadocicum
corymbosum
florentinum
gymnocephalum
Heldreichii
humile
Jankae
lanatum
maculatum
pallidum
pannosum
Pilosella
ramosum
rupestre
tridentatum
umbellatum
villosum
vulgatum

Holcus lanatus
mollis

Hordeum jubatum

Horminum pyrenaicum
— *var. album*

Houttuynia cordata

Hunnemannia fumariaefolia

Hyacinthus amethystinus
azureus
fastigiatus
Hackelii
hispidus
orientalis
romanus

Hydrocotyle vulgaris

Hyoscyamus niger

Hypecoum grandiflorum
procumbens

Hypericum acutum
Desetangsii
dubium
elegans
elodeoides
hirsutum
Kotschyanum
lysimachioides
montanum
olympicum
orientale
perforatum
polyphyllum
quadrangulum
rhodopeum
rumelicum
Webbii

Hypochoeris uniflora

Hyssopus officinalis
— *var. aristatus*

Hysterionica pinifolia
Hystrix patula
Iberis amara
 gibraltarica
 Jordanii
 pinnata
 sempervirens
 — var. *Garrexiana*
 umbellata
Impatiens Balsamina
 Noli-tangere
 Roylei
 scabrida
Incarvillea Delavayi
 grandiflora var. *brevipes*
Inula barbata
 bifrons
 Britannica
 cordata
 ensifolia
 Helenium
 hirta
 Hookeri
 macrocephala
 magnifica
 montana
 Oculus-Christii
 orientalis
 racemosa
 sabuletorum
 salicina
 spiraeifolia
 squarrosa
 thapsoides
Ipomoea montana
 purpurea
Iris Bloudowii
 bucharica
 Bulleyana
 chrysographes
 Delavayi
 dichotoma

Iris—cont.
 Douglasiana
 foetidissima
 — var. *citrina*
 fulva
 Kaempferi
 laevigata
 longipetala var. *montana*
 Milesii
 missouriensis
 ochroleuca
 orientalis
 Pseudacorus
 — var. *alba*
 setosa
 sibirica
 Sintenissii
 tenax
 versicolor
 xiphioides
Isatis tinctoria
Isopyrum fumarioides
Iva xanthifolia
Ixiolirion montanum var.
 tataricum
Jasonia tuberosa
Jasione perennis
Juncus alpinus
 bufonius
 Chamissonis
 compressus
 effusus
 Gerardii
 glaucus
 squarrosus
 tenuis
Jurinea arachnoidea
Kentranthus Calcitrapa
 ruber
 — var. *albus*

Kitaibefia vitifolia
Kochia scoparia
 trichophila
Koeleria albescens
 cristata
 phleoides
Kohlrauschia prolifera
Lactuca alpina
 bracteata
 Bourgaei
 Dubyaea
 hastata
 macrophylla
 perennis
 virosa
Lagurus ovatus
Lallemantia canescens
 peltata
Lamium album
 Galeobdolon
 maculatum
 Orvala
Lapsana communis
Laserpitium gallicum
 Halleri
 latifolium
 peucedanoides
 Siler
Lasiospermum radiatum
Lathyrus angulatus
 Aphaca
 articulatus
 cicera
 clymenum
 latifolius
 lusitanicus
 luteus
 — var. *aureus*

Lathyrus—cont.
 maritimus
 montanus
 niger
 Nissolia
 odoratus
 paluster
 pannonicus
 pratensis
 roseus
 rotundifolius
 rotundifolius x *tuberosus*
 sativus
 setifolius
 silvester
 sphaericus
 tingitanus
 tuberosus
 undulatus
 varius
 venosus
 vernus
 — var. *angustifolius*
Lavatera arborea
 cachemiriana
 Olbia
Layia elegans
Leersia oryzoides
Legousia falcata
 pentagonia
 speculum-veneris
Leontodon hastilis
 hirtus
 hispidus
Leontopodium alpinum
 sibiricum
Leonurus Cardiaca
 sibiricus
Lepachys pinnata

Lepidium *Draba*
 graminifolium
 latifolium
 sativum
 virginicum

Leptosyne *Bigelovii*
 Douglasii
 maritima
 Stillmannii

Leucojum *hyemale*
 pulchellum
 vernum

Lewisia *Cotyledon*
 Leana

Liatris *pycnostachya*
 scariosa

Libertia *formosa*
 grandiflora

Lilium *carniolicum*
 pomponium
 pyrenaicum
 tenuifolium
 washingtonianum

Limnathes *alba*
 Douglasii

Limonium *confusum*
 elatum
 filicaulis
 Gmelinii
 minutum
 Suworowii
 tomentella
 virgatum
 vulgare

Linaria *alpina*
 — var. *rosea*
 antiparia
 Broussonetii
 dalmatica
 Elatine

Linaria—*cont.*
 melantha
 purpurea
 sapphirina
 tristis

Lindelofia *longifolia*

Linum *alpinum*
 arboreum
 austriacum
 capitatum
 catharticum
 flavum
 gallicum
 grandiflorum
 — var. *roseum*
 monogynum
 perenne
 tenuifolium
 usitatissimum
 — var. *album*

Lithospermum *angustifolium*
 arvense
 intermedium
 officinale

Loasa *vulcanica*

Lobelia *Erinus*
 sessilifolia

Lopezia *coronata*

Lotus *corniculatus*
 edulis
 ornithopodioides
 Requienii
 siliquosus
 tenuifolius
 Tetragonolobus

Lunaria *annua*
 — var. *alba*
 rediviva

Lupinus *angustifolius*
 Barkeri
 densiflorus
 Hartwegii
 longifolius
 micranthus
 mutabilis
 — var. *Cruickshanksii*
 nanus
 nootkatensis
 onustus
 perennis
 pilosus
 polyphyllus
 — var. *albus*
 texensis var. *subcarnosus*

Luzula *Fosteri*
 nivea
 pilosa

Lychnis *alba*
 alpina
 chalconica
 Coeli-rosa
 — var. *elegans*
 coronaria
 — var. *oculata*
 Flos-cuculi
 Flos-jovis
 Githago
 Preslii
 pyrenaica
 Sartorii
 Sermo
 Viscaria
 — var. *alba*

Lycopersicum *esculentum*
 — var. *cerasiforme*
 pyriforme

Lycopus *europaeus*
 exaltatus

Lysichitum *camtschaticense*

Lysimachia *barystachys*
 clethroides
 Fortunei
 punctata

Lythrum *alatum*
 Salicaria
 — var. *rosea*
 virgatum

Macleaya *cordata*
 microcarpa

Madia *dissitiflora*

Malcomia *africana*
 chia
 littorea
 maritima

Malva *Alcea*
 borealis
 crispa
 moschata var. *alba*
 oxyloba
 parviflora
 rotundifolia
 silvestris
 — var. *alba*

Malvastrum *campanulatum*

Mandragora *officinarum*

Margyricarpus *setosus*

Marrubium *leonuroides*
 supinum
 vulgare

Matthiola *bicornis*
 incana
 sinuata var. *glabra* *albi-*
 flora
 thessala

Meconopsis *aculeata*
 betonicifolia
 cambrica

Meconopsis—cont.

latifolia
nepalensis
paniculata
quintuplinervia
Wallichii

Medicago ciliaris

falcata
hispida
— var. pentacycla
littoralis
lupulina
orbicularis
rigidula
sarmentosa
sativa
scutellata

Melica altissima

— var. atropurpurea
ciliata
nutans
transsilvanica
uniflora

Melilotus albus

indicus
officinalis

Melissa officinalis var. aurea

Mentha aquatica var. citrata

gentilis
longifolia
— var. mollissima
— var. nemorosa
piperita
pratensis
rotundifolia
spicata
— var. crispa

Mentzelia laevicaulis

Mertensia sibirica

Mesembryanthemum

pinnatifidum
pyropeum

Meum athamanticum

Micromeria graeca

Microseris Lindleyi

Milium effusum

Mimulus cardinalis

cupreus
Eastwoodiae
Lewisii
luteus
— var. alpinus
— var. guttatus
ringens

Mirabilis divaricata

Froebelii
Jalapa
longiflora
viscosa

Miscanthus japonicus var.

variegatus

Mitella diphylla

Modiola multifida

Molinia coerulea

— var. variegata

Moltkia petraea

Monarda didyma var. alba

fistulosa
Russeliana

Monolepis trifida

Moricandia arvensis

Morina kohanica

longifolia

Muehlenbergia mexicana

Muscari armeniacum

commutatum
compactum
conicum
latifolium
neglectum
polyanthum
racemosum
tenuifolium
Szovitsianum

Myosotis macrantha

pyrenaica
repens
sylvatica

Myosurus minimus

Myriactis nepalensis

Myriogyne minuta

Myrrhis odorata

Narcissus Bulbocodium

cyclamineus
Pseudo-Narcissus var. mos-
chatus
triandrus var. albus

Nardus stricta

Nemesia versicolor

Nemophila maculata

Menziesii
— var. discoidalis

Nepeta concolor

distans
Govaniana
granatensis
latifolia
— var. grandiflora
macrantha
melissaefolia
Mussinii
nervosa
Wilsonii

Nicandra physaloides

violacea

Nicotiana acuminata

alata
rustica
Sanderæ
sylvestris
Tabacum
— var. petiolaris

Nigella arvensis

damascena
Garidella
hispanica
integrifolia
orientalis
sativa

Nolana atriplicifolia

paradoxa
prostrata

Oenanthe crocata

fistulosa
Lachenalii
pimpinelloides
silaifolia

Oenothera acaulis

amoena
Berteriana
biennis
— var. grandiflora
densiflora
fruticosa
glauca
— var. Fraseri
lepida
missouriensis
odorata
pumila
rosea
speciosa
Whitneyi

Omphalodes linifolia

Onobrychis viciaefolia

Ononis biflora
 hircina
 Natrix
 spinosa

Onopordon Acanthium
 tauricum

Onosma albo-roseum
 stellulatum

Ophiopogon intermedius

Orabanche Hederae
 major

Orchis foliosa
 incarnata
 latifolia
 maculata

Origanum Onites
 virens
 vulgare

Ornithogalum arcuatum
 narbonense
 nutans

Oryzopsis miliacea

Oxytropis argentea
 baicalensis
 campestris
 sulphurea
 uralensis var. *sericea*

Paeonia anomala
 corsica
 Delavayi
 macrophylla
 Mlokosewitchii
 peregrina
 tenuifolia
 Woodwardii

Palaua dissecta

Panicum amarum
 bulbosum
 capillare
 Crus-galli
 miliaceum
 proliferum
 sanguinale
 Teneriffæ

Papaver alpinum
 bracteatum
 caucasicum
 dubium
 glaucum
 hybridum
 lateritium
 macrostomum
 monanthum
 nudicaule
 orientale
 — var. *bracteatum*
 pavoninum
 pilosum
 Rhoeas
 — var. *latifolium*
 rupifragum
 somniferum
 — var. *album*
 strictum

Paracaryum coelestinum
 glochidiatum
 heliocarpum

Paradisea Liliastrum
 var. *major*

Parietaria officinalis

Parnassia palustris

Paronychia capitata

Paspalum dilatatum
 elegans

Patrinia gibbosa
 palmata

Peganum Harmala

Peltaria turkmena

Pennisetum macrourum

Pentstemon angustifolius
 arizonicus
 barbatus
 campanulatus
 confertus
 — var. *coeruleo-purpureus*
 cordifolius
 diffusus
 Eatonii
 gentianoides
 glaber
 heterophyllus
 hirsutus
 humilis
 laevigatus
 — var. *digitalis*
 Menziesii
 — var. *Douglasii*
 ovatus
 Richardsonii
 Scouleri
 secundiflorus
 Torreyi
 tubiflorus
 unilateralis
 Watsonii

Perezia multiflora

Petroselinum crispum

Peucedanum coriaceum
 hispanicum
 sativum
 verticillare

Phacelia congesta
 tanacetifolia
 viscida
 Whitlavia

Phalaris aquatica
 canariensis
 paradoxa
 tuberosa

Phaseolus aconitifolius
 multiflorus
 mungo
 ricciardianus
 tuberosus
 vulgaris

Phleum alpinum
 phleoides
 pratense
 tenue

Phlomis agraria
 alpina
 armeniaca
 tuberosa
 umbrosa

Phlox argillacea
 divaricata
 Drummondii
 paniculata
 — var. *alba*
 subulata

Physospermum commutatum

Physostegia virginiana

Phyteuma angustifolium
 Carestiae
 lobelioides
 nigrum
 orbiculare
 Sieberi
 spicatum
 Vagneri

Phytolacca acinosa
 clavigera
 decandra

Picridium tingitanum

Picris echiioides
 pauciflora

Pimpinella gracilis

Pisum arvense
elatius
sativum
— var. *umbellatum*

Plantago alpina
Candollei
Coronopus
Cyanops
indica
Lagopus
lanceolata
major
maritima
media
nivalis
Psyllium

Platycodon grandiflorum
— var. *Mariesii*

Poa annua
attica
caesia
caespitosa
Chaixii
chinensis
compressa
flabellata
flexuosa
nemoralis
pannonica
pratensis
violacea

Podolepis acuminata

Podophyllum Emodii
peltatum

Polemonium carneum
coeruleum
— var. *album*
— var. *himalayanum*
mexicanum
pauciflorum
reptans
sibiricum
viscosum

Polygonatum biflorum
multiflorum
verticillatum

Polygonum affine
alpinum
— var. *polymorphum*
capitatum
compactum
divaricatum
lanigerum
lapathifolium
Laxmannii
molle
orientale
rude
tortuosum
viviparum
Weyrichii

Polylepis ivesioides

Polypogon littoralis

Portulaca grandiflora

Potentilla alchemilloides
argentea
— var. *calabra*
arguta
argyrophylla
— var. *leucochroa*
aurea
Crantzii
— var. *pyrenaica*
crinita
Cryptotaeniae
depauperata
fragarioides
fragiformis
geoides
gracilis
gramnopetala
Griffithii
heptaphylla
Hippiana
hirta
Hopwoodiana
montenegrina

Potentilla—cont.
nepalensis
— var. *minor*
norvegica
pennsylvanica
recta
— var. *macrantha*
— var. *palmata*
Richardii
rivalis
rupestris
— var. *pygmaea*
sanguisorbifolia
sericea
speciosa
sterilis
supina
tanacetifolia
taurica
Thurberi

Poterium alpinum
obtusum
officinale
Sanguisorba
sitchense
tenuifolium
— var. *album*

Pratia begonifolia
repens

Prenanthes purpurea

Primula algida
anisodora
aurantiaca
Bulleyana
burmanica
Cockburniana
florindae
geraniifolia
helodoxa
involucrata
japonica
microdonta
— var. *violacea*
oblanceolata
pubescens

Primula—cont.
pulverulenta
saxatilis
scotica
secundiflora
sikkimensis
tibetica
Veitchii
vittata
Wardii
Wilsonii

Prunella grandiflora
vulgaris

Psoralea macrostachys
orbicularis

Pulicaria dysenterica

Puschkinia scilloides

Ramondia pyrenaica
serbica

Ranunculus aconitifolius
acris
amplexicaulis
arvensis
Cymbalaria
Flammula
Gouanii
lanuginosus
Lenormandii
Lingua
muricatus
parnassifolius
parviflorus
platanifolius
psilostachys
repens
sceleratus
trilobus
Villarsii

Raoulia glabra

Raphanus sativus

Reseda alba
lutea
odorata
Phyteuma
virgata

Rhagadiolus edulis

Rheum palmatum
Rhaponticum
spiciforme

Richardsonia pilosa

Ricotia Lunaria

Rodgersia aesculifolia
pinnata
Purdomii
sambucifolia
tabularis

Romulea Bulbocodium
candida

Rubia tinctorum

Rudbeckia amplexicaulis
californica
fulgida
laciniata
— var. *nitida*
maxima
speciosa
subtomentosa

Rumex acetosa
albusensis
conglomeratus
crispus
flexuosus
heterophyllus
maritimus
obtusifolius
palustris
Patientia
pulcher
salicifolius
sanguineus
scutatus

Sagina saginoides

Sagittaria latifolia
sagittifolia

Salvia Aethiopis
austriaca
clandestina
glutinosa
Horminum
interrupta
Jurassicii
lyrata
pratensis
— var. *Baumgartenii*
Schiedeana
Sclarea
tiliaefolia
Verbenaca
verticillata
virgata

Saponaria caespitosa
calabrica
cerastioides
lutea
officinalis
Vaccaria

Saracha umbellata

Satureia cuneifolia
montana
— var. *illyrica*

Saussurea albescens
salicifolia

Saxifraga aizoides
— var. *atrorubens*
Aizoon
— var. *balcana*
— var. *baldensis*
— var. *flavescens*
— var. *laeta*
— var. *notata*
calabrica

Saxifraga—cont.
cartilaginea x *cochlearis*
cochlearis
— var. *minor*
cordifolia
Cotyledon
decipiens
— var. *compacta*
x *Gaudinii*
Geum
— var. *crenata*
— var. *dentata*
Haagii
Hostii var. *altissima*
hypnoides var. *boreali-*
atlantica
lingulata
— var. *Albertii*
— var. *lantoscana*
x *Macnabiana*
Maweana
moschata var. *Rhei*
pedemontana
x *tazetta*
tenella
Timbalii
x *viridis*

Scabiosa anthemifolia var. *rosea*
atropurpurea
australis
caucasica
ciliata
Columbaria
crenata
daucoides
Fischeri
graminifolia
longifolia
macedonica var. *lyrio-*
phylla
ochroleuca
prolifera
Pterocephala
stellata
Succisa
sylvatica
triniaefolia
vestina

Schizanthus Grahamii
pinnatus
retusus

Schizopetalon Walkeri

Scilla bifolia var. *alba*
— var. *taurica*
Lilio-Hyacinthus
messenica
peruviana
pratensis
sibirica
— var. *alba*

Scirpus Eriophorum
Holoschoenus
sylvaticus
triqueter

Scleranthus annuus

Scopolia lurida

Scorpiurus sulcata
vermiculata

Scorzonera hispanica
laciniata

Scrophularia aquatica
nodosa
peregrina
Scorodonia

Scutellaria albida
alpina
altissima
galericulata
indica var. *japonica*
peregrina
Tournefortii

Securigera Coronilla

Sedum album
anopetalum
crassipes
dumulosum

Sedum—cont.

Ellacombianum
heterodontum
kamtschaticum
Kirilowii
maximum
Middendorffianum
multicaule
reflexum
roseum
rupestre
Semenovii
spathulifolium
— var. purpureum
spurium
— var. album
stoloniferum
Telephium
— var. Borderi

Selinum tenuifolium
vaginatum

Sempervivum arachnoideum
Doellianum
Funkii
glaucum
tectorum
triste

Senecio abrotanifolius
adonidifolius
alpinus
clivorum
Doria
Doronicum
erucifolius
japonicus
Ledebourii
Ligularia
macrophyllus
nemorensis
paludosus
Przewalskii
rufinervis
saracenicus
stenocephalus
suaveolens
tanguticus

Senecio—cont.

Veitchianus
Wilsonianus

Sericocarpus conyzoides

Serratula coronata
quinquefolia
radiata
tinctoria
— var. alba
— var. monticola

Seseli Libanotis
osseum
Pallasii

Sesleria autumnalis

Setaria glauca
italica
verticillata
viridis

Sherardia arvensis

Sida Napaea

Sidalcea candida
neo-mexicana

Sideritis hyssopifolia

Sieglingia decumbens

Silene alpestris
caucasica
ciliata
compacta
conica
conoidea
colorata
cordifolia
crassipes
cretica
Cucubalus
Delavayi
echinata
elegans

Silene—cont.

finabriata
Fortunei
Friwaldskyana
fruticosa
fuscata
gallica
gigantea
italica
linicola
maritima
Muscipula
nicaeensis
noctiflora
pendula
quadrifida
Reichenbachii
Salzmannii
Saxifraga
Sino-Watsonii
squamigera
tatarica
viridiflora
Zawadzki

Siler trilobum

Silphium Asteriscus
integrifolium
perfoliatum
scaberrimum
terebinthinaceum
trifoliatum

Silybum Marianum

Sisymbrium Irio
officinale
strictissimum
Thalianum

Sisyrinchium angustifolium
bermudianum
californicum
striatum

Smilacina racemosa

Smyrnum Olustratum
perfoliatum

Solanum Dulcamara
nigrum
villosum

Solidago arguta
caesia
Curtisii
Drummondii
elliptica
elongata
Gattingeri
juncea
latifolia
lithospermifolia
mollis
neglecta
nemoralis
odora
ohioensis
patula
petiolaris
pilosa
puberula
rigida
rugosa
serotina
Virgaurea
— var. cambrica

Sonchus arvensis
oleraceus
paluster

Sparganium simplex

Spartina alterniflora
Townsendii

Spergula arvensis

Sphaeralcea acerifolia
Fendleri

Spiraea Aruncus
— var. Kneiffii
camtschatica

Spiraea—*cont.*
decumbens var. tomentosa
palmata
vestita

Stachys alpina
arenaria
Betonica
— var. rosea
germanica
grandiflora
intermedia
palustris
silvatica

Stevia ovata

Stokesia cyanea
— var. alba

Stipa Calamagrostis
capillata
papposa
pennata

Swertia Kingii
perennis

Symphyandra pendula
Wanneri

Symphytum officinale
orientale

Synthyris reniformis

Tagetes erecta
lucida
patula

Tamus communis

Tanacetum argenteum
boreale
vulgare

Taraxacum officinale

Telephium Imperatii

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Tellima grandiflora

Teucrium Botrys
canadense
Chamaedrys
flavum
pyrenaicum
Scorodonia

Thalictrum angustifolium
aquilegifolium
calabricum
Chelidonii
corynellum
cultratum
dasycarpum
dioicum
Fendleri
flavum
foetidum
glaucum
minus
— var. adiantifolium
— var. elatum
— var. purpurascens
odoratum
simplex
squarrosus

Thermopsis fabacea
lanceolata
montana
rhombifolia

Thlaspi arvense
cepeae-folium
ceratocarpum

Thymus Chamaedrys
cimicinus
hyemalis
odoratissimus
Serpillum
— var. citriodorus
vulgaris

Tinantia fugax

Tofieldia calyculata
palustris

Tolpis barbata

Trachymene pilosa

Tradescantia reflexa
virginiana

Tragopogon crocifolius
major
orientalis
ruber

Tricyrtis latifolia
macropoda

Trifolium alpestre
arvense
glomeratum
incarnatum
Lupinaster
medium
montanum
ochroleucum
pannonicum
pratense
rubens

Triglochin maritimum

Trigonella coerulea
corniculata
cretica
foenum-graecum
polycerata
radiata

Trillium grandiflorum

Tripsacum dactyloides

Trollius altaicus
asiaticus
dschungaricus
europaeus
laxus
Ledebourii

Trollius—*cont.*
pumilus
— var. yunnanensis
sinensis

Tropaeolum aduncum
majus
minus
speciosum

Troximon laciniatum

Tulipa Kaufmanniana
praestans
sylvestris

Tunica Saxifraga

Urospermum picroides

Ursinia anthemoides
pulchra
speciosa

Urtica cannabina
pilulifera
• — var. Dodartii

Valeriana baltica
officinalis
pyrenaica
sambucifolia

Valerianella echinata
eriocarpa
rimosa
vesicaria

Venidium decurrens

Veratrum album
viride

Verbascum longifolium
nigrum
olympicum
phoeniceum
pulverulentum

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Verbena bonariensis
 hispida
 officinalis
 prostrata
 tenera
 teucrioides

Verbesina helianthoides

Veronica Allionii
 armena
 austriaca
 fruticans
 fruticulosa
 gentianoides
 grandis
 incana
 incisa
 longifolia
 nummularia
 officinalis
 orchidea
 orientalis
 pinguifolia
 prostrata
 spicata
 Teucrium
 thracica
 Tournefortii
 tubiflora

Vicia angustifolia
 atropurpurea
 bithynica
 calcarata
 cassubica
 Cracca
 disperma
 Ervilia
 Faba
 gigantea
 grandiflora
 lutea
 melanops
 narbonensis
 Orobus
 pyrenaica
 sativa
 sepium

Vicia—cont.
 sylvatica
 tenuifolia
 unijuga
 villosa

Vincetoxicum fuscum
 luteum
 nigrum

Viola blanda
 canadensis
 canina
 cornuta
 declinata
 elatior
 gracilis
 hederacea
 lutea
 mirabilis
 odorata
 pubescens
 rugulosa
 rupestris
 septentrionalis
 silvestris
 — var. alba
 striata
 suavis
 tricolor var. nigra

Volutarella muricata
 Wahlenbergia graminifolia
 Pumilio

Wulfenia carinthiaca

Xanthium echinatum
 strumarium

Zaluzianskya capensis

Zauschneria californica
 — var. mexicana

Zinnia Haageana
 pauciflora
 tenuiflora

Zephyranthes candida

Zygadenus elegans

TREES AND SHRUBS.

Acanthopanax divaricatus
 Henryi
 lasiogyne
 leucorrhizus var. scaberulus
 sessiliflorus
 setchuenensis
 Simonii

Acer cappadocicum
 circinatum
 Heldreichii var. macropterum
 hyrcanum
 Lobelii
 macrophyllum
 monspessulanum
 neglectum
 pennsylvanicum
 tetramerum
 Trautvetteri

Actinidia melanandra

Aesculus californica
 indica

Akebia lobata

Alnus cordata
 elliptica
 firma
 glutinosa
 hirsuta
 incana
 japonica
 nitida
 oregona
 pubescens
 serrulata
 sinuata
 subcordata
 tenuifolia
 viridis
 — var. mollis

Amelanchier asiatica
 canadensis
 florida
 laevis

Andromeda polifolia

Aralia chinensis
 — var. glabrescens

Arbutus Menziesii

Arctostaphylos Manzanita
 tomentosa

Baccharis patagonica

Berberis actinacantha
 aggregata
 — var. Pratii
 angulosa
 aristata
 Beaniana
 brachypoda
 buxifolia
 canadensis
 concinna
 consimilis
 Darwinii
 diaphana
 dictyophylla
 — var. albicaulis
 Edgeworthiana
 Francisci-Ferdinandii
 Hookeri
 koreana
 Lecomtei
 Leichtlinii
 Lycium
 morrisonensis
 orthobotrys
 polyantha
 pruinosa
 Sieboldii

Berberis—*cont.*

Silva-Taroucana
sinensis
Soulieana
subcaulialata
thibetica
Thunbergii
Tischleri
Veitchii
Vernae
virescens
Wilsonae
yunnanensis

Betula corylifolia
davurica
Ermanii
— var. nipponica
humilis
— var. kamtschatica
Jacquemontii
japonica
— var. mandshurica
— var. szechuanica
lenta
lutea
Medwediewii
papyrifera
— var. occidentalis
populifolia
pumila

Bruckenthalia spiculifolia

Buddleia albiflora
alternifolia
Fallowiana
nivea
stenostachya
variabilis
— var. amplissima
— var. magnifica
— var. nanhoensis
— var. Veitchiana

Buxus sempervirens

Callicarpa Giraldiana
japonica
koreana

Calycanthus occidentalis

Caragana ambigua
arborescens
— var. Redowskii
aurantiaca
Boisii
decorticans
frutescens
microphylla
sophoraefolia

Carpinus caroliniana
japonica
orientalis
Turczaninovii

Caryopteris tangutica

Cassandra calyculata

Cassinia fulvida
retorta
Vauvilliersii

Ceanothus americanus

Cedrus atlantica
Libani

Celastrus articulatus
Hookeri
Rosthornianus
rugosus
scandens

Celtis Bungeana
glabrata
occidentalis
pumila

Cephalotaxus drupacea
Fortunei

Cercis Siliquastrum

Chionanthus virginica

Cistus tanescens
corbariensis
cyprius
heterophyllus
hirsutus
laurifolius
monspeliensis
nigricans
populifolius
villosus

Clematis aethusifolia var.
latisecta
campaniflora
connata
Douglasii var. Scottii
Fargesii
Flammula
fusca
glauca var. akebioides
Gouriana
intermedia
montana
— var. rubens
orientalis
Pseudo-flammula
Rehderiana
serratifolia
Spooneri
vedrariensis
Veitchiana
virginiana
Vitalba
Viticella

Clerodendron Fargesii

Clethra acuminata
alnifolia
— var. Michauxii
— var. paniculata
barbinervis
monostachya
tomentosa
Wilsonii

Colutea arborescens var.
bullata
media
orientalis

Coriaria japonica

Cornus alba
Amomum
asperifolia
Baileyi
Bretschneideri
candidissima
Mas
Nuttallii
officinalis
paucinervis
pubescens
Purpusii
sanguinea
stolonifera

Corokia virgata

Cotoneaster acuminata
acutifolia
amoena
apiculata
bacillaris
bullata
buxifolia
congesta
divaricata
Franchetii
frigida
glaucophylla
Harroviana
hebeophylla
Henryana
horizontalis
hupehensis
lactea
Lindleyi
lucida
melanocarpa
— var. laxiflora
microphylla
— var. thymifolia
moupinensis
multiflora
obscura
pannosa
prostrata
racemiflora

Cotoneaster—*cont.*

rotundifolia
rubens
salicifolia
— var. rugosa
serotina
Simonsii
turbinata
Wardii
Zabelii

Crataegus acclivis

ambigua
arnoldiana
aulica
austromontana
Bartoniana
Beckwithae
berberifolia
canadensis
Carrierei
Chapmanii
chlorosarca
coccinea
coloradoides
cordata
corporea
cuneata
densiflora
dilatata
Dippeliana
durobrivensis
Egglestonii
Ellwangeriana
elongata
ferentaria
filipes
Fisheri
flavida
Forbesae
gloriosa
infera
integriloba
intricata
Jonesae
Lambertiana
Laurentiana
lenta
Macauleyae

Crataegus—*cont.*

Macounii
macracantha
missouriensis
modesta
mollis
neo-Canbyi
orientalis
pastorum
populnea
praecox
pratensis
pruinosa
prunifolia
punctata
rivularis
semi-orbiculata
sera
sinaica
stipulosa
straminea
succulenta
tanacetifolia
tomentosa
verecunda
Wattiana

Cupressus Lawsoniana

nootkatensis
obtusa
pisifera
thyoides

Cydonia cathayensis

Maulei

Cytisus albus var. durus

austriacus
grandiflorus
nigricans
praecox
ratisbonensis
scoparius
— var. Andreanus
sessilifolius
supinus

Daboëcia polifolia

Danae racemosa

Daphne Mezereum

Davidia Vilmoriniana

Deutzia compacta

corymbosa
gracilis
longifolia
macrocephala
mollis
reflexa
scabra
Schneideriana var.
laxiflora
Sieboldiana
Wilsonii

Diervilla florida

japonica
sessilifolia
venosa

Diospyros Lotus

Elaeagnus argentea

multiflora

umbellata

Enkianthus campanulatus

cernuus
Palibinii
perulatus
reflexus

Erica arborea

australis
scoparia
stricta
Tetralix
Veitchii

Euonymus lancifolius

latifolius
oxyphyllus
phellomana
planipes
Sieboldianus

Euonymus—*cont.*

ussuriensis
yedoensis
— var. Koehneana

Evodia hupehensis

Exochorda Giralddii var.

Wilsonii
macrantha

Fontanesia Fortunei

phillyraeoides

Fraxinus coriacea

lanceolata
oregona
Ornus
parvifolia
velutina

Garrya elliptica

Gaultheria procumbens

Shallon

Genista aetnensis

hispanica
pilosa
radiata
sagittalis
tinctoria
— var. elatior

Halesia carolina

Halimodendron argenteum

Hamamelis virginiana

Helianthemum alpestre

alpinum
alyssooides
appeninum
canum
formosum
halimifolium
hymettum
pilosum

Helianthemum—*cont.*
vulgare
— var. *rhodanthum*

Hibiscus syriacus
— var. *Hamabo*

Hippophae rhamnoides

Hoheria Lyallii
— var. *glabrata*

Hydrangea arborescens
Bretschneideri
paniculata
petiolaris
radiata
xanthoneura var. *glab-*
rescens
— var. *setchuenensis*
— var. *Wilsonii*

Hypericum Androsaemum
aureum
dubium
elatum
hircinum
inodorum
patulum
— var. *Henryi*
prolificum
undulatum
Webbii

Ilex cornuta
decidua
integra
macrocarpa
opaca
Pernyi
verticillata

Indigofera Gerardiana

Jamesia americana

Jasminum Beesianum
Wallichianum

Juglans cathayensis

Kalmia glauca
latifolia

Laburnum alpinum
vulgare

Ledum latifolium
palustre

Leiophyllum buxifolium

Leptospermum pubescens
scoparium

Leucothoë Catesbaei
racemosa

Leycesteria formosa

Ligustrum compactum
Delavayanum
Ibota
insulare
sinense
yunnanense

Lonicera alpigena
chaetocarpa
chrysantha
— var. *turkestanica*
conjugalis
deflexicalyx
Douglasii
flava
gynochlamydea
Henryi
hispida
iberica
involucrata
japonica
Koehneana
Ledebourii
longa
Maackii
minutiflora
Morrowii
muendeniensis

Lonicera—*cont.*
nigra
oblongifolia
obovata
orientalis
— var. *longifolia*
quinquelocularis var.
translucens
segreziensis
Sullivantii var. *hirsuta*
tatarica
trichosantha
Xylosteum

Lupinus arboreus

Lyonia ligustrina

Maackia amurensis

Magnolia glauca
hypoleuca
Lennei
parviflora
Soulangiana
tripetala

Meliosma cuneifolia

Menispermum canadense

Microglossa albescens

Muehlenbeckia axillaris

Myricaria germanica

Neillia amurensis
capitata
intermedia
longiracemosa
opulifolia
Torreyi

Olearia albida
erubescens
Hastii
odorata

Ononis fruticosa
spinosa

Oxycoccus macrocarpus

Oxydendrum arboreum

Paliurus Spina-Christi *

Paulownia Fargesii

Pernettya mucronata

Pertya sinensis

Petteria ramentacea

Phellodendron chinense
sachalinense

Philadelphus argyrocalyx
brachybotrys
— var. *purpurascens*
californicus
coronarius
Delavayi
Falconeri
incanus
inodorus
latifolius
Lewisii
Magdalenae
pekinensis
Satumanus
sericanthus
speciosissimus
tomentosus
verrucosus
Wilsonii

Photinia Beauverdiana var.
notabilis
villosa var. *sinica*

Pieris floribunda
formosa
japonica
Mariana

Pinus Armandii
parviflora
Piptanthus concolor
Platanus acerifolia
orientalis
Potentilla davurica
fruticosa
Prumnopitys elegans
Prunus emarginata
eminens
incisa
insititia
Mahaleb
Maximowiczii
serotina
serrulata
tomentosa
Ptelea isophylla
trifoliata
Pterostyrax hispida
Pyracantha angustifolia
coccinea
crenulata
Gibbsii
— var. *yunnanensis*
Rogersiana
— var. *fructu luteo*
Pyrus alnifolia
alpina var. *superaria*
americana
— var. *nana*
arbutifolia
Aucuparia var. *Backhousei*
— var. *moravica*
Conradinae
crataegifolia
decurrens
floribunda
Folgneri
Halliana

Pyrus—cont.
Hostii
Malus var. *Niedwetzkyana*
Meinichii
melanocarpa
minima
pekinensis
pinnatifida
pohuashanensis
Prattii
prunifolia
rotundifolia
Sargentii
scalaris
Scheideckeri
sikkimensis
Sorbus
theifera
Toringo
— var. *major*
toringoides
Tormalis
Tschonoskii
Vilmorinii
Wilsoniana
yunnanensis var. *Veitchii*
Zumi
Quercus castaneaefolia
Ilex
rubra
Raphiolepis japonica
Rhamnus caroliniana
cathartica
crocea
davurica
Erythroxylon
fallax
Frangula
imeretina
petiolaris
Purshiana
spathulifolia
Rhododendron adenogynum
adenopodum
aechmophyllum

Rhododendron—cont.
arhaurophyllum
ambiguum
brachycarpum
californicum
calostrotum
campylocarpum
carolinianum
caucasicum
charianthum
chartophyllum
concinnum
Cuthbertii
Davidsonianum
decorum
discolor
erubescens
Fargesii
Faurei
flavidum
fulvum
glaucum
halense
hippophaeoides
hypolepidotum
impeditum
keleticum
lepidotum
lochmium
maximum
Metternichii
micranthum
neriiflorum
oreotrephes
pleistanthum
polylepis
punctatum
racemosum
rigidum
rubiginosum
scintillans
shweliense
Smirnowii
telmateum
timeteum
trichocladum
triflorum
Tschonoskii
villosum

Rhododendron—cont.
virgatum
Weyrichii
yanthinum
yunnanense
Rhodotypos kerrioides
Rhus Potaninii
trichocarpa
verniciiflua
Ribes alpinum
aureum
Bethmontii
divaricatum
futurum
petraeum
sanguineum
stenocarpum
Warscewiczii
Robinia Kelseyi
Rosa alba
arkansana
blanda
calocarpa
cinnamomea
Davidii
elegantula
elymaica
Fargesii
flexuosa
glutinosa
graciliflora
gymnocarpa
Helenae
Hugonis
humilis
involuta var. *Wilsonii*
macrophylla
mirifica
mollis
moschata
Moyesii
multibracteata
nutkana
omeiensis

Rosa—*cont.*
 omeiensis var. atrosan-
 guinea
 — var. polyphylla
 — var. pteracantha
 pisocarpa
 Pokorniyana
 poteriifolia
 pyrifera
 rubrifolia
 rugosa
 saturata
 Seraphinii
 sericea
 sertata
 setipoda
 Soulieana
 stylosa var. evanida
 Sweginzowii
 virginiana
 Webbiana
 Willmottiae
 Woodsii var. Fendleri

Rubus biflorus
 flosculosus
 Giraldianus
 inopertus
 Koehneanus
 lasiostylus
 leucodermis
 mesogaeus
 occidentalis
 parvifolius var.
 Fraserianus
 phoenicolasius
 thibetanus
 triphyllus
 xanthocarpus

Ruscus aculeatus

Ruta graveolens

Schizandra chinensis

Securinega fluggeoides
 ramiflora

Sinofranchetia chinensis

Skimmia japonica

Smilax excelsa
 macrophylla
 scobinicaulis
 Sieboldii

Solanum jasminoides

Sophora viciifolia

Spartium junceum

Spiraea Aitchisonii
 altaiensis
 arborea
 — var. glabrata
 betulifolia
 bracteata
 canescens
 corymbosa
 discolor
 Henryi
 Lindleyana
 Miyabei
 mollifolia
 Rosthornii
 salicifolia
 Sargentiana
 sorbifolia var. stellipila
 tomentosa
 Veitchii
 Wilsonii

Stachyurus chinensis

Staphylea Coulombieri
 pinnata
 triflora

Stewartia Pseudo-camellia

Stranvaesia Davidiana
 — var. undulata
 salicifolia

Styrax Hemsleyanus
 japonicus
 Obassia
 Wilsonii

Symphoricarpus Heyeri
 occidentalis
 racemosus
 rotundifolius

Syringa amurensis
 Emodi
 japonica
 Julianae
 pekinensis
 pinetorum
 Potaninii
 reflexa
 Sweginzowii
 tomentella
 villosa
 Wilsonii

Taxus cuspidata

Thuja orientalis

Tripetaleia paniculata

Vaccinium corymbosum
 hirsutum
 ovatum
 simulatum

Veronica Colensoi
 gigantea
 glaucescens
 Guthriana
 Kirkii
 laevis
 Lindsayi
 pimeleoides

Viburnum acerifolium
 betulifolium
 bracteatum
 brevipes
 burejaeticum
 cotinifolium
 Davidii
 dilatatum
 Henryi
 hupehense
 lobophyllum
 Opulus var. americanum
 ovatifolium
 theiferum
 Veitchii

Vitis Coignetiae
 sinensis
 vulpina

Zanthoxylum Bungei

Zenobia speciosa
 — var. pulverulenta

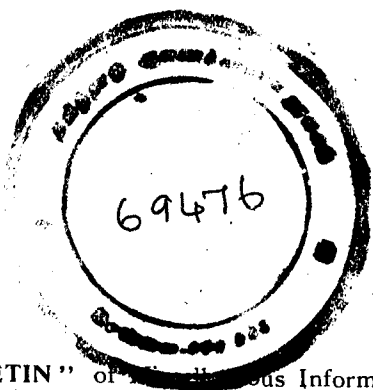
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