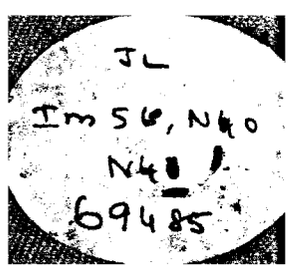
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BULLETIN OF MISCELLANEOUS INFORMATION

1940

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ERRATUM.

Kew Bulletin, Appendix, 1939. p. 693, line 19, for " east " read " west."

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BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1940

ROYAL BOTANIC GARDENS, KEW

I—THE STRUCTURE AND DEVELOPMENT OF SOME APOMICTS OF TARAXACUM.

W. M. CURTIS.*

INTRODUCTION.

In the genus *Taraxacum* a large number of biotypes have been recorded which, when grown under similar experimental conditions, show marked morphological differences. The biotypes now studied were grown, except when used in controlled experiments, in the open in garden soil in the Herbarium Experimental Ground at Kew, the conditions of soil, moisture and light being as uniform as possible. Seedlings of the same age obtained from the seed of one plant were grown in rows; the plants in one row were very uniform but often quite distinct in habit and leaf shape from the plants in other neighbouring rows grown from seeds of different strains. While the biotypes are morphologically distinct, there may be in any one of them a considerable degree of variation influenced by factors affected by age, by the supply of food, by light and moisture. Turrill (1938) has discussed the taxonomic status of biotypes of *Taraxacum* and has drawn attention to their plasticity. The present observations and experiments on variation in the biotypes are concerned mainly with the characters of the leaves and their variation in relation to the conditions enumerated above. The origin of the material of the biotypes used is given in the appendix to this paper, where it is shown that apomixis has been proved for two of the biotypes discussed. The leaf shape characteristic of each biotype at the time of full flowering (April-May) in the plant's second growing season, is shown in Figures 1 and 2.

EXPERIMENTAL WORK WITH PLANTS GROWN IN THE OPEN.

Variation with age.—Seeds of one apomict, Z.73, collected in May 1937 were planted the following February in a cool greenhouse. The seedlings produced 3 or 4 entire leaves: they were then transplanted to the beds in the open in full sunlight. Deeply lobed leaves were developed throughout the year. A similar sequence was obtained with the morphologically distinct apomict Z.145 when seeds were planted in June. Leaves characteristic of these apomicts are shown in diagrams 1 and 2, Figure 1.

During the second growing season a succession of types of leaf was shown. Detailed records of one plant from a row were made, involving the removal of a leaf at intervals of 14 days throughout the season. One biotype, Z.179, formed deeply lobed leaves in

* The research on which this paper is based was carried out under the aegis of the Association for the Study of Systematics in Relation to General Biology.

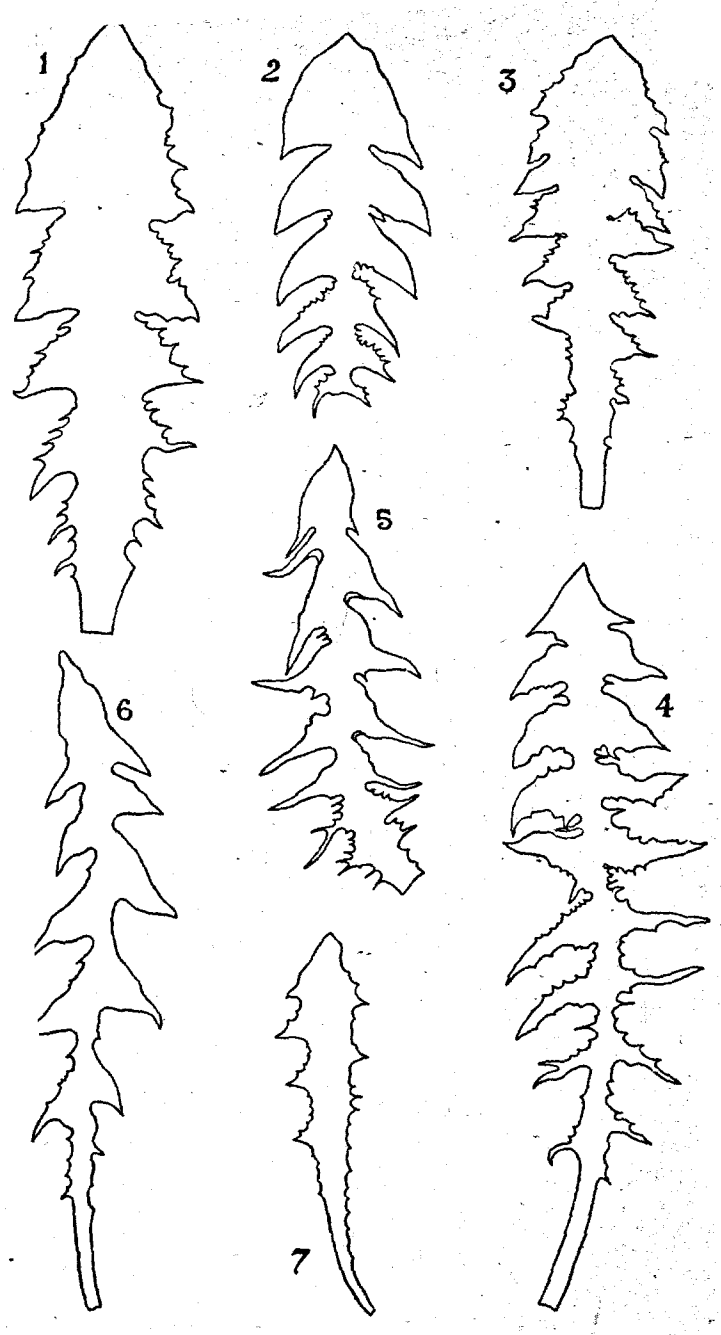

Fig. 1. Outlines of leaves of various biotypes collected at the time of full flowering in the second growing season, April–May, 1936. Reference numbers of biotypes :—1, Z.73 ; 2, Z.145 ; 3, Z.179 ; 4, Z.190 ; 5, Z.208 ; 6, Z.193 ; 7, Z.196. All diagrams × ½.

February 1936, which increased in size until after the plant flowered in April. A typical leaf is shown in diagram 3, Figure 1 ; the maximum length reached was 17 cm. When fruits formed the leaves were large but less deeply lobed and succeeding leaves were broad, spathulate and had only slightly toothed margins. In October, dissected leaves were again found and these persisted through the winter. They were, however, smaller, the maximum length being 10 cm., and less regularly lobed than the leaves found in the spring. In the third and fourth years of growth, flowering in April was associated with leaves exactly similar to, though rather smaller (maximum length 11 cm.) than, those found in the second year. This sequence is very similar to that recorded for a strain of *T. officinale* by Griffiths (1924).

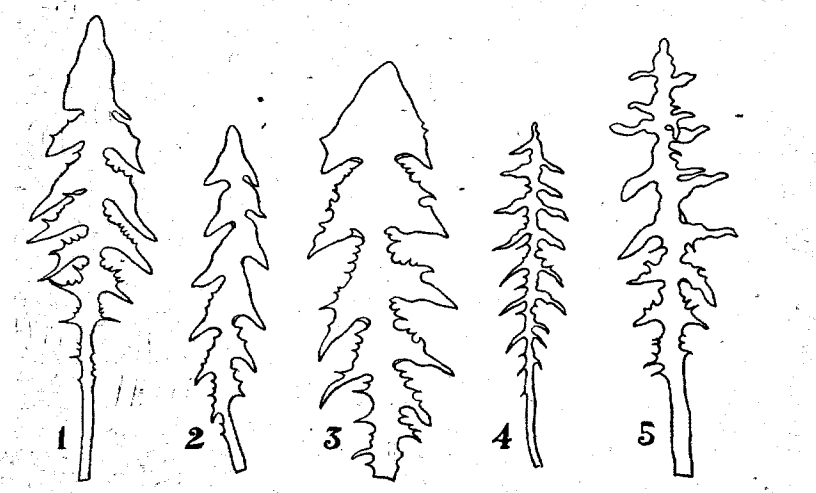

Fig. 2. Outlines of leaves of various biotypes collected at the time of full flowering in the second growing season. Reference numbers of biotypes :—1, Z.194 ; 2, Z.301 ; 3, Z.257 ; 4, Z.282 ; 5, Z.291. All diagrams × ½.

The succession of leaves in five other biotypes, Z.190, Z.199, Z.208, Z.193, Z.196, recorded during their second year of growth in 1936, was from a deeply lobed type persisting until after flowering in April and May, to an entire non-dissected shape which was found throughout the autumn and winter. The lobed leaves characteristic of those biotypes in May are shown in diagrams 4–7, Figure 1. The sequence of leaves produced by the biotype Z.199 is shown in Figure 3. In two of these strains, Z.193 and Z.196, it appears probable that the persistence of the entire type of leaf was due to the removal of the leaves taken for record, since untouched plants in the same rows produced lobed leaves in October. The normal sequence in these two biotypes would then be similar to that of Z.179. A slightly different sequence was shown by a biotype Z.194 where the early spring leaves were not lobed. Here also, lobed leaves, shown in diagram 1, Figure 2, were associated with

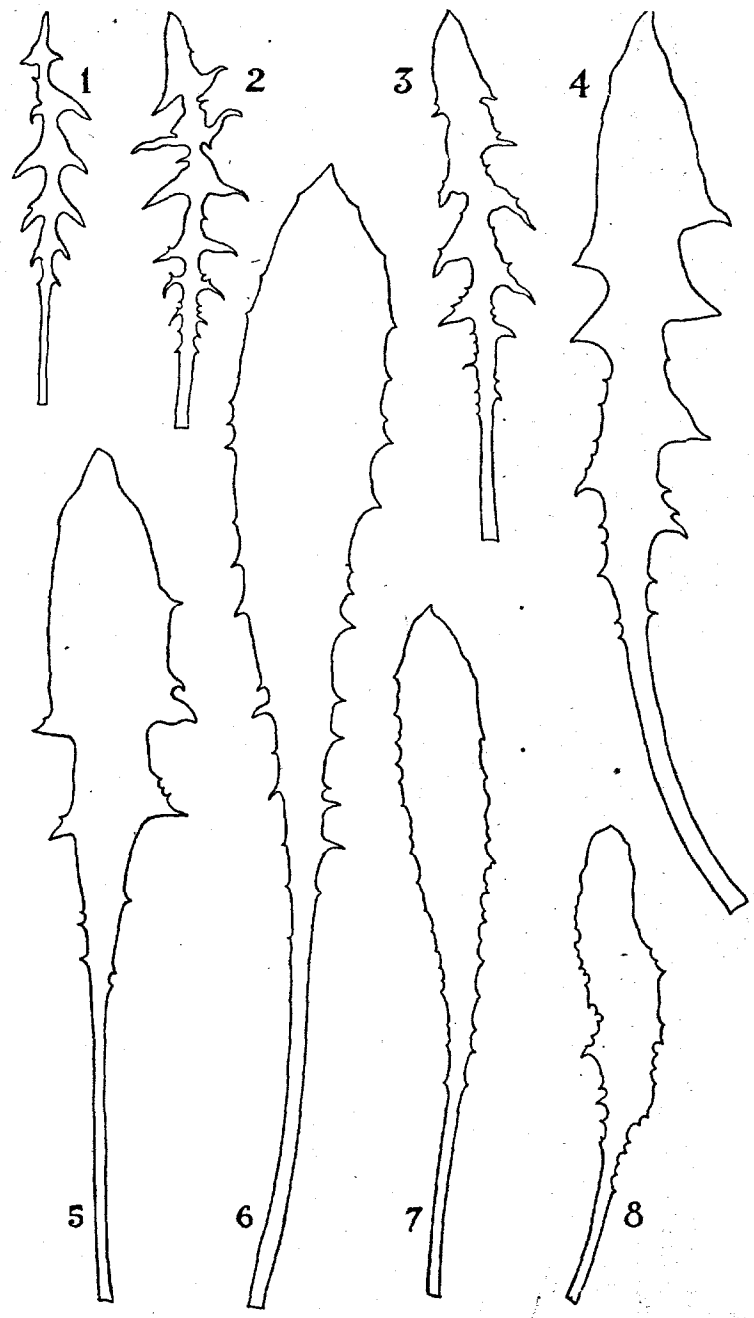

Fig. 3. Outlines of leaves collected from plant Z.199/E during the second growing season. Times of collecting:—1, 14-3-1936; 2, 27-3-1936 (plant flowering); 3, 24-4-1936; 4, 23-5-1936; 5, 3-6-1936; 6, 22-6-1936; 7, 26-8-1936; 8, 10-9-1936. All diagrams × ½.

flowering and were followed by entire leaves. The latter persisted through the winter in a plant from which leaves were removed for record, but in untouched plants were replaced by lobed leaves in the autumn.

During the third growing season all except two of the biotypes described had, at the time of flowering in April, leaves which were less dissected than those found in the second year. The lobes tended to be broader, more irregular and without any of the backward prolongations which were previously characteristic. Leaves collected from a plant of the biotype Z.199 during the third and fourth growing seasons are illustrated in Figure 4. The exceptions were the strains Z.196 and Z.179. Of these, Z.196 died after transplanting and Z.179 repeated the leaf pattern of the previous year.

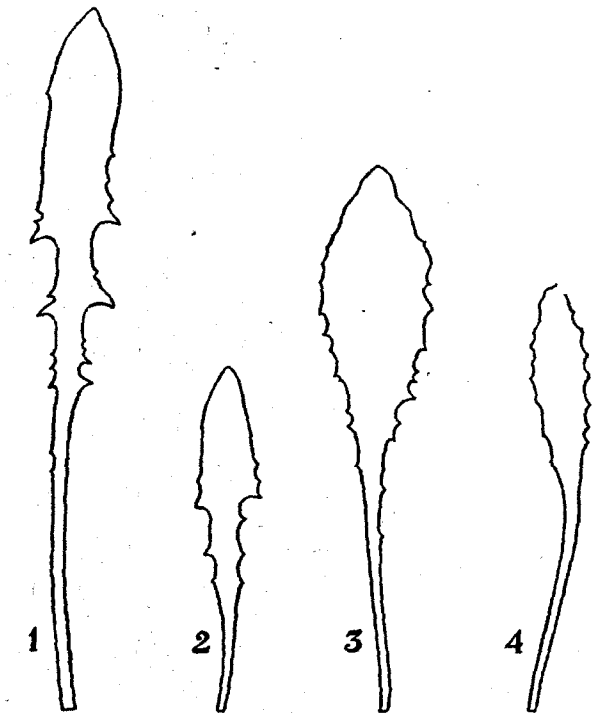

Fig. 4. Outlines of leaves collected from plant Z.199/E during the third and fourth growing seasons. Times of collecting:—1, 25-4-1937; 2, 9-4-1938; 3, 10-8-1938; 4, 14-10-1938. All diagrams × ½.

Older plants of strain Z.145, studied in their fourth and fifth growing seasons, had crowns divided into a number of rosettes. The leaves showed a sequence from an irregularly lobed type in the spring to a less dissected type at the time of flowering: the latter leaf shape persisted through the winter. In all plants the position of the leaves varied according to the biotype and the season and

could be classified as flattened, sub-erect, or erect. In the older plants the leaves remained sub-erect or erect in marked contrast to the flattened position often taken by the leaves of younger plants in early spring.

Some alteration in leaf shape during the ageing of plants grown in special conditions are discussed later.

Regeneration following injury.—The regeneration of leaves following the removal of the crowns of plants of different ages was recorded. Three first-year plants, biotypes Z.301, Z.257, Z.282, having deeply lobed leaves (as shown in diagrams 2–4, Figure 2), were used and the crowns removed in July 1937. The new leaves which soon appeared were entire and remained so throughout the winter, affording a strong contrast with the deeply lobed leaves of the undamaged plants of the same strain. In the following spring the three plants with regenerated crowns had lobed leaves, the plants flowered and were indistinguishable from the undamaged plants in their rows. The new rosettes here repeated, though more slowly, the sequence of leaves developed by the seedling. They may be compared with the plants studied by Sears (1922). When the crowns were removed in May 1937 from three four-year-old plants of the apomict Z.145 already described, the new leaves developed in June were slightly and irregularly lobed but were identical with those found at the same time on undamaged plants of the same age. They also followed the same sequence of changes, which was recorded until autumn of the following year.

In a plant of the biotype Z.208 the leaves were eaten and completely destroyed in June, during the second growing season; the growing point, however, remained. The new leaves produced were all lobed and comparable with those of undamaged plants of this strain.

The plants (ramets) obtained by cloning an old plant showed a definite but slow change in leaf form, from an entire to a dissected type. Plants five to six years old having crowns consisting of a number of rosettes with entire leaves, were divided; about twelve ramets from each of the two plants used were planted in soil new to dandelions. The apomicts used were Z.145, cloned in September 1937, and Z.73, cloned in November 1937. In the following June the leaves of the ramets were entire and very similar to those of the old plants of the same stock, the largest leaves of ramets of Z.73 were about 12 cm. long. In October the leaves of the ramets had become large, for Z.73, 23 cm. long, and dissected, in contrast to the smaller entire leaves of the old plants. The largest leaves of the old plants of Z.73 in October measured 13 cm. in length. In these experiments some of the rosettes planted had all the old leaves removed, in others they were allowed to remain. Various amounts of the old root were left. The ramets which developed showed no differences corresponding to these different

treatments. Further experiments on the regeneration of plants grown under special conditions in a greenhouse are discussed later.

The influence of food supply.—Two sets of culture experiments carried out with small numbers of plants to test the effect of the supply of the elements nitrogen and calcium, suggest that the fully lobed leaves characteristic of a particular biotype are developed only if these elements are provided. In the first experiments, begun in July 1937, the apomicts Z.145 and Z.73 were used. Seedlings having about three leaves, the largest not more than 8 cm. long, were planted in sand in 7 in. pots which were sunk in the open, exposed to full sunlight. Three plants of each apomict received a culture solution poor in nitrates and the same number received a complete solution containing additional nitrates. Two months later the plants deprived of nitrates had leaves slightly but definitely less dissected than those of the controls.

Further experiments were carried out in September 1938 in the laboratory, using the apomict Z.73. Seedlings were again grown in sand and the pots placed in sunlight. Three plants received a complete culture solution, three a solution poor in calcium, and three a solution without nitrates. Three months later the plants having the complete solution had an average number of 22 leaves,

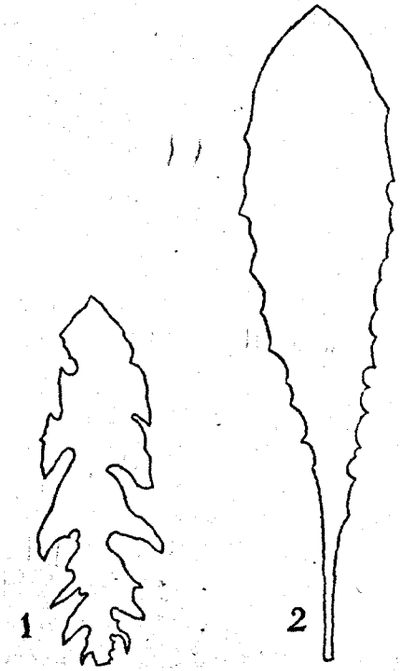

Fig. 5. Outlines of leaves from plants of the biotype Z.145. Seed planted 28-5-1937: leaves collected 21-9-1937. 1. Plant grown in sunlight. 2. Plant grownin the shade. Diagrams × ½.

the eighth or ninth and succeeding ones being lobed ; those receiving a poor supply of calcium had an average of 18 leaves, slightly less lobed. Those without nitrates had only 6 leaves, which were entire. The nitrogen starved plants, obviously retarded in their development, presented a marked contrast with the differently treated plants of the same age ; they may be compared with the plants described below, which were grown in dull light.

The influence of light.—Preliminary experiments with two apomicts Z.145 and Z.73 showed the very marked influence of light on leaf form. Seedlings from the same batch as those used for the first culture experiments were planted in July 1937 in pots using garden soil. Three pots containing plants of the apomict Z.145 and four of Z.73 were sunk in the ground in the open and exposed to full sunlight. The same number of plants in pots were sunk in the ground in a position shaded throughout the day by a large lime tree. As far as possible, all the plants were kept equally moist. Two months later the plants grown in sunlight had flattened rosettes of lobed leaves, the largest formed by Z.73 being 9·5 cm. long ; the plants grown in the shade had sub-erect rosettes the leaves being larger, for Z.73, 15·5 cm. long, and entire. Leaves from plants of the apomict Z.145 are shown in Figure 5.

The total number of leaves produced by plants grown for three months in the sun was considerably greater than that formed by plants of the same age grown for the same time in the shade. The average numbers were approximately, for Z.145, 13 in the sun, 5 in the shade ; for Z.73, 18 in the sun, 7 in the shade. One plant of the apomict Z.73 was in a position reached by sun flecks and it was noticeable that the leaves of this plant were more dissected than those growing in the complete shade.

Experimental work with Plants grown under Special Conditions.

Treatment with growth substances.—In order to test the possibility that the differences in leaf shape might be connected with the supply of growth hormones, plants were grown at Kew in a cool shaded greenhouse where the conditions were such that entire leaves were formed. The seedlings were then treated with the three growth substances α napthaline acetic acid, β indole acetic acid, and β indole butyric acid. Solutions of two concentrations were used, 1 : 20,000 and 1 : 2000. These were prepared by dissolving the weighed quantity of the growth substance in a small amount of methylated spirit, after which the required volume was made up with tap water. About 6 cc. of the solution was sprayed on the leaves of each plant by an atomiser. The growth substances were also applied in lanoline paste prepared by warming 1 gm. of hydrous lanoline until it just melted, when ·05 gms. of the substance were stirred in. The paste was applied when it was cold, to the growing point or youngest leaves of the plant.

In the first experiments only β indole acetic acid solution of the lower concentration was used. Seedlings of the apomict Z.73, which had two or three leaves between 2 and 3 cm. in length, were treated at the beginning of May 1938. Six plants in the greenhouse were sprayed and as controls six untreated plants were grown in the greenhouse. Plants were also grown in pots sunk in the ground in the open in full sunlight and of these, six were sprayed with β indole acetic acid solution and six left as controls. No response to the first application of the growth substance was obtained and the treatment was repeated every fourth day for thirty-two days, but without positive results. In August, treated and untreated plants in the greenhouse had exactly similar entire leaves, 18 cm. long, like those produced by this biotype when grown in the shade in the open in previous experiments. The plants grown in sunlight had more numerous and deeply lobed leaves. The plants sprayed with β indole acetic acid appeared to be somewhat more vigorous than the controls.

In further experiments, seedlings of the apomict Z.145 were treated with solutions of the three growth substances at the higher concentration. Seedlings having three leaves, the largest 6 to 7 cm. long, were selected at the end of June 1938. Six plants grown in the greenhouse were treated with each solution and six untreated plants were grown in the greenhouse and in the open. Twenty-four hours after treatment the leaves of all the plants sprayed were rolled tightly outwards ; five days later they remained only slightly curled. After seventeen days differences were noticeable between the sets of plants, those sprayed with α naphthaline acetic acid had made no apparent growth, those sprayed with β indole acetic acid were growing vigorously, while those treated with β indole butyric acid were less vigorous than the control plants or those which received β indole acetic acid. At the beginning of October the control plants in the greenhouse had six entire leaves, the largest being 23 cm. long. The leaves of all the plants grown in the greenhouse and sprayed with growth substances were of this same shape, the only difference seen between the sets of plants was in the amount of growth made. Of the plants treated with α naphthaline acetic acid, two had died, two were very retarded, having only three leaves, less than one third the size of those of the controls, and two were making fairly good growth. Plants which received β indole acetic acid continued to grow rather more strongly, and those which received β indole butyric acid rather less strongly, than the controls. The plants in the sun had at this time eighteen deeply lobed leaves, the largest 19 cm. long.

Experiments using the same three growth substances in lanoline paste were also begun in June, using the seedlings of the apomict Z.145. Six seedlings were treated with each growth substance. Twenty-four hours after treatment the leaf bases had become bent so that the leaves were flattened instead of in a sub-erect position.

Some flattening persisted for twelve days and the tips of the youngest leaves in contact with the paste did not develop. A second application of paste was made fourteen days after the first. After a further twenty-four hours the application of α naphthaline acetic acid and of β indole acetic acid had caused flattening of the leaves but treatment with β indole butyric acid had no visible effect. In October the plants treated with α naphthaline acetic acid had all died, those treated with β indole acetic acid were indistinguishable from the controls, those treated with β indole butyric acid were similar in growth but less vigorous.

The shape of the leaf produced by the apomicts Z.73 and Z.145 when grown in dull light for seven months is seen to be unaltered by the application of the three growth substances α naphthaline acetic acid, β indole acetic acid and β indole butyric acid, although these substances may affect the general vigour of the plant.

The effect of the growth substances contained in the proprietary product "Auxan," on plants of the strain Z.145 was tested. A five-year old plant was taken in August 1938 and sixteen ramets obtained from it. On the crowns taken, three or four leaves were retained, the largest not more than 6 cm. long. A length of 2–3 cm. of root was left and was cut across diagonally. The roots of eight ramets were dipped in "Auxan" and four planted in the sun and four in pots in a shaded greenhouse. The same number of untreated ramets were planted as controls. All the plants made new growth but no difference between treated and untreated plants was seen at any time during the six months that the experiment was in progress.

An experiment in grafting.—If the difference between the leaves formed by plants of the same biotype grown in the sun and in the shade is connected with the presence of hormones effective only in certain conditions, it is conceivable that such growth substances might pass across the cut surfaces of a graft and influence the new leaves developed from graft or stock. Plants of the apomict Z.73 were used in this experiment. One plant, grown from seed planted in February 1938, in a pot sunk in the ground in the open, had in August developed a crown of characteristic lobed leaves. The pot was then taken to a cool shaded greenhouse and the crown of the plant removed. Two other plants of the same age which had been grown in the shade and had entire leaves were also taken and the crown removed from one of them. From the other, the leaves were removed and the crown cut to the shape of a wedge 1·5 cm. in length. This was used as the graft and inserted in a wedge-shaped incision in the root of the plant grown in the sun. Graft and stock were bound together. The plants were kept in the greenhouse. Four weeks later the plant grown from seed in the shade had developed entire leaves, while the graft had leaves slightly and irregularly lobed. No leaves were at this time developed from the stock, but after a further three weeks slightly lobed leaves were

found. These types are illustrated in Figure 6. The graft did not continue to grow; graft and stock became separated by layers of cork. The result of this experiment, suggesting some influence of stock on graft, needs to be confirmed by a number of further experiments with grafts and must also be interpreted in the light of the experiments on the regeneration of crowns and of the data on the development of leaves, given below.

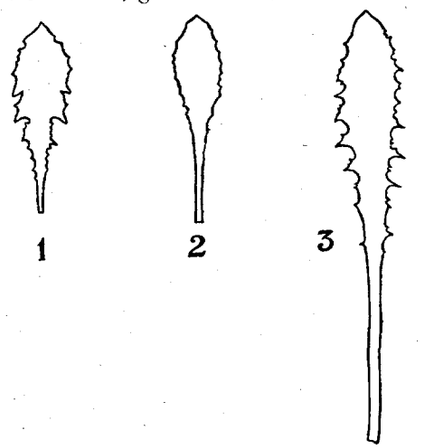

Fig. 6. Outlines of leaves from plants of the biotype Z.73, grafted six months after germination. 1. Leaf from graft taken 4 weeks after grafting. Plant grown in the shade. 2. Leaf growing from cut crown of a plant grown in the shade, 4 weeks after the crown was removed. 3. Leaf from stock taken 7 weeks after the crown was removed and graft made. All diagrams × ½.

Regeneration following injury.—Four plants of the same apomict, Z.73, as those used in the previous experiment were taken in October 1938. They had been grown from seed planted in the previous March in pots sunk in the ground in the open. The plants had produced deeply lobed leaves. The main roots had grown through the drainage holes of the pots to the soil below and were broken across when the pots were removed. The crowns of the plants were cut off and the pots placed on their sides, three in the shaded greenhouse and one in the open. Dandelions quickly develop numerous buds when the crowns are removed: if a growth substance influencing growth shape were present and this diffused downwards, the buds developed at different levels might show the influence of the hormone in varying degrees.

Seven weeks after the crowns were removed new leaves had developed at the anterior ends of all the plants. Also in two of the plants grown in the greenhouse callus had formed at the distal ends of the cut roots and in one of them leaves were also produced from this end. Three months later the plants presented a very varied appearance: that in the open had broad dissected leaves, and of the plants in the greenhouse one had entire leaves and one having five

buds had only entire leaves developed from three of them, but slightly lobed leaves were formed from the two lower buds. In the latter plant lobed and entire leaves were, three weeks later, found in the same bud. The remaining plant continued to develop leaves at each end of the root. These are shown in plate 1, fig. 1, taken in February 1939, twenty weeks after the crown of the plant was removed. Nine leaves were developed from the distal end : these were definitely lobed, dark green in colour and had hairs scattered over midrib and blade. The fifteen leaves formed at the anterior end were, with the exception of two slightly lobed leaves produced from buds at the lowest level, entire ; they were lighter in colour and hairs were less numerous. The leaves at each end of this plant had been exposed to similar external conditions, although the rim of the pot would possibly have caused additional shading during the early stages of development of the leaves at the anterior end.

Variation with age of plants grown in the shade.—The plants treated with growth substances in May and June 1938 were, with the control plants, grown in the shaded greenhouse for a further twelve months. For several months only entire leaves were developed in contrast to the deeply lobed leaves produced by plants of the same stock and age grown in full sunlight. Later, the shaded plants showed a sequence of leaf-forms irrespective of their treatment with growth substances but depending on the age of the plant from seed and it appears that the effect of shading is to retard rather than to inhibit completely, the production of lobed leaves by biotypes normally producing them. Plants of the apomict Z.73 grown from seed planted in February 1938 had at the end of October developed lobed leaves ; plants of the same strain grown in the same conditions from seed planted in November 1937, formed slightly lobed leaves in the following May and distinctly lobed ones in August. Plants of the apomict Z.145 behaved similarly ; those grown from seed planted in June formed lobed leaves at the end of November. The lobed leaves formed in these conditions were characteristic for the biotype but distinct from those developed in full sunlight. They are illustrated for Z.73, in Figure 7. In these experiments the shading of the greenhouse was not absolutely complete, sunlight penetrated for a short time in the early mornings during July and October.

The influence of moisture.—Seedlings of the apomict Z.73 planted in pots in April, were grown in the greenhouse as in the previous experiments. Four plants were given only sufficient water to prevent wilting ; four similar plants, watered freely, were covered by a bell jar. Control plants were given a liberal amount of water but were left uncovered. In August the leaves of all the plants were entire, but there were some differences in their proportions : the leaves of plants kept dry were shorter (maximum length 16·5 cm.) and those of the plants grown in a moist atmosphere were longer (maximum length 21·5 cm.) than those of the controls, the maximum

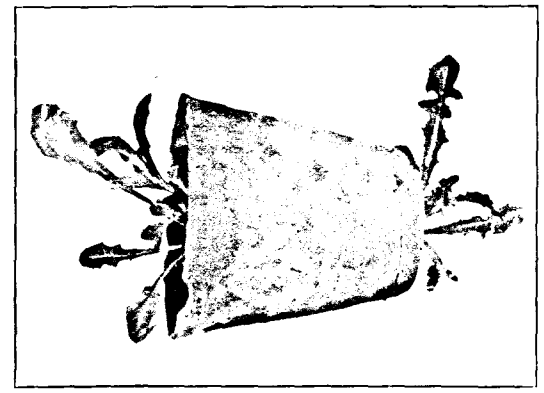

Fig. 1. Plant of the biotype Z.73, showing leaves formed from buds developed after the crown was removed and the root cut across ; original crown on left.
Photo. taken 27.2.39. × $\frac{1}{3}$.

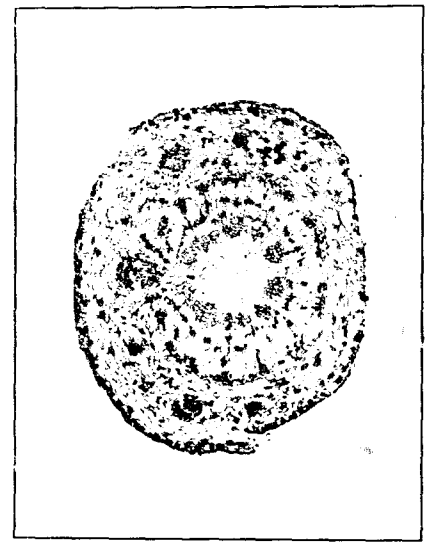

Fig. 2. Transverse section of young vertical rhizome. × 17.

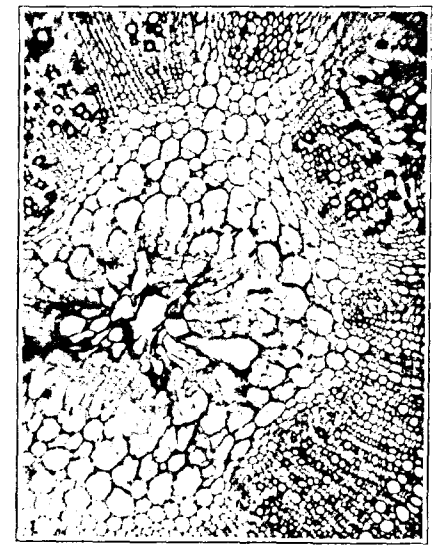

Fig. 3. Transverse section of the crown of a plant before the elongation of the inflorescence axis. × 47.

Fig. 4. Transverse section of root showing secondary cambium. × 41.

[*To face page* 12

length of which was 19 cm. In September, lobed leaves were formed by the plants kept dry and in December three of these plants had only lobed leaves. The crown of the fourth plant had divided, although no inflorescence axes could be seen, and the two rosettes had entire leaves. The new rosettes, as in the plants described by Sears (1922), developed a leaf shape characteristic of young plants. The three plants with lobed leaves contrasted strongly with those kept very moist; in these only entire leaves were found. Drought was seen to increase the dissection of the leaves when the dry conditions obtained for several months.

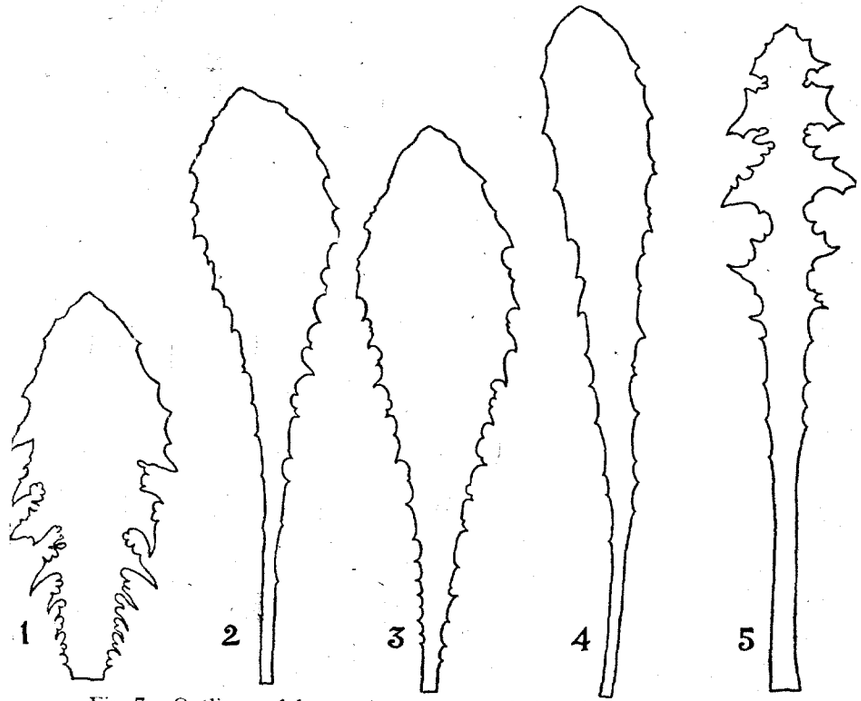

Fig. 7. Outlines of leaves from plants of the biotype Z.73 grown in different conditions. Diagrams 1–4, leaves from seed planted February 2nd, 1938. Diagram 5, leaves from seed planted November 15th, 1937.

1. Plant grown in the open in sunlight. 2. Plant grown in unheated greenhouse, shaded. 3. Plant grown in unheated greenhouse, shaded, kept dry. 4. Plant grown in unheated greenhouse, shaded, kept very moist. 5. Plant grown in unheated greenhouse, shaded. All diagrams $\times \frac{1}{2}$.

Pearsall & Hanby (1926), in a study of the modifications of the leaf as laid down in the bud and the development of its final form in some woody Dicotyledons, have shown that leaf growth is affected by hydrostatic pressures, being increased by positive pressures and restricted by negative ones. They found that the seasonal variations in leaves such as those of sycamore could be explained by the

variation in internal hydrostatic pressure. Sycamore leaves were more dissected in the summer when conditions were such that a negative pressure was produced. Griffiths (1924) referring to a preliminary account by Pearsall & Priestley, on factors affecting leaf form, suggested that the leaf of *Taraxacum* might be particularly sensitive to changes in water pressure, a low water pressure being associated with dissected leaves.

Development and Structure of the Leaves.

The foliage leaves are arranged to form the characteristic rosette at the surface of the ground, the internodes of the stem remaining very short. The phyllotaxis is commonly $\frac{3}{8}$ but, as in other rosette and semi-rosette hemi-cryptophytes such as *Crassula orbicularis* described by Raunkiaer (1934), the vertical members of a series sometimes show a slight divergence from strictly superimposed rows.

The persistence of the leaves varies with the biotype and with the season. At the end of August 1936, actively growing leaves of the biotypes Z.193, Z.196, and Z.208 were marked when they were 6–8 cm. long. Fourteen days later the leaves had reached their full size for the season, in Z.193, 16·5 cm., in Z.196, 12 cm., in Z.208, 9 cm.; they were withering thirty days after they were first marked.

The total number of leaves developed by a plant of a particular biotype in a certain time was found to depend on the environmental conditions. Figures have been given to show the larger number of leaves developed by plants given a complete culture solution in comparison with the number formed by nitrogen starved plants in the same time. Preliminary experiments to compare plants grown in the sun and in the shade showed that the plant grown in the sun formed the larger number. In a further experiment of this kind, seed of the apomict Z.73 was planted in February 1938. A plant grown in the sun had in November 1938 developed more than 100 lobed leaves, vigorous flowering had taken place in October and the crown had become divided into a number of rosettes. A plant of the same age grown in the shade had in November produced only 19 entire leaves. Development in these apomicts was therefore much more rapid in the sun than in the shade.

The lobed leaves characteristic of a particular biotype are laid down at a very early stage in the development of the rosette. The smallest leaves, 0·56 mm. in length, that could be dissected from the growing points of plants of the apomict Z.73 grown in the sun for five months, showed clearly the four lobes characteristic of the mature leaf. The material examined was cleared in lactic phenol and in the leaves 0·56 mm. long, vascular tissue was found to be indicated only by elongated cells in the position of the midrib. The ratio of the width of the leaf across the sinus to that across the lobe, measured at right angles to the midrib, varied from 1 : 1·3, to 1 : 1·9, in five leaves measuring between 0·56 mm. and 2 mm. in

Table I.

Number of Cells in Sections taken across Sinus. Width of Blade, 3·65 mm.

Number of cells in Upper Epidermis*	Number of Stomata	Number of cells in palisade	Number of air spaces of width greater than 1 palisade cell.
154	9	198	8
160	8	180	8
161	5	177	8
153	7	199	6
156	5	193	10
152	8	179	9
159	6	181	7
161	7	186	8
163	7	191	7
156	9	192	8

Average number of epidermal cells per mm. (stoma counted as 1 cell), 45.

Average number of palisade cells per mm. (1 air space counted as 1·5 cells), 52.

Table II.

Number of Cells in Sections taken across Lobe. Width of Blade, 5·55 mm.

Number of cells in Upper Epidermis	Number of Stomata	Number of cells in palisade.	Number of air spaces of width greater than 1 palisade cell
238	15	268	18
239	11	286	10
249	12	280	8
226	13	256	12
235	11	275	12
240	12	270	15
242	12	278	10
238	11	269	13
241	10	272	12
236	11	279	13

Average number of epidermal cells per mm. (calculated as above), 45.

Average number of palisade cells per mm. (calculated as above), 53.

* Actual counts of " cells " as seen in transverse sections. Possibly the actual number of cells is somewhat lower owing to irregularity in contours and the counting of lobes as cells. The same remark applies to the next table. The figures in the two tables should, however, be considered comparable in general terms.

length. The proportions were 1 : 1·8, to 1 : 2·3, in five leaves measuring between 9 cm. and 11·5 cm. in length.

The later development of the young leaves in the bud, involving the maintenance of the degree of dissection seen at early stages and some increase in it, would appear to be brought about by cell division rather than by alteration in the size of the cells laid down. This is shown by the data in Tables I and II giving details of the numbers of cells seen in transverse sections of a leaf collected in September 1939 from a plant Z.73/F grown in the sun for six months. Serial sections of the leaf were cut at a thickness of 15μ and the number of cells in the upper epidermis and in the adjoining palisade layer were counted.

An attempt to correlate the form of the mature leaf with the time of development of the primordium in the bud showed that in plants of the biotype Z.291, the leaves developed at the time of flowering in May were probably present in the bud in February. The plants studied were grown in the ground in the open and collected during their second growing season, the crown of each plant selected having divided into three rosettes. The dissected leaf characteristic of this biotype at the time of flowering is shown in diagram 5, Figure 2. The number of leaves and of inflorescence axes developed and the number that could be dissected from the buds was determined in February, before active growth began and in May, after the plants had flowered. The data for these plants are given in the following table:

TABLE III.

Number of Leaves and Inflorescence Axes developed by Plants of the Biotype Z.291.

	Plant collected 7/2/1939			Plant collected 14/5/1939		
	Number of leaves developed	Number of leaves dissected from growing point	Number of inflorescence axes	Number of leaves developed	Number of leaves dissected from growing point	Number of inflorescence axes
Crown I	21	24	9	23	2	8
Crown II	9	22	11	28	2	12
Crown III	8	25	16	32	3	15
Totals for 3 crowns	38 + 71		36	83 + 7		35

Although data of the persistence of the leaves of this biotype have not been obtained, comparison with plants of the biotypes Z.193, Z.196, Z.208, previously described, suggests that the leaves persist for only a few weeks after they are mature. Leaves of the biotype Z.291, functional in the autumn, would then develop from primordia not visible until after flowering.

A study of the vein islets in leaves, that is the areas enclosed by the smallest veins, has been suggested as a criterion of senescence: Bijhouwer (1931) has drawn attention to the literature on this subject. For *Taraxacum*, Sears (1922) found that the changes in leaf shape were independent of the number of vein islets per unit area of leaf. The present work on certain biotypes of *Taraxacum* confirms the lack of correlation between leaf shape and the number of vein islets per unit area. The areas of leaf examined were taken from the middle of the blade in the region between midrib and margin, they were decolourised and cleared in lactic phenol to which a little cotton blue had been added. The numbers of vein islets and of free vein endings in twelve such areas each of 1 sq. mm. were counted and the average taken. The appearance of the vein islets in a mature leaf of the plant Z.193 D is shown in Figure 8.

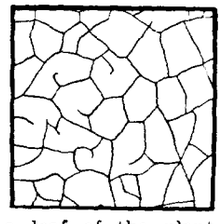

Fig. 8. Vein islets in a leaf of the plant Z.193/D. Area shown = 1·5 sq. mm.

Mature leaves from plants of eight biotypes grown in similar conditions were examined. The number of vein islets per sq. mm. did not prove to be characteristic for a biotype and a high degree of variation was found in the mature leaves of one plant. No significant difference in number was shown by the entire and dissected leaves formed by one plant at different ages. If the shape of these leaves is connected with the pressure of water supply a difference might be expected, since Pearsall & Hanby (1926) found that an increase in hydrostatic pressure resulted in an increase in the number of veins and the formation of smaller vein islets. Some difference was found in leaves of plants of the same age taken from each of two stocks grown in the sun and in the shade. The differences, however, were of the same order as those previously obtained in one plant. Details of the numbers of vein islets per sq. mm. of leaf are given in Table IV.

An examination of the larger veins in *Taraxacum* leaves showed that in many entire leaves the lateral veins diverged from the midrib making an obtuse angle towards the base of the leaf. In lobed leaves the lateral veins either diverged approximately at

Table IV.

Number of Vein Islets per sq. mm. of Leaf Blade.

Plant	Type of leaf	Date collected	Number of islets per sq. mm.			Number of vein endings per sq. mm.		
			Average of 12 areas	Maximum	Minimum	Average of 12 areas	Minimum	Maximum
Z.179/B ...	Dissected	8/5/36	16·1	20	9	3	6	0
Z.193/D ...	”	”	14·9	22	11	4·9	9	0
Z.199/E ...	”	”	16·1	26·5	8	1·9	6	0
Z.194/E ...	”	”	8·2	10	6	3	7	1
Z.196/C ...	”	”	11·9	14	9	1·5	3	0
Z.200/E ...	”	”	11·7	16	9·5	6·4	10	1
Z.208/C ...	”	”	16·9	28	11	1·4	4	0
Z.208/A ...	Entire	25/10/35	6·5	9	4·5	2	4	1
Z.208/A ...	Dissected	”	8·8	14	5	1	4	0
Z.145/D ...	”	8/5/36	14·4	23	12	3	5	1
” ...	Entire	25/10/35	12·6	19	6·5	5·8	14	2
” ...	”	”	4·9	7	1·5	4·2	4	1
” ...	”	”	9·9	13	7	3·2	8	0
” ...	Entire young	”	12·1	18	9	1·6	5	0
Z.145/sun ...	Dissected	21/9/37	14·6	19	9	3·1	7	0
Z.145/shade ...	Entire	”	4·7	7	4	3·9	4	2
Z.73/sun ...	Dissected	10/8/38	11·1	13·5	9	5·2	12	1
Z.73/shade ...	Entire	”	6·3	8·5	4	5	7	3

right angles to the midrib or the angle of divergence was similar to that found in the entire leaves, but the lateral veins bent sharply, often at right angles, to supply the lobe. It was not possible, however, to obtain a strict correlation between the degree of lobing and the path of the lateral veins.

In transverse section, the blade of a mature leaf taken from a plant grown in the sun showed two rows of palisade cells which were only slightly elongated in a direction at right angles to the blade. Four to six rows of rounded cells made up the mesophyll. Air spaces were numerous throughout. Stomata occurred in both upper and lower epidermis and were raised a little above the surface. The entire leaves characteristic of a plant grown in the shade were thinner than the lobed ones formed by a plant of the same age growing in sunlight. Often in the " shade " leaves only one clearly defined layer of palisade cells was found and fewer layers of spongy parenchyma. Transverse sections of " sun " and " shade " leaves are shown in Figure 9. No significant anatomical differences were noticed between the lobed leaves and the non-dissected ones found at a later stage in the life of the plant. All of the older leaves of plants that were examined in the summer and autumn were infected by the fungus *Puccinia Taraxaci*. A characteristic feature of all leaves collected after exposure to conditions suitable for photosynthesis, was the occurrence of oil drops in the cells: generally one large drop was found in every cell of the mesophyll.

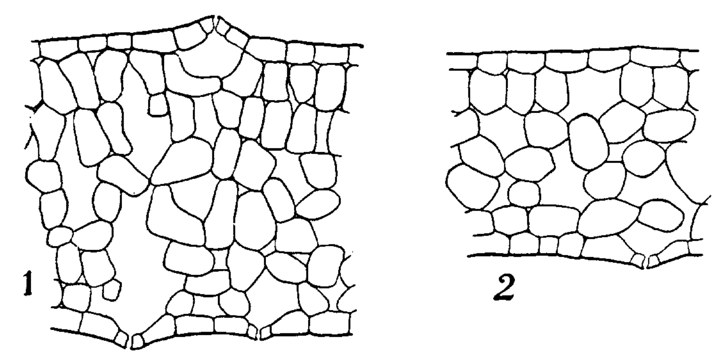

Fig. 9. Transverse sections of leaves of plants of the biotype Z.73, collected 22-9-38. 1. Plant grown in the sun. 2. Plant grown in the shade. Diagrams × 240.

Root Structure.

The young roots examined had a diarch structure. The central relatively small mass of xylem was composed of tracheids and vessels having close annular, spiral or scalariform thickenings. Pitted vessels were not found. Medullary rays were prominent. In older roots, which have been described by DeBary (1884), the bulk of the fleshy part was made up of secondary phloem consisting of parenchyma, sieve tubes and articulated laticiferous vessels. The occurrence of sieve tubes is of interest: Jeffrey (1917) recorded this

fact, but denied that the development of the milk system is in inverse proportion to that of the sieve tubes; he found that in the root of *Taraxacum* sieve tubes could not be clearly distinguished from laticiferous vessels. In the material now studied sieve tubes occurred abundantly although they could not be identified with certainty in stained sections and special methods were necessary for their isolation. The sieve tubes were isolated in sections macerated in acid alcohol for twenty-four hours (one part of hydrochloric acid to four parts of alcohol) and subsequently treated with 10 per cent. ammonia. In sections of old roots collected in the autumn the callose on the sieve plates could be stained with corallin soda, with Russow's callus reagent or with aniline blue. In transverse sections of the roots, sieve tubes and laticiferous vessels occurred in groups arranged in concentric circles in the parenchyma. The parenchyma cells formed regular radial and vertical rows with air spaces between them. The narrow sieve tubes were approximately the same length as the parenchyma cells, and sieve plates which were transverse or nearly so, occurred on the end walls at the level of the transverse air spaces in the parenchyma. At this level also, anastomoses between the laticiferous vessels were most frequent, hence the sieve plates were easily overlooked unless special methods were used to demonstrate their presence. Sieve tubes, laticiferous vessels, and the parenchyma of the secondary phloem are shown in diagrams 1 and 2, Figure 10.

In the cortex of the root and of the stem, structures superficially resembling laticiferous vessels were found. The tangential walls of a small group of parenchyma cells had thickened, partly broken down and separated so that an intercellular space was formed such as is illustrated in diagram 3, Figure 10. The space so formed sometimes contained a secretion. These cavities are similar to the " pseudo-canals " noted by Col (1903) in other *Liguliflorae.*

Secondary thickening in the root resulted mainly in the addition of phloem, only a little xylem was added. Cork cambia, first formed in the outer layers of the cortex and later in the phloem, prevented any considerable or regular increase in the diameter of the root. It was not found possible to determine the age of a plant by counting the " annual rings," as suggested by Roberts (1936).

Stem Structure.

The region which could be identified anatomically as stem in a normally grown plant, was very short, a length of less than 1 cm. below the growing point of the crown. The upper part of the stem bearing the closely packed leaves of the rosette had a structure complicated by the crowded and overlapping leaf bases. This short stem may be compared with the long vertical underground stems which were sometimes found to develop from buds which arose adventitiously on pieces of the roots of old plants when such roots had been broken across and were left or had become buried in the

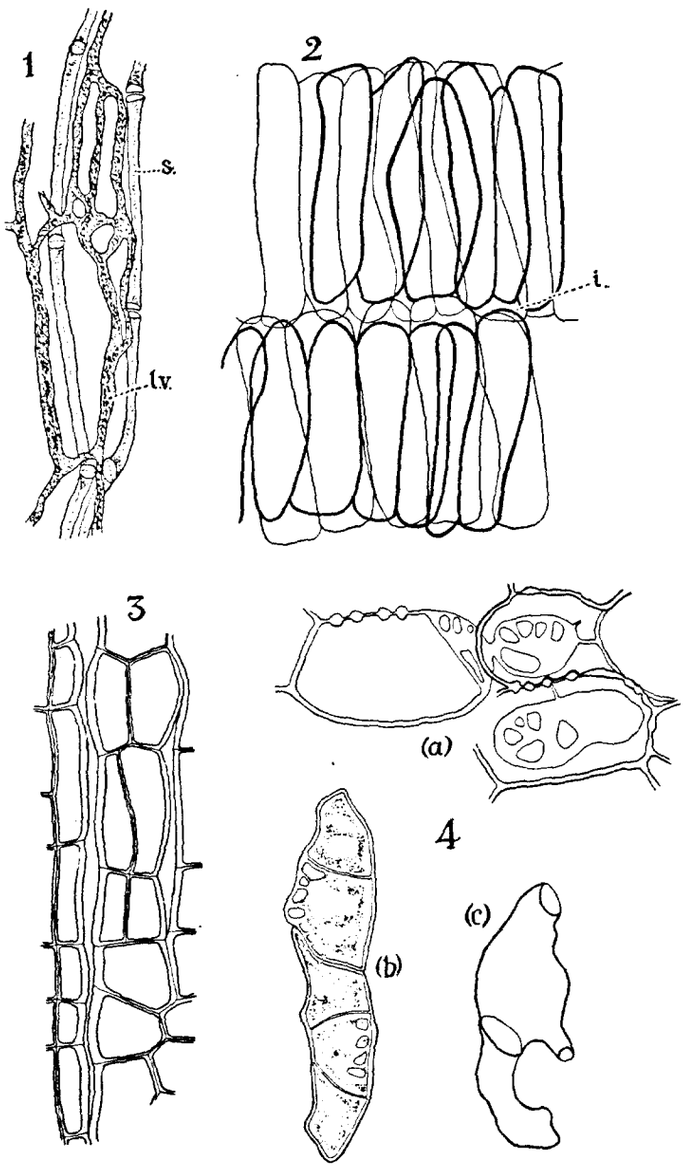

Fig. 10. 1. L.S. root, macerated to separate sieve tubes. s=sieve tubes; l.v.=laticiferous vessel. 2. L.S. root, parenchyma of secondary phloem. i=intercellular space. 3. L.S. root, " pseudo-canals " in cortex. 4. (a), T.S. apex of crown, pitted parenchyma cells of pith. (b), (c), apex of crown, macerated to separate the cells of the pith. All diagrams × 240.

soil at a depth of 12–20 cm., the rest of the plant having been removed. When roots with secondary phloem were cut across and kept moist, wide V-shaped longitudinal splits were often formed, extending inwards. The uninjured cells were rapidly protected by cork. In the broken roots described, at the anterior ends and at places where splits extended to the central xylem cylinder, callus formed and bore buds from which long stems grew up towards the surface of the soil. The stems, which were twisted, bore scale leaves. The internodes were 2–3 cm. in length at the lower end but shorter at the upper end, while at the surface of the soil a typical rosette of leaves developed. The scale leaves had sheathing bases which completely or nearly encircled the stem, the line of attachment being horizontal or oblique. It was possible to trace the fusion of the decurrent leaf base with the stem through at least one internode. The free portion of the scale leaf was pointed in shape and readily withered from the tip. The whole of the blade sometimes disappeared and the decay spread downwards along the part of the base fused with the stem. Branches arose from buds in the axils of some of the scale leaves; they were often very numerous near the ground level. They emerged making almost a right angle with the main stem and bent to grow up nearly parallel with it.

In transverse section an elongated vertical underground stem showed the familiar Dicotyledonous stem structure, a ring of collateral vascular bundles separated by prominent medullary rays; this is seen in plate I, fig. 2. Each vascular bundle of the stem had a number of well developed laticiferous vessels on the outer margin of the protophloem, representing the pericyclic laticiferous system described by Solereder (1908). Leaf gaps occurred in the ring of bundles. Leaf traces, collateral and concentric bundles and isolated groups of phloem and laticiferous vessels were found in the cortex. As secondary phloem was developed, groups of sieve tubes and laticiferous vessels were formed as in the secondary phloem of the root.

The upper, stem portion of the crown showed the same arrangement of tissues, leaf traces being more numerous in the cortex. Longitudinal sections of the crown showed very clearly the anastomoses between the laticiferous vessels of the protophloem, secondary phloem, and leaf traces.

As cork formed readily in the secondary phloem, outer structures were soon removed, but a careful study of the underground stem, the developing crown and the hypocotyl of the seedling (shown in diagram 2, Figure 11) strongly suggests that in accordance with the leaf skin theory of Saunders (1922), the external tissues of these organs are formed by the leaf bases which are decurrent and fused with the outer layers of the stem.

Near the apex of the stem the pith consisted of a characteristic spongy tissue. The cells had thick cellulose walls: the tangential

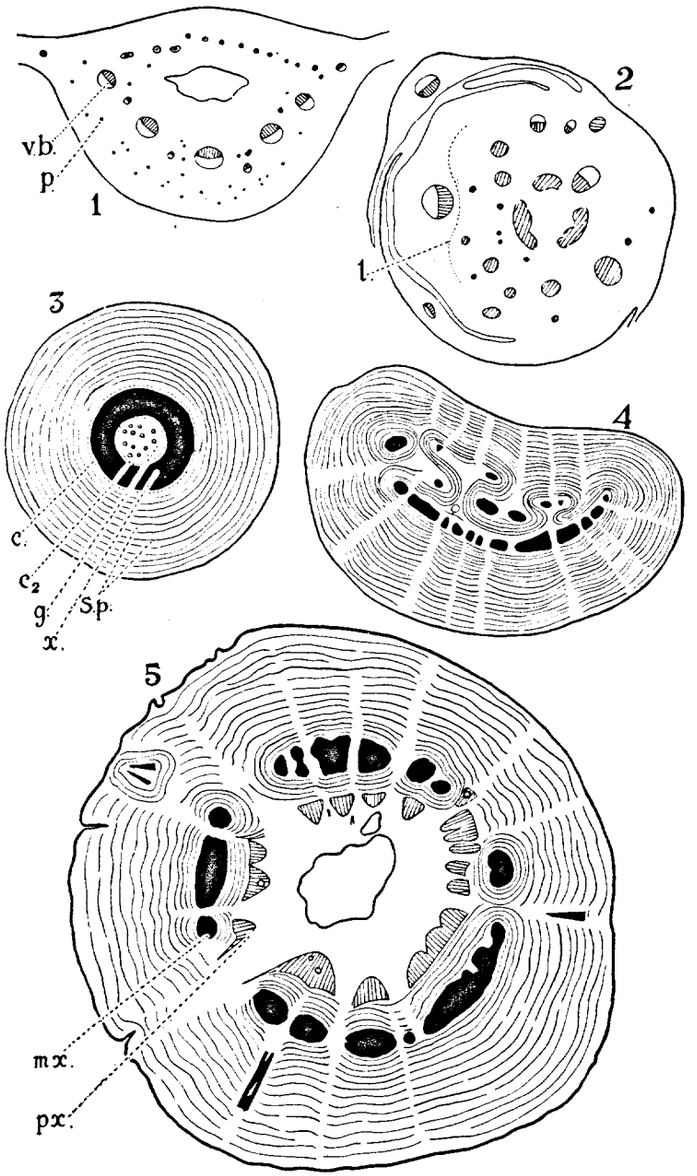

Fig. 11. 1. T.S. leaf base, ×13. v.b.=vascular bundle. p.=groups of phloen and laticiferous vessels. 2. T.S. hypocotyl of seedling, ×33. l=line of future separation between leaf and stem. 3. T.S. root, ×8. c=cambium; c_2=secondary cambium; g=deposits of gum in xylem; s.p.=groups of sieve tubes and laticiferous vessels in the secondary phloem; x=functional xylem. 4. T.S. "branch" formed by longitudinal splitting of the crown, ×2. 5. T.S. base of crown in an old plant, ×4. px.=protoxylem of original bundles; mx.=metaxylem.

walls were especially thick and tended to separate so that concentric circles a few cells in depth, resulted. The cells were often irregular in shape, sometimes with outgrowths pushing into the intercellular spaces. Between some of the adjoining cells the end walls had broken down or were perforated by large simple pits so that an irregular series of canals was formed. Some cells from this tissue are shown in diagram 4, Figure 10. It is in this spongy pith that changes were found preceding the division of the crown.

Division of the Crown.

In each of some fifty plants examined, the terminal bud of the stem formed an inflorescence. In six specimens, before the elongation of the inflorescence axis, the central cells in the spongy pith of the crown had broken down and the cavity was isolated by a cork cambium. A secondary cambium was also found in the pith adjoining the protoxylem. This structure is illustrated in plate I, fig. 3. Sections taken at a lower level showed this cambium as a continuous ring. In some twenty specimens of the same age, deposits which were golden brown or crimson in colour were found in the pith of the crown : they occurred when there was no external evidence of injury. The deposits gave the reactions characteristic of a gum : when heated with hydrochloric acid, a trace of orcin added, and the substance again heated, subsequent addition of ferric chloride gave a dark green colour. Cells containing the gum were isolated by meristematic cells, and as in the specimens already described, two concentric cylinders of cambium were found. The inner, secondary cambium cut off a small amount of xylem on the side adjoining the original xylem, and towards the inside of the stem, a large amount of secondary phloem. The secondary cambium was seen in sections taken at a lower level to join the original one at several points, thus isolating a number of separate xylem masses. By the continued activity of the cambia a number of secondary steles were formed. This is seen in diagram 5, Figure 11. Cork cambia developed in the secondary phloem led to the complete isolation and separation of the secondary steles through a certain length of the stem and root.

In those plants where no break-down of the pith or deposits of gum were found before the time of flowering, branching of the crown appeared to follow the decay of the terminal inflorescence axis. The decay at the base of the axis spread downward, affecting some of the central cells of the pith of the stem and central vessels of the root, sometimes for a considerable distance. Branching initiated by the decay of the terminal inflorescence axis has been described by Fritsché (1914) for *Taraxacum*. In this method of branching the decayed tissue was isolated by cork and secondary cambia formed within the xylem cylinder as in the plants described above.

In all plants in which they were formed, the activity of the secondary cambia in the isolation of separate steles led to the

production of a number of apparently short " branches " terminating in new rosettes and arising from the main root. A study of the development of these " branches " showed that they originated by a splitting which extended downwards from the apex of the stem. In structure the " branches " closely resembled roots unless only two or three were developed when the steles were flattened in transverse section. This is shown in diagram 4, Figure 11, which also illustrates the irregular course of the cambium frequently seen.

In plants six to seven years old, a high degree of separation of the roots was reached and it was sometimes found that the divisions of the root corresponded to the number of new crowns developed. Such crowns had strands of vascular tissue which could be traced a considerable distance along the root and even throughout its length. Not infrequently in these plants some crowns separated completely and grew as new individuals. In other plants, divisions of the root were complicated by the formation of cambia which isolated deposits of gum. Such cambia are seen in the transverse sections of roots shown in plate I, fig. 4, and in diagram 3, Figure 11. The cambia often took very irregular lines leading to numerous irregular divisions. Separation might be complete for only a short distance and the plant then seemed to show " branch roots " fusing at a lower level with the root of their origin. Further, a true fusion of roots was also observed, which took place in a way similar to that described by Millner (1932) in *Hedera Helix*.

Concluding Remarks.

A number of biotypes of *Taraxacum* which are morphologically distinct show a considerable plasticity in habit and leaf form, being influenced by factors affected by age, the supply of food, light and moisture. The effect of age was seen in the succession of leaves developed by biotypes grown from seed in the open. In two apomicts the three or four entire leaves produced by the seedling in spring were succeeded by deeply lobed leaves which were formed throughout the year. During the second growing season these plants, like those of three other biotypes, showed a succession of leaf forms : the lobed leaves found in early spring were replaced by a non-disected type after flowering, while in the autumn a lobed leaf again appeared. In three other biotypes a slightly different sequence obtained, the autumn leaves remained entire. During the third and fourth growing seasons, in six biotypes the leaf pattern of the second year was repeated, although in the older plants the leaves were less regularly lobed and they were carried in an erect or sub-erect position in contrast to the flattened position often taken by the leaves of younger plants. The leaves developed following the complete removal of the crown showed a similar but slower sequence of forms. The same slow sequence was found in the ramets obtained by cloning an old plant.

Ramets grown from small pieces of root and having only a limited food supply developed leaves indistinguishable from those

of well nourished plants. Experiments with culture solutions suggest that the elements nitrogen and possibly calcium are necessary for the development of the lobed leaves characteristic of a particular biotype.

Light was shown to influence leaf form and the number of leaves developed by a plant very considerably. For two apomicts, plants grown in the shade for six to eight months formed only a small number of entire leaves, while plants of the same age grown in the sun developed a much larger number of deeply lobed leaves. The shade plants later formed leaves showing some degree of dissection : the sequence characteristic for sun plants of these apomicts is seen to be delayed and modified in shade conditions.

Water supply also affects leaf shape. In an apomict having normally a lobed leaf, plants grown in the shade but kept dry formed shorter more dissected leaves than the control plants. Growth in the shade and a saturated atmosphere for twelve months resulted in the formation of only entire leaves.

Experiments designed to test the influence of growth hormones showed that the substances α naphthaline acetic acid, β indole acetic acid and β indole butyric acid, when sprayed by an atomiser over the young leaves of seedlings or applied in lanoline paste to the growing points, did not affect leaf form, although they affected the general vigour of the plant. An attempt to detect a growth substance by a chemical colour test in extracts of plants produced negative results.

A study of the development of the leaves showed that the lobed leaf characteristic of a particular biotype is laid down at an early stage in the development of the rosette. The further growth of the young leaf at the lobes is accompanied by cell division : measurements of epidermal and palisade cells at sinus and lobe showed that the cells were of the same dimensions in these two regions.

The vein islets of the leaves were examined. The number of islets in a unit area of leaf blade was found to be very variable in any one biotype and the number was not correlated with the leaf shape.

Anatomically the leaf structure is that of a typical dorsiventral leaf. Leaves from plants grown in the sun had two rows of palisade cells, sometimes irregularly arranged and only slightly elongated in a direction at right angles to the blade. The stomata on both upper and lower epidermis were slightly raised. Oil drops collected in the cells of the mesophyll when the leaf was exposed to conditions favourable for photosynthesis. No significant anatomical differences were found in the lobed and entire leaves.

The root develops a relatively small central xylem cylinder and a large amount of secondary phloem. In the latter, consisting of parenchyma and groups of laticiferous vessels and sieve tubes arranged regularly in concentric circles, the numerous narrow sieve tubes were most readily distinguished by maceration or in sections of material collected in the autumn when callose was deposited on the sieve plates of the end walls.

The stem in normally grown plants is very short : long vertical underground stems may be formed from adventitious buds when roots are left deeply buried in the ground. The anatomical structure of these stems was that of a typical Dicotyledonous plant. Laticiferous vessels occurred at the periphery of the protophloem and in the secondary phloem in close proximity to the narrow sieve tubes. The structure of the stem immediately below the crown was complicated by the large overlapping leaf bases.

Division of the crown is connected with the development of cambium within the xylem cylinder. The arcs of secondary cambium rejoined the original cambium at a lower level in the crown, thus causing the isolation of separate xylem masses. This sometimes occurred before the elongation of the terminal inflorescence axis and in such plants there was degeneration of the spongy pith at the apex of the crown or there were found to be deposits of gum in the pith or in some of the first-formed xylem vessels. In other plants, division of the crown followed the decay of the inflorescence axis : the decayed tissue at the apex of the stem was isolated by cork and secondary cambia developed as before. The development of such secondary cambia led to the isolation of secondary steles and these became completely separated by the formation of cork in the secondary phloem. The separation was sometimes complete throughout the plant : in many plants, however, division was only partial and was complicated by the formation of cambia in relation to deposits of gum.

APPENDIX

ORIGIN OF MATERIAL OF BIOTYPES USED IN THE PRESENT PAPER.

Z.73.—Grown from seed collected near Stromness War Memorial, Stromness, Mainland, Orkney, 10.10.1931, Col. H. H. Johnston. The material used was grown from seed from one flowering head of one plant of the original row of plants grown at Kew. This head in the young condition had the corollas and stamens removed by a transverse razor cut before the capitulum opened. The seeds set apomictically and the plants raised were uniform at all stages of development when grown under the same conditions. All the plants used in this paper and quoted under Z.73 were therefore proved apomicts.

Z.145.—Original plant collected on Potterne Fields, Potterne, Wiltshire, 26.1.1932, E. M. Marsden-Jones and W. B. Turrill. The material used was grown from seed from one head of the original plant transplanted to Kew. All the plants were obtained apomictically in the same way as for Z.73.

Z.179.—Grown from seed of one capitulum collected near Ible, Derbyshire, 8.8.1933, W. B. Turrill.

Z.190.—Grown from seed collected on Athos Peninsula, Greece, near Chilandari, 22.4.1934, W. B. Turrill.

Z.191.—Grown from seed collected on Athos Peninsula, Greece, between Kapsokalivia and Lavra, 19.4.1934, W. B. Turrill.

Z.193.—Grown from seed collected on Athos Peninsula, Greece, above Zographu Arsenal, 16.4.1934, W. B. Turrill.

Z.194.—Grown from seed collected on Athos Peninsula, Greece, near Vatopedion, 21.4.1934, W. B. Turrill.

Z.196.—Grown from seed collected on Athos Peninsula, Greece, between Simopetra and Karyes, 13.4.1934, W. B. Turrill.

Z.199. Grown from seed collected by Xerxes Canal, at the north-west end of Athos Peninsula, Greece, 17.4.1934, W. B. Turrill.

Z.200.—Grown from seed collected on Athos Peninsula, Greece, near Stavronikita, 21.4.1934, W. B. Turrill.

Z.208.—Grown from seed collected from one capitulum, north of Aberdeen, on more or less stabilized sand-dunes, 7.9.1934, W. B. Turrill.

Z.224.—Grown from seed collected on Pepeljak, North Macedonia, 10.6.1935, Mrs. H. P. Thompson.

Z.257.—Grown from seed collected by the Pjorsa river, Holt, South Iceland, 22.6.1936, J. C. W. Greene.

Z.282.—Grown from seed collected at Kineton Thorns, east Gloucestershire, 25.5.36, E. Milne-Redhead.

Z.291.—Grown from seed collected on Chailey Common, Sussex, in a damp place in heathland verging towards grassland, 17.5.36, E. Milne-Redhead.

Z.301.—Grown from seed collected near Loch Ine, west Cork, Ireland, 14.8.1936, W. B. Turrill.

Specimens of all the above are preserved in the Herbarium, Royal Botanic Gardens, Kew.

Z.73 and Z.145 are apomicts of the section *Vulgaria*. Z.179, Z.208, Z.224, Z.257, and Z.301 are biotypes, and probably also apomicts, of the section *Vulgaria*. Z. 291 is a biotype of the section *Spectabilia*. Z.190, Z.191, Z.194, Z.196, and Z.200 are biotypes of *T. Hoppeanum* Griseb. et Schenk. Z.193 and Z.199 are biotypes of *T. megalorrhizon* (Forsk.) Hand-Mazz. Z.282 is a biotype of *T. laevigatum* (Willd.) DC.

ACKNOWLEDGMENTS.

I should like to express my sincere thanks to Dr. Turrill for suggesting the problem and for his continued help during the research; and to Dr. Metcalfe for his help and the facilities that he has given me in the Jodrell Laboratory.

I should also like to thank Mr. G. Atkinson for photograph 1 and Mr. G. Robinson for photographs 2, 3 and 4, Plate I.

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II—NOTES ON FERNS AND FERN ALLIES: II.

F. BALLARD.

Adiantum Lüddemannianum *Moore* in The Florist, 1876, 93 (not Veitch Cat. 1878 as stated in C. Chr. Ind. Fil). A plant of garden origin, it is said to have arisen spontaneously in a French nursery. Its relationships are obscure. Originally stated to be a hybrid between *A. cuneatum* L. & F. and *A. Moritzianum* Link, it was considered a variety of *A. cuneatum* by Schneider and of *A. Capillus-Veneris* L. by Moore. The freakish appearance of the plant with its crispate-tasselled fronds suggests that it is a sport of a kind familiar enough in some other genera, though uncommon in *Adiantum*. It was first described by Carrière as *A. cristatum* in Rev. Hort. **46,**

228 (1874). Although bearing sori the plant is apparently quite sterile.

Adiantum patens *Willd.* var. **Oatesii** (*Bak.*) *Ballard*, stat. nov. *A. Oatesii* Bak. in Oates, Matabeleland, App. V, 369, c. ic. (1881). This plant resembles the tropical American *A. patens* closely and is distinguished only by the soft thin texture and pale green colour of its fronds. Baker believed it to be related to *A. pedatum* L. and this is understandable in view of the sterile incomplete frond that constitutes the type material. The variety has been found in the Bauchi Plateau of Northern Nigeria, Southern Tanganyika Territory, and north western and southern Rhodesia. In Northern Rhodesia the plant grows sometimes on termite hills.

Arthropteris orientalis (*Gmel.*) *O. Posth.* var. **punctulata** (*Bak.*) *Ballard*, comb. nov. *Nephrodium punctulatum* Bak. Syn. Fil. 261 (1867). *Dryopteris orientalis* (Gmel.) C. Chr. var. *punctulata* (Bak.) C. Chr. This is a well-marked variety confined to the Cameroons.

Botrychium lanuginosum *Wall. ex Hook. & Grev.* The name *Botrychium lanuginosum* first appeared in Wallich's Catalogue of 1828 and was thus a *nomen nudum*. Hooker and Greville a little later, in 1828 or 1829, in their Icones Filicum, **1,** t. 79, published a plate of the species prepared from material supplied by Wallich. A description accompanied the plate and the species was thus validated.

The figure drawn by Greville, however, depicts a small plant very different in appearance from the modern concept of *B. lanuginosum* (see Plate II). A character which serves to distinguish this species from all other *Botrychia* is the unusual position of the fertile spike. It arises laterally from the main rachis in a position which, although it tends to vary from plant to plant, is always situated above the base of the blade. So significant has this feature been regarded by some workers that Clausen in his recent revision of the *Ophioglossaceae* (Mem. Torr. Bot. Club, **19,** no. 2 : 1938) has proposed a new section, the *Lanuginosae*, for the species. The Greville plate portrays a fertile spike arising from the base of the blade, coincident with the attachment of the two lowest pinnae. The general effect somewhat resembles *B. virginianum* and suspicions were aroused as to the actual identity of the plant figured. Efforts were made to locate the specimen, which was absent from the Hooker collections at Kew, and it was eventually discovered in the Greville herbarium at Edinburgh. A single sheet of the species contains two specimens, both purporting to represent Wallich's No. 48. One is a complete plant and bears little resemblance to Greville's drawing ; the other consists of a blade only and is undoubtedly the plant from which the upper part of Greville's drawing was prepared. The unusually small size of the blade and the apparent insertion of the fertile spike at the base were at first sight somewhat puzzling. A

PLATE II

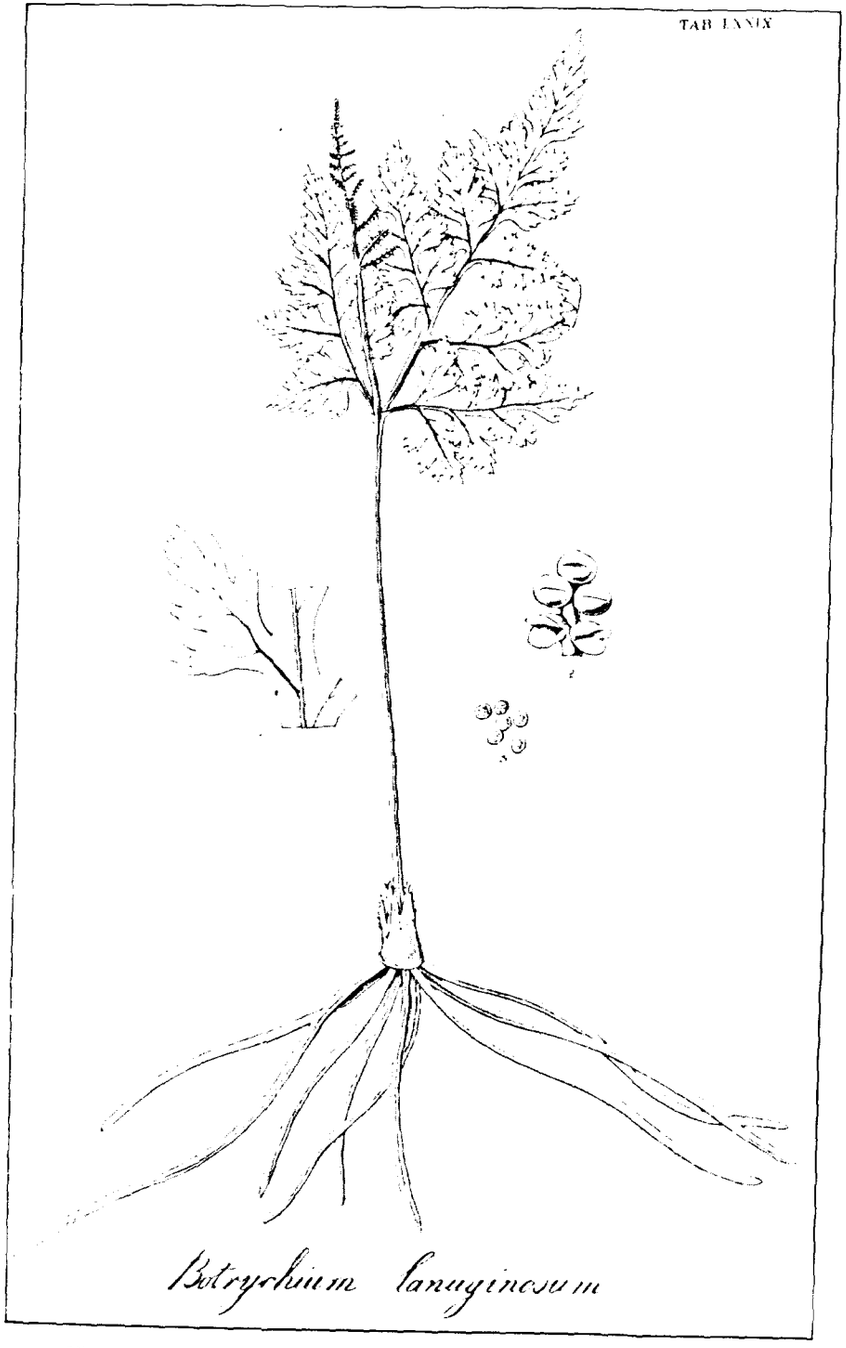

Figure of *Botrychium lanuginosum* Wall. ex Hook. et Grev., from Hooker and Greville's Icones Filicum, **1,** t.79.

[*To face page 30*

careful examination of the fertile spike, however, revealed the fact that the insertion was not at the base of the blade but at a point on the rachis about half an inch below it. The true state of affairs then became apparent. The natural assumption had been that the specimen represented a complete blade, whereas in reality only the uppermost portion, including the fertile spike, was present, the lower pinnae being missing.

One has to conclude, therefore, that in order to produce a drawing of a size convenient for reproduction, Greville combined, quite innocently, the incomplete frond just described with the basal portion of another specimen.

It seems strange that neither Hooker nor Greville attached any importance to the unusual position of the fertile spike. The point of insertion is not mentioned in the text accompanying the plate, although the authors admit having seen several specimens.

Dryopteris Wilsoni (Bak.) C. Chr. This was described by Baker as *Nephrodium Wilsoni* in Ann. Bot. **5,** 321 (1891) from an incomplete frond collected in Uganda near the shores of the Victoria Nyanza. The specimen is undoubtedly a large frond of **Arthropteris orientalis** (*Gmel.*) *Posth.*, although so little stipe is present that the articulation is missing. There are, however, obscure traces of lime-spots, a feature which is so characteristic of this species.

Polypodium Schneideri *G. Schneider.* This fern was raised in the late Messrs. Veitch's Chelsea nursery by G. Schneider and was claimed to be a hybrid between *P. aureum* L. and *P. vulgare* L. var. *elegantissimum.* The crossing was successfully repeated several times by Schneider, and Prof. J. B. Farmer, who investigated the structure of the hybrid (Ann. Bot. **11,** 533 : 1897), was satisfied of the validity of Schneider's claim. A description of the plant appeared in Schneider's "Book of Choice Ferns," **3,** 209 (1894) accompanied by a picture (p. 210). Christensen's reference in his Index Filicum (p. 562) is to a *nomen nudum.* In 1898, H. Christ described (Bull. Herb. Boiss. **6,** 835) a Sumatran plant as *P. Schneideri*, a name which is illegitimate according to the Rules of Nomenclature and for which another name has to be found. Since, however, it seems possible that the species is identical with *P. longissimum* Bl., no new name is proposed here.

III—PLANTS NEW TO ASSAM : XI.* C. E. C. Fischer.

Corydalis Borii *C. E. C. Fischer*, sp. nov. [Fumariaceae] ; *C. Chanetii* Lév. proxima, sed foliis haud longe petiolatis, pinnis utrinque 3–4, bracteis integris, sepalis haud cordatis, floribus majoribus differt.

Annual (?) glabrous *herb. Leaves* : basal not seen ; cauline several, sessile or nearly so, ovate in outline, 4–14 cm. long, 2–10 cm.

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*Continued from K.B. 1938, 213.

wide, pale below, pinnatisect, lobes 3–4 on each side, more or less decurrent on the midrib, elliptic, the terminal lanceolate, lobulate the lobules unequally 2–4-toothed, teeth acute or rounded. *Inflorescence* of terminal or terminal and lateral, few- to many-flowered racemes, 4–6 cm. long in flower, up to 17 cm. long in fruit, the lateral usually shorter; peduncles short; bracts lanceolate from a broad base which embraces the base of the pedicel, acute, 4–5 mm. long; pedicels 2·5–3 mm. long, lengthening in fruit. *Sepals* subcircular or broader than long, 0·75–1 mm. long, 1–1·5 mm. wide, delicate, erose-denticulate. *Corolla* including the spur 2·2–2·5 cm. long; *anterior petal* oblanceolate, obtuse, more or less boat-shaped, 9–10 mm. long; *posterior* cucullate, 8–9 mm. long with a nearly straight spur 1·4–1·5 cm. long; 2 *interior* oblong, obtuse, 5–5·5 mm. long, 2·5 mm. wide, cohering by their apices and joined at the base to the sides of the posterior petal, winged on the back along the midnerve and with a thick, broadly conical wing or fold along the lower $\frac{2}{3}$ of one of the lateral nerves. *Ovary* narrowly fusiform, 4–5 mm. long; ovules 8–10. *Capsules* (mature?) narrowly oblanceolate, 9–13 mm. long, 8–10 seeded.

NAGA HILLS: Chingkhu, 2400 m., fls. & frt. Dec., *N. L. Bor.* 6785 (type in Kew Herb.), "gregarious in oak forest"; Thekubama, 2100 m., fls. & frt. June, *Bor* 4456, "gregarious in deep evergreen forest, fls. orange-brown"; Pulebudze, 1500 m., fls. & frt. Aug., *Bor* 6349, "fls. orange."

Hypericum gracilipes *Stapf* ex *C. E. C. Fischer*, sp. nov. [Hypericaceae]; *H. Uralum* Ham. ex D. Don peraffinis, ramulis teretibus, venis foliorum supra impressis, bracteis anguste lanceolatis caudato-acuminatis, sepalis lanceolatis, stigmate capitellato differt.

A glabrous, branched *undershrub*; branchlets terete, brown. *Leaves* decussate, lanceolate to narrowly ovate, acute or subacute at both ends, 1·8–3·7 cm. long, 0·6–2 cm. wide, midrib and 3 pairs of primary nerves arising below the middle impressed above, slightly prominent below, the nerves inarching and anastomosing near the margins, secondary nerves and reticulations obscure, brown when dry, opaque so that the glands are inconspicuous; petioles 0 or very short. *Cymes* dichotomous, terminating the branchlets, up to 7-flowered; peduncle about 1 cm. long; bracts linear-lanceolate, caudate, up to 1·3 cm. long; bracteoles similar, shorter. *Sepals* 5, coriaceous, narrowly lanceolate, 8–8·5 mm. long, 1·8–2·2 mm. wide, subacute. *Petals* 5, broadly obovate to subrotund, slightly oblique, up to 1·6 cm. long and 1·4 cm. wide, apex rounded, yellow, thinly membranous with one margin subcoriaceous. *Stamens* numerous, in 5 bundles; filaments unequal, shorter than the petals. *Ovary* ellipsoid, 6 mm. long, 5-celled; ovules axile; styles 5, 5 mm. long, slender; stigmas capitulate. *Capsule* 1 cm. long.

LUSHAI HILLS: Neikdawn, on banks of stream, 1200 m., fls. & frt. July, *Mrs. N. E. Parry* 74 (type in Kew Herb.). NAGA HILLS: Kedima, on a sandstone slope, 1800 m., fls. July, *Bor* 6313.

Dr. O. Stapf had set Mrs. Parry's specimen aside as a new species to which he proposed to give the binomial adopted.

Ophiorrhiza tingens *C. B. Clark* ex *C. E. C. Fischer*, sp. nov. [Rubiaceae]; *O. Mungos* Linn. accedens, stipulis multo longioribus, bracteolis persistentibus, capsulis minoribus differt.

An *undershrub* up to 30 cm. high (sometimes trailing and longer); stems terete, woody and glabrous below, simple or branched and more or less brown-puberulous above. *Leaves* lanceolate to ovate, rarely subrotund, acute to caudate-acuminate, tapered to the base and more or less decurrent, 9–17 cm. long, 3–6 cm. wide, glabrous above or with scattered very short hairs, more or less puberulous on the midrib and nerves below, midrib prominent below, primary nerves 10–14 pairs, slightly raised below, slightly arched, parallel, anastomosing near the margins, when dry usually dark-brown or olivaceous above, pale and often reddish below; petioles 1–4 cm. long, brown-pubescent or glabrescent; stipules narrowly ensiform, up to 1 cm. long, entire or more or less deeply 2-fid, apices filiform. *Inflorescence* terminal, 1·5–3 cm. long, lengthening in fruit, peduncles 1·5–7 cm. long, more or less densely brown-pubescent, bracts and bracteoles persistent, linear, up to 6 mm. long. *Calyx-tube* funnel-shaped, 1 mm. long, brown-puberulous; lobes 5, lanceolate to ovate, acute, 0·2 mm. long. *Corolla-tube* cylindric, 4·5–8·5 mm. long, villous within just below the mouth; lobes 5, oblong lanceolate, obtuse, 2–2·5 mm. long, puberulous within. *Stamens* 5, inserted at about the middle of the corolla-tube or close to the base; filaments 0·5–1·5 mm. long; anthers linear 1·6–2·3 mm. long. *Disk* of 2 fleshy, oblate, curved segments 0·5–1 mm. long, 1·5 mm. wide. *Style* slender, shorter than the longer stamens and included or up to 8·3 mm. long and shortly exserted, barbellate; stigma flat, expanded, entire or bifid. *Capsules* 2–2·5 mm. long, 4·5–8 mm. wide.

NAGA HILLS: Kohima, 1800 m., fls. purplish, Oct., *C. B. Clarke* 41121 A (type in Kew Herb.); Kohima, 1260 m., fls. purple, May, D. Prain s.n.; Tesangki, 1200 m., fls. white pink outside, May, *Bor* 2654; Benronmi, 1450 m., fls. white and frt. May, *Bor* 2669; Paona, 2500 m., fls. white and purple, end April, *Bor* 2751; Tesangki, 1450 m., fls. end April, *Bor* 2782; Konoma, 1700 m., fls. April, *King's Collector* 246. NOWGONG, *Simons* s. n.; *Jenkins* 4842. GARO HILLS; *Simons* s. n. KHASIA: Burney Hut, 180 m., fls. nearly white, May, *Clarke* 38076 A; Nungpo, 540 m., fls. lurid-purplish, early April, *Clarke* 43268. BURMA: S. Mines, towards Kuwa, Boon, fls. May, *Griffith* Kew Distr. No. 2865.

Heterostyly seems to occur in this species, but more research in the field is necessary to establish the point.

C. B. Clarke recognised all the specimens listed above except those of Dr. N. L. Bor's as a new species and inscribed them with the combination accepted.

Ophiorrhiza Wattii *C. E. C. Fischer*, sp. nov. [Rubiaceae]; *O. cantonensi* Hance peraffinis, foliis apice basique sensim attenuatis, bracteolis longioribus latioribusque, corollis longioribus differt.

An *undershrub* up to 30 cm. high, unbranched in specimens seen; stem woody below, sulcate when dry. *Leaves* elliptic or elliptic-lanceolate, caudate, tapering to the base, 6–16·5 cm. long, 2·4–4·5 cm. wide, midrib impressed above, primary nerves 10–11 pairs, arched, parallel and joining the next above near the margin, a very fine vein running along the margin interrupted by a series of glands, dark above when dry, paler below, with scattered minute hairs on both faces especially near the margins and on the nerves, hardly visible without a lens; petioles slender, 1–3·5 cm. long; stipules not seen. *Inflorescence* terminal; peduncles 1·5–2·5 cm. long, with 2 lines of rufous pubescence; branchlets short, rufous-puberulous; bracts and bracteoles linear-lorate, finely acuminate, 4–12 mm. long; pedicels 1–2 mm. long, rufous-puberulous. *Calyx-tube* cupular, 1·5 mm. long, rufous-puberulous; lobes 5, ensiform, 1·5–2 mm. long. *Corolla-tube* cylindric, 1·3 cm. long, pubescent on the middle third within; lobes 5, oblong, rounded, 2 mm. long. *Stamens* 5, inserted about the middle of the corolla-tube; filaments slender, 3–4 mm. long; anthers basifixed, linear, 3·5 mm. long. *Disk* of 2 quadrate or trapezoid, fleshy, lobiculate segments 1–2 mm. long. *Style* slender, 3–4 mm. long; stigma ellipsoid, flat, 2·5–3·5 mm. long, entire or more or less deeply bifid. *Capsule* 2·5 mm. long, 6 mm. wide.

MANIPUR: in the forest around Sihorifuror, 1800 m., fls. and frt. April, *G. Watt* 6350 (type in Kew Herb.). NAGA HILLS: Shiloi Jopi, gregarious in oak forest at 2500 m. fls. white, Sept., *Bor* 6750. Watt recognised his specimen as a new species but did not publish a description; as the combination he proposed has since been used I have dedicated the species to him.

Tarenna Borii *C. E. C. Fischer*, sp. nov. [Rubiaceae]; *T. asiaticae* (Linn.) O. Ktze. affinis, foliis membranaceis, corymbis floribusque majoribus, pedicellis multo longioribus distincta.

A small, glabrous *tree*; ultimate twigs terete, grey-brown. *Leaves* lanceolate- or ovate-oblong, acuminate, base rounded or cuneate, 9–12 cm. long, 3·5–5·5 cm. wide, primary nerves 7–10 pairs, prominent below, glabrous except for a small group of hairs in each of the axils below; petioles 0·4–2·3 cm. long; stipules ensiform from a broad base, 6–7 mm. long, deciduous. *Corymbs* terminal with a few smaller from the upper axils, up to 6 cm. across; peduncles short; bracteoles 2 at the base of the pedicels, shortly united at the base, ovate, cuspidate, 2 mm. long; pedicels slender, 6–10 mm. long, black when dry. *Calyx* turbinate, 6–6·5 mm. long including the ovary; lobes 5, cuspidate, keeled at the apex, 2 mm. long, 3 mm. wide, margins sometimes minutely bristle-ciliate. *Corolla* hypocrateriform; tube cylindric, 6–8·5 mm. long, hairy within with pale-brown, crisped hairs; lobes 5, overlapping

clockwise, broadly oblong, often with a blunt tooth on one or both sides near the apex, 8·5–11 mm. long, 5–6 mm. wide. *Stamens* 5; anthers sessile on and partly exserted from the naked mouth of the corolla, 6–7 mm. long. *Ovary* 3·5–4 mm. long; ovules ∞; style rather stout, 7–8 mm. long; stigma exserted, fusiform, 5 mm. long, 1·5 mm. diam. *Fruit* not seen.

NAGA HILLS: Tesangki, 1625 m., fls. white, May, *Bor* 2653 (type in Kew Herb.); *Bor* 2644, without particulars, in Dehra Dun Herb.

Patrinia pentandra *C. E. C. Fischer*, sp. nov. [Valerianaceae]; *P. monandrae* C. B. Clarke similis, caulibus fistulosis, foliis sessilibus, staminibus quinque differt.

A tall *herb*; stem fistular, pale-brown, 6–7 mm. diam. *Leaves* sessile, pinnatisect nearly to the midrib, lobes 2–3 pairs and a terminal, the lowest pair very short, linear, entire, the next two narrowly elliptic-lanceolate or- oblanceolate, acute, 2·5–3·5 cm. long, 5–8 mm. wide, margins 2–3-toothed on each side, terminal lobe elliptic, acute at both ends, 8–11 cm. long, 3–4 cm. wide, coarsely, regularly toothed, primary nerves of lateral lobes 3 from the base, of the terminal 6–7 pairs, ultimate reticulations of all fine, glabrous or nearly so above, sparsely pubescent on the nerves below, ciliolate; stipular ridge pubescent. *Panicles* terminal and axillary, the terminal up to 30 cm. long; rhachis and its branches pubescent on one side; floral leaves at the divisions like the cauline but smaller; bracts linear, obtuse, 1·7–2·7 mm. long; bracteoles 2 under the flower, subcircular, 2 mm. diam., serrulate. *Flowers* numerous, sessile. *Ovary* narrowly turbinate, 1·5 mm. long, puberulous, 3-celled. *Calyx* a mere, very short, entire rim. *Corolla* cupular; tube 2·2 mm. long, villous within; lobes 5, semicircular or oblong, 1·5 mm. long. *Stamens* 5, on the base of the corolla; filaments 1·5 mm. long, glabrous or villous in the same flower; anthers oblong, 0·6 mm. long, reddish, appressed-pubescent. *Style* slender, 2·5 mm. long, glabrous; stigma capitate. *Fruit* ellipsoid, 3-gonous, crustaceous, 3 mm. long, hispidulous on the angles and the back, subequally 3-celled, posterior cell 1-seeded, the anterior 2 empty; bract attached to the fruit papery, oblong or subcircular, strongly veined, 6·5–7·5 mm. long, 4–5·5 mm. wide.

NAGA HILLS: Lacham, 1100 m., fls. yellow and white, Sept., *N.L. Bor* 6733 (type in Kew Herb.). MANIPUR: Moa, frt. Oct., *C. B. Clarke* 41423A.

Myriactis assamensis *C. E. C. Fischer*, sp. nov. [Compositae]; ab omnibus ceteris speciebus foliis minoribus angustis differt.

A much-branched *herb* 10–25 cm. high; stems numerous from the base, glabrous below, dark-grey, sulcate. *Leaves* alternate, sessile, linear to linear-oblanceolate, acute, slightly narrowed to a semi-amplexicaul base, 1·5–2·7 cm. long, 2–3 mm. wide, margins entire or with an acute tooth on both sides a little below the apex

and often another pair lower down but above the middle, midrib slightly impressed above, slightly prominent below, lateral nerves obscure. *Capitula solitary*, terminating the branchlets, hemispheric, 3–4 mm. diam.; peduncles slender, up to 7 cm. long, hispidulous, bearing a few reduced leaves which become smaller upwards. *Phyllaries* 2-ranked, thinly membranous, oblong, obtuse, minutely denticulate, 2–3 mm. long, the inner the larger, when dry olivaceous and minutely puberulous with pale scarious minutely ciliolate margins. *Receptacle* flat naked. *Ray florets* 2–3-seriate; *ovary* linear to elliptic-oblanceolate and compressed, narrowed at both ends, 1·5–2 mm. long, glandular; *ligules* linear, obtuse, 7–8 mm. long, white; *style* short, shortly, bluntly 2-fid. *Disk florets* many, tubular, 2–2·5 mm. long; *ovary* as in the ray florets; *corolla* abruptly funnel-shaped above a short cylindric base, 2–2·5 mm. long, yellow; lobes 4–5, triangular, acute, about half the length of the tube; *stamens* 4–5, anthers short, oblong, apiculate; *style* deeply 2-fid, lobes linear lanceolate, acute, minutely papillose outside. *Achenes* very narrowly oblanceolate, compressed, 3 mm. long, including a very short beak, dark-brown, glandular.

NAGA HILLS: Nahatomi, on rocks in Tizu River, 900 m. fls. Dept., *Bor* 6692 (type in Kew Herb.). GARO HILLS: Nongwalbibra, among rocks in Somesiwari River, 725 m., fls. & frt. early Jan., *Mrs. N. E. Parry* 1229, Garo name: *Rongbikal*.

Saussurea nagensis *C. E. C. Fischer*, sp. nov. [Compositae]; *S. deltoideae* (DC.) C. B. Clarke peraffinis, lobis terminalibus foliorum anguste lanceolatis, phyllariis basi valde incrassatis concavis distincta.

A tall *undershrub*; stem more or less woody below, terete, sulcate, reddish and thinly cottony above (lower parts not seen). *Leaves* stiffly membranous, ovate in outline, acuminate, deeply pinnatisect, often to very near the midrib, 20–23 cm. long, 13–16 cm. wide, lobes 3–4 pairs with sometimes a very small detached pair below, lanceolate, acuminate, apiculate, margins, as also those of the long linear-lanceolate terminal lobe, sinuate-dentate with large and small apiculate teeth, the 2nd pair from the base the largest of the lateral lobes, midrib prominent on both faces, lateral nerves more or less prominent below; upper surface dark-green, densely dotted with short, brown, crisped hairs, below grey-floccose, brownish on the nerves, basal lobes narrowly decurrent on the 2–3 cm. long, flocculent petiole, usually subtended by a small auricle. *Inflorescence* terminal, panicled, up to 30 cm. long, lateral branches racemose, up to 10 cm. long, 1–4-capitulate; peduncles of solitary or terminal capitula up to 6·5 cm. long, of the rest 2–10 mm. long; rhachis, its branches and the peduncles thinly tomentose; bracts at the divisions of the rhachis and base of the peduncles linear-lanceolate to linear, up to 5 cm. long, the lower largest, more or less coarsely and sharply dentate, the upper much smaller and entire, indumentum as of the leaves. *Capitula* hemispheric, up

to 2 cm. diam.; phyllaries 6-seriate, 8·5–9·5 mm. long, the outer ensiform from a broad, much thickened, concave base 3·5 mm. diam., apiculate, cottony below, the upper part shortly dark-hairy, the inner bracts shorter and narrower with less thickened bases, the outer 2–3 rows recurved; receptacle flat, densely furnished with yellowish setae 2·4–5·6 mm. long. *Florets* all tubular. *Ovary* oblong, compressed with one side excavate (at least when dry) or more or less trigonous in section, shallowly ribbed, 3–3·5 mm. long, apex truncate with a raised, usually denticulate rim. *Pappus* 1-seriate, united into a ring at the base, 8–11 mm. long, white, plumose. *Corolla* 1 cm. long, mauve, lower half narrow-cylindric, upper very narrowly funnel-shaped; lobes 5 linear, acute, 2·7 mm. long. *Stamens* 5, anthers 4 mm. long, their tails 2 mm. long, nearly entire. *Style* 2-fid, arms plano-convex, obtuse. *Achenes* not seen.

NAGA HILLS: Phulani, on grassy slopes, 2150 m., fls. Sept., *Bor* 27.

Lobelia Handelii *E. Wimm.* [Campanulaceae].

Previous record from Yunnan.

NAGA HILLS: Japvo, 2900 m., fls. late Sept., *Bor* 6428.

Symplocos Ifsiana *C. E. C. Fischer*, sp. nov. [Symplocaceae]; proxima *S. cordifoliae* Thw., ramulis tomentosis, foliis papyraceis majoribus subtus pilosis, lobis calycis ovatis, stylo villoso, fructu hirsuto distat.

A small *tree*; youngest twigs brownish- or fuscous-tomentose; branchlets finely furrowed, brown, glabrescent. *Leaves* papery, elliptic or elliptic-oblong, rarely elliptic-oblanceolate, acuminate, base rounded or cuneate, the apex sometimes falcate, 10–20 cm. long, 4·5–7·5 cm. wide, midrib and 9–11 pairs of primary nerves impressed above, prominent below, the nerves anastomosing near the margins, secondary nerves scalariform, margins closely denticulate with linear teeth callous at the tip, upper surface glabrous except for the hairy midrib and usually the primary nerves also at least near their bases, below pilose on the midrib, nerves and nervules; petioles terete, 8–13 mm. long, brown- or fuscous-tomentose. *Racemes* simple, from the apical axils, 3–5 cm. long; rhachis grey- or brownish-tomentose; flowers crowded, sessile; bracts broadly ovate, obtuse 5–6 mm. long, villous without, ciliate; bracteoles similar but smaller and sometimes apiculate. *Calyx-tube* very short above the ovary; lobes 5, ovate, obtuse, densely grey-villous as is the tube without, 3·5 mm. long. *Corolla-tube* very short; lobes 5, elliptic-oblong, obtuse or subacute, pale-yellow (when dry), 8–8·5 mm. long, thinly pubescent on the lower half and on the tube without. *Stamens* 70-80; filaments slender, glabrous, 7·5–9·5 mm. long, united at the very base and adhering to the corolla-tube, not pentadelphous; anthers broadly oblong, 0·7 mm. long. *Ovary* cupular, 1·5 mm. long, densely grey-villous, 3-celled; style 7·5 mm. long, villous in the lower ⅔. *Fruit* oblong,

1–1·15 cm. long, 5–6 mm. diam., crowned by the calyx, very dark-green (when dry), brown-hairy.

NAGA HILLS: Thevopesimi, in evergreen forest, 2170 m., fls. Sept., *Bor* 22 (type in Kew Herb.); Kamku Range, 2170., frt. March, *Bor* 2932.

The names of several Forest Officers in India have been commemorated in the names given to genera and species of Indian plants, but none have been dedicated to the Indian Forest Service (I.F.S.) as a whole and I take the liberty of doing so in this case.

Symplocos nagensis *C. E. C. Fischer*, sp. nov. [Symplocaceae]; *S. ramosissimae* Wall. affinis, ramulis hornotinis tomentosis, foliis angustioribus, costa subtus pilosa, staminibus multo numerosioribus differt.

A small *tree*; youngest twigs closely brown-tomentose, the older slender, dark-brown, finely furrowed (when dry), glabrous. *Leaves* elliptic to elliptic-oblong, acuminate, base cuneate, 5·5–9·2 cm. long, 2–3 cm. wide, midrib prominent below, primary nerves 7–8 pairs, above shining and glabrous except for the puberulous midrib, below dull and with scattered hairs when young, soon becoming glabrous except for the permanently hirsute midrib, margins slightly revolute, sharply serrate except for the lower $\frac{1}{5}$–$\frac{1}{3}$ and the apex, the teeth callous-tipped; petioles slightly compressed, 3–5 mm. long, hairy. *Racemes* from the upper axils, 2–7-flowered; peduncle 1 cm. long, densely appressed-pubescent, brownish near the base, greyish upwards; bracts ovate, 1 mm. long, pubescent outside; pedicels 2–4 mm. long, appressed grey-pubescent; bracteoles 2, opposite, at the base of the ovary, similar to the bracts. *Calyx* with ovary turbinate, 2·8 mm. long, pubescent; lobes 5, subsemicircular, 1 mm. long. *Corolla* 4 mm. long, cream-coloured; lobes 5, very shortly united at the base, broadly ovate, obtuse, glabrous. *Stamens* over 100, very slightly pentadelphous; filaments slender, up to 5 mm. long, glabrous. *Ovary* 2-celled; style 7 mm. long, glabrous. *Fruit* not seen.

NAGA HILLS: Kanjang, 2350 m., fls. Sept., *Bor* 6745.

Wrightia sikkimensis *Gamble* [Apocynaceae].

Known from Sikkim.

NAGA HILLS: Jotsoma, 1450 m., fls. May, *N. L. Bor* 6363, Climber; flowers reddish." Though this is a climber, it is not otherwise distinguishable from the plant described by Gamble.

Onosma Borii *C. E. C. Fischer*, sp. nov. [Boraginaceae]; *O. multiramosae* Hand.-Mzt. peraffinis, cymis terminalibus et axillaribus, calycis tubo distincto, corolla calyce satis longiore, filamentis latis, disci praesentia distat.

Erect *herb*; twigs pale grey-brown, setose with patent hairs from tubercular bases mixed with short adpressed bristles (lower parts not seen). Basal *leaves* in a rosette lying procumbent (fide N. L. Bor); upper cauline sessile or very shortly petioled, narrowly lanceolate, acute or subacute, base rounded, 2·7–5·3 cm. long, 6–12 mm. wide, midrib impressed above, prominent below, lateral nerves 3 pairs, arising at a very acute angle, obscure, above dark-green rough with long setae from tubercular bases, which latter eventually appear as white dots, mixed with shorter ones, below greyish and harsh with long setae from tubercles on the midrib, the rest densely covered with long and short stiff hairs, margins revolute. *Cymes* dichotomous, terminal and from the upper axils, up to 4 cm. long; rhachis and its branches setose like the twigs; bracts and bracteoles like the leaves but much smaller, similarly setose; pedicels 4–10 mm. long, setose. *Calyx* cupular, setose from tubercles mixed with short appressed bristles without, densely appressed white-setose within; tube 3·2–4·5 mm. long; lobes lanceolate, acuminate, 5·5–6·5 mm. long. *Corolla* narrowly barrel-shaped; tube 1·55 cm. long, retrorsely hispid without, hairy below the stamens within; lobes triangular-ovate, obtuse, 1–1·2 mm. long. *Stamens* inserted just below the middle of the corolla; filaments flat, broad, 3·7–4 mm. long, hairy at the base; anthers included, cohering by their bases into a cone, linear-ensiform, introrse, 6 mm. long including the beak, margins and apex minutely spinulose, *Disk* annular, thinly membranous, 1·5 mm. long. *Ovary*-lobes lobulate, 1 mm. long; style slender, 1·65 cm. long, shortly exserted; stigma capitate, minute. *Fruit* not seen.

NAGA HILLS: Laruri, 1230 m. and Shiloi Jopi, 2450 m., fls. Sept., *N. L. Bor.* 39 (type in Kew Herb.). "*Fls. blue changing to* pink at the corolla-mouth."

Onosma lycopsioides *C. E. C. Fischer*, sp. nov. [Boraginaceae]; *O. Borii* C. E. C. Fischer affinis, ramulis fuscis, foliis elliptico-oblongis distat.

Erect *herb* (lower parts not seen); twigs terete, dark-brown, covered with spreading whitish or brownish setae from tubercular bases mixed with shorter hairs. Upper cauline *leaves* sessile elliptic-oblong, acute, narrowed to the base, 5·5–12 cm. long, 1·3–3·5 cm. wide, lateral nerves obscure, upper surface dark-brown when dry, whitish-setose from tubercular bases which latter eventually appear as white discs, below pale and furnished with softer setae from smaller tubercles, denser on the nerves. *Cymes* terminal and from the upper axils; peduncles up to 10 cm. long, setose like the twigs, partial rhachises and pedicels; bracts like the leaves but much smaller, sometimes ovate; bracteoles at the base of the pedicels linear to linear-lanceolate, finely acuminate, sessile, 5–10 mm. long, white-setose; pedicels 5–10 mm. long. *Calyx* turbinate; tube 3·7–4 mm. long; lobes lanceolate, acute, 5·5 mm. long, patently densely white-setose from tubercular bases outside, densely appressedly white-setose within. *Corolla* barrel-shaped from a very short cylindric base 1·7 cm. long, retrorsely hispid without, glabrous within except for a zone of hairs about the

base of the stamens ; lobes ovate, obtuse, 1·5 mm. long. *Stamens* inserted about ⅓ above the base of the corolla ; filaments ensiform, 6 mm. long, brown-hirsute at the base ; anthers included, cohering by their bases, introrse, narrowly linear-lanceolate, dorsifixed, 6 mm. long including the beak, margins and apex minutely spinulose. *Disk* annular, thinly membranous, 2 mm. long, apex 8-lobulate. *Ovary* 1 mm. long ; style slender, glabrous, 1·6 mm. long, shortly exserted ; stigma capitate, minute. *Fruit* not seen.

NAGA HILLS : Japvo, 3050 m., fls. Sept., *N. L. Bor* 6507 (type in Kew Herb.) " Flowers bluish-purple."

In Kew Bull. 1938, 211, this same specimen was erroneously cited as *Lycopsis arvensis* Linn. which it closely resembles in its vegetative parts. The specimen was devoid of corollas, stamens and nutlets so that the main points of difference between the two genera were lacking. Subsequently further samples of the same collection were received and the error could then be corrected.

Wulfenia Amherstiana *Benth.* [Scrophulariaceae].

Known from the Western Himalayas from Afganistan to Kumaon.

KHASIA AND JAINTEA HILLS : Lawlyngdoh, 1800 m., fls. Sept., *fide* Dr. N. L. Bor *in litt.* (specimens in Dehra Dun & Shillong Herbaria).

Chirita Trailliana *Forr. et W. W. Smith* [Gesneriaceae].

Recorded from W. China.

NAGA HILLS : Kilomi, 1850 m., fls. June. *N. L. Bor* 4482.

Didymocarpus yunnanensis (*Franch.*) *C. E. C. Fischer*, comb. nov. [Gesneriaceae]. *Rottlera yunnanensis* Franch. in Bull. Mus. Hist. Nat. Paris, **5**, 250 (1899)—a Yunnan plant.

NAGA HILLS : Pulebudze, 1540 m., fls. Aug., *N. L. Bor* 6346.

Aeschynanthus oblanceolata (*Anth.*) *C. E. C. Fischer*, stat. nov. [Gesneriaceae] ; *A. bracteatae* Wall. affinis, foliis oblanceolatis cuspidatis minoribus, bracteis minoribus, filamentis haud exsertis differt.

A glabrous epiphytic *shrub* 0·4–1·6 m. long, pendulous ; branches pale- to dark-brown, 2 mm. diam. or more, woody. Leaves oblanceolate, sometimes elliptic-oblanceolate, abruptly cuspidate, subacute, base tapered, 4–7 cm. long, 1·3–2·5 cm. wide, midrib impressed above, raised below, nerves invisible, margins more or less revolute ; petioles 6–10 mm. long canaliculate above. *Inflorescence* in the upper axils, sometimes appearing terminal through the arrest of the terminal buds ; peduncles solitary or twin, 3–6 cm. long, 1–2-flowered, with minute, thick, broadly ovate, apiculate bracts at the base ; bracteoles ovate or ovate-lanceolate, obtuse or subacute, 1–1·6 cm. long ; pedicels 0·5–2 cm. long. *Sepals* 5, narrowly oblong, obtuse or subacute, 1·4–2 cm. long. *Corolla* tubular, curved, slightly ventricose ; tube 3·2–3·5 cm. long ; limb 2-lipped, posterior lip of 2 broadly oblong, rounded lobes 3–4 mm.

long, anterior 3-lobes, lobes broadly oblong, 4–6 mm. long, midlobe longest. *Stamens* 4 ; filaments slender, 1·3–1·6 cm. long, puberulous towards the apex, inserted about the middle of the corolla-tube, those of the anterior a little lower than the posterior and a little longer ; anthers oblong, 2–2·5 mm. long, united in pairs by their apices in the corolla-mouth. *Disk* annular, lobulate, 2 mm. long. *Ovary* stipitate ; stipe 1·2–1·6 cm. long ; carpel linear, 1·1–1·3 cm. long ; style 4–5 mm. long ; stigma widely funnel-shaped. *Fruit* and *seeds* not seen.

NAGA HILLS : Pulebudze, 2530 m., fls. Aug., *N. L. Bor* 6345, " flowers plum-coloured, mouth spotted." N. E. Burma : " on rocks and trees in mixed forests," 2530–2900 m., fls. Sept. *G. Forrest* 24935 (type in Edin. Herb., duplicate in Kew Herb.) " pendulous epiphytic plant of 1–2 ft. ; flowers brilliant scarlet-crimson " ; 26° 14′ N. : 98° 46′ E., on trees in forests on the lower ridges of the divide, 2530–2900 m., fls. July, *Forrest* 27080, " Epiphytic plant of 1–4 ft. Flowers deep crimson."

Besides the colouring of the flowers I can see no differences between the three collections except that in the last cited the leaves are more coriaceous and some of them (the lower ones) smaller and more elliptic. In all three in the dry state the bracteoles and the sepals appear to be concolorous with the corolla.

In Not. R. Bot. Gard. Edinb. **18**, 190, Anthony has published the combination *Aeschynanthus Peelii* Hook. f. et T. var. *oblanceolata* Anth. citing *Forrest* 24933 & 27080. I consider that the differences between these and the type of the species, as also of *A. bracteata* Wall. are sufficiently pronounced to merit elevation to specific rank ; indeed they are greater than those Anthony (l.c.) indicates between the two older species, which, he thinks, were wrongly merged by C. B. Clarke in Fl. Brit. Ind. **4**, 342. I am not prepared to express an opinion on this point as the type of *A. bracteata* (Wall. Cat. 794) is not available at the moment. A rather poor duplicate of it, however, shows that one of Anthony's points of difference—the relative length of the peduncles and petioles—is not valid. *A. oblanceolata* (Anth.) Fisch. diverges more from either of the two older species than they do from each other. One character showing a marked difference is not mentioned by Anthony. In both the older species the stamens are well-exserted from the corolla, in the new one the anthers are in the corolla-mouth. (I have not seen the Edinburgh sheets, but duplicates of the 2 cited are in the Kew Herbarium.)

Lysionotus gracilipes *C. E. C. Fischer*, sp. nov. [Gesneriaceae] ; *L. pubescenti* C. B. Clarke peraffinis, caulibus anisophyllis, foliis ellipticis minoribus subtus pubescentibus, capsula graciliore differt.

Epiphytic *undershrub* ; branchlets more or less compressed, brown, glabrous below, brown-tomentose upwards. *Leaves* thinly coriaceous, opposite or ternate, rarely alternate, narrowly elliptic or elliptic-lanceolate, acute at both ends, 2·5–6·5 cm. long, 0·5–1·7 cm.

wide, those at the same node unequal, primary nerves 4–6 pairs glabrous above, thinly clothed with multicellular hairs below, margins sinuate; petioles terete, 1–4 mm. long, tomentose. *Inflorescence* axillary, of 3–6-flowered umbels, one or two branches of the umbels often 2-flowered; peduncles filiform, up to 11 cm. long; bracts at the base of the umbel 2, ovate, obtuse, 3 mm. long, glabrous; bracteoles similar, smaller. *Sepals* 5, oblong-lanceolate, subacute, bluntly apiculate, 5 mm. long, 1·5 mm. wide, 3-nerved. *Corolla* tubular-ventricose, white, thinly pubescent outside; tube 3·2 cm. long; limb 2-lipped; anterior lip of 2 oblate, rounded lobes 2·5 mm. long, 5 mm. wide, with 2 folds in the throat 6 mm. long, 2 mm. wide, tapering in front, semi-cordate at the base; posterior lip 3-lobed, 1·3–1·5 cm. long, terminal lobe oblong, 6 mm. long, lateral broadly ovate, 5 mm. long. *Stamens* 2, included; filaments inserted just above the middle of the corolla-tube, flat, curved towards the apex, 1·2 cm. long; anthers sub-circular, 1·6 mm. diam., confluent. *Disk* annular, lobiculate, 1·3 mm. long. *Ovary* shortly stipitate, linear, 1·5 cm. long; style compressed, 8·5 mm. long; stigma hardly wider. *Capsules* slender, acuminate, 5–6 cm. long. *Seeds* not seen.

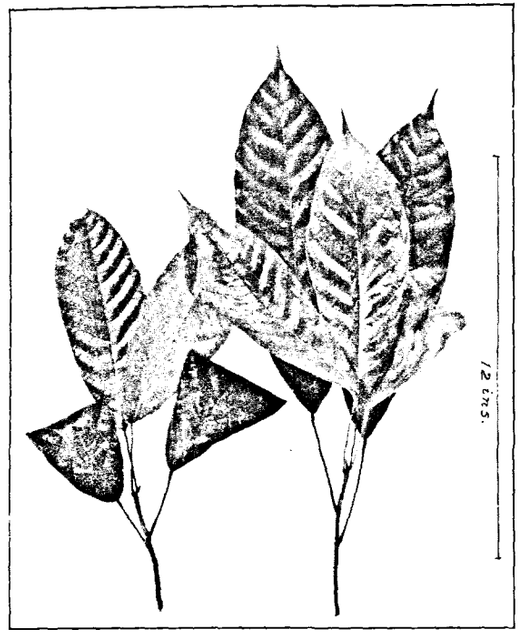
NAGA HILLS: Kohima, 2350 m., fls. & frt. Aug. *N. L. Bor* 6232 (type in Kew Herb.).

IV—NOTE ON THE VEGETATIVE PROPAGATION OF CACAO AT KEW. G. EVANS.

For some years past the Royal Botanic Gardens have been actively concerned in the transfer of cacao plant material from one part of the British Empire to another.

The West African cacao growing colonies, Nigeria and the Gold Coast, have for some time been interested in the results obtained by the cacao research workers at the Imperial College of Tropical Agriculture in Trinidad and have been desirous of obtaining plant material from the selected clones of high grade "Forestero" cacao that have been one of the results of this research. West Coast cacao is of lower quality than the West Indian types which usually contain a proportion of "Criollo" or "*pentagona*" blood and command higher prices in the world's market.

There are, however, certain serious diseases in the West Indies, such as the "witches broom" caused by *Marasmius perniciosus*, which do not occur in West Africa, and in order to avoid the risk of their introduction the West African colonies are naturally taking all precautions, and consequently the Governments have prohibited the direct importation of all living cacao material. It is for this reason that the good offices of Kew have been sought and any material from the West Indies has now to come to the Royal Botanic Gardens in the first place, where it is grown in quarantine under supervision and is not released until it has been inspected by the officers of the Imperial Mycological Institute.



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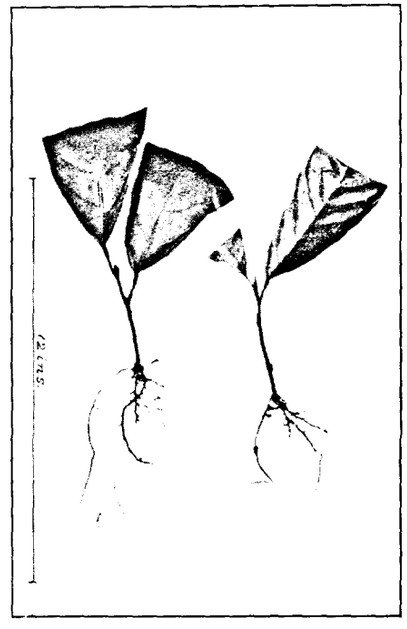

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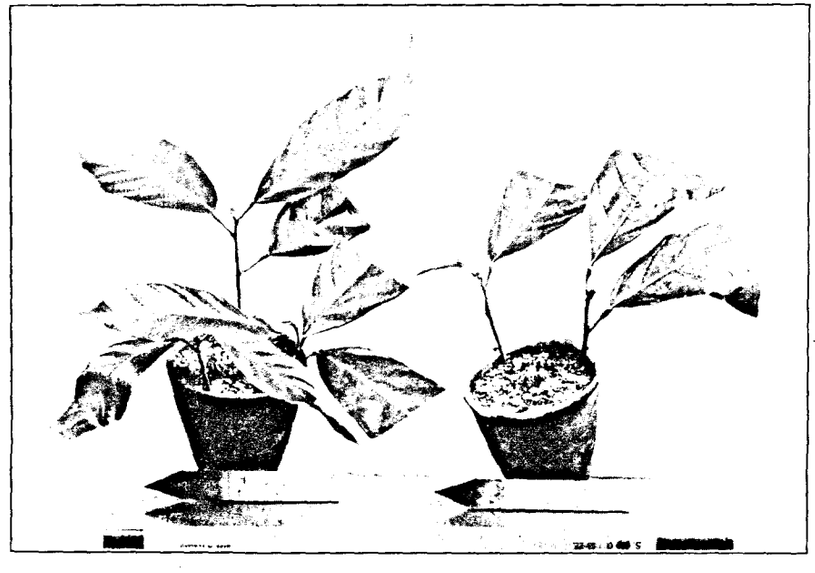

3.

Fig. 1. Soft-wood cuttings of cacao; cutting on left trimmed ready for potting.
Fig. 2. Cuttings showing root development after three months.
Fig. 3. Method of propagation in pots.

[*To face page* 42

Different kinds of material have been handled by Kew in the last two or three years. Seedlings have been raised from pods sent from Trinidad and from Nigeria, and the technique for the transportation of pods, to ensure that the seed is viable on arrival, has been developed.

Experiments in budding have also been made and a number of seedling plants raised from Nigerian seed have been used as root stocks and have been successfully budded.

It must be remembered, however, that Kew is working under some difficulty, since the cacao plants have to be raised in tropical houses where accommodation is strictly limited. In addition, because of weather conditions, the opportunity for exporting plants is restricted to the four summer months, and available space may, therefore, be severely taxed at certain times of the year. As several hundred plants are wanted by the West African colonies, it is important to devise a method whereby the required material can be raised and exported as rapidly as possible, and to send off the plants as soon as they are strong enough to travel. The smaller the plants, the less space will they occupy and the larger will be the number that can be packed into a Wardian case. This would result not only in a speeding up of operations, but also in a saving in the cost of packing and shipping. For these reasons, it was decided, in the autumn of 1939, to carry out experiments to test the possibility of rooting cuttings. As these have given better results than were anticipated, it should be of value to place on record the results of the first preliminary trials.

In Trinidad, cacao has been successfully rooted for some years past and cuttings of semi-hard wood, 7 or 8 inches in length, and about as thick as a lead pencil, are used. This system could possibly be adopted in Kew, but it has certain disadvantages. In the first place a good deal of material is required, and space at Kew is naturally limited, and secondly, the rooted plants are somewhat large and so occupy too much space in a Wardian case.

It was, therefore, determined to try and root young slips. The material used in the experiment (see Plate III) consisted of young soft-wood cuttings or slips, not thicker than a programme pencil, bearing only three or four fully developed leaves. These were taken from side shoots of clonal plants on their own roots received from Trinidad about a year ago, which are now growing in pots in the tropical houses at Kew. The cuttings taken are only about four inches in length, and about half the length is buried in the soil. It seems to be immaterial whether the cutting is made at the node or not, or whether a small heel of maturer wood from the main branch is attached.

The cuttings were planted in the regular compost used at Kew which consists of about two parts loam to one of sand and one of black peat. So far no plant growth substances have been used, but it is possible that these may be tried in future experiments.

Twenty cuttings were taken and after the leaf surface had been reduced, they were potted into 2 inch pots on 9th October, 1939. The pots were placed in a small case or wooden frame with a glass top about 4 ft. by 4 ft. in size, and this contained a 5 inch layer of coconut fibre, overlying a hot water tank at a temperature of about 115° to supply bottom heat. This case is one of several in the tropical pits in which the temperature varies between 75° and 85° and where the humidity is kept as high as possible, being usually between 70 and 80.

Callus rapidly formed and the first signs of rooting appeared early in November. On 11th January, 1940 (when the accompanying photographs were taken), the majority of the cuttings had rooted most satisfactorily, some of the roots being 5 inches long. At the same time growth above ground had commenced and the leading shoot was often over an inch in length with new leaves unfolding.

Of the twenty cuttings potted in October fifteen were well rooted and had begun to put on growth by the beginning of January. Ten of these were of I.C.S.1 and five of I.C.S.7, which are the two Trinidad clones at present available in Kew. There seems to be little difference between " fan " or " chupon " cuttings in the matter of striking, as nine of the rooted plants are from " chupons " and six are from " fan " shoots.

The experiments, so far as they go, are distinctly promising because it must be remembered that the period covered by them is probably the worst of the whole year for the purpose, owing to the prevalence of fog and the scarcity of sunlight. It seems likely that even better results may be obtained in the spring as the daylight improves, and it is also hoped that the time required to raise a stock of rooted plants fit to travel will be shortened.

There seems a possibility that by using the method described above, smaller, sturdier plants, occupying less space in a Wardian case, and less liable to damage in transit than budded plants, may be produced. The process is also far simpler and involves much less labour and greenhouse space than does the budding method.

V—NEW OR LITTLE-KNOWN PLANTS FROM SOUTHERN INDIA : XII.* C. E. C. FISCHER.

Centratherum indicum (*Less.*) *C. E. C. Fischer*, comb. nov. [Compositae].

The combination *Centratherum reticulatum* (DC.) Benth. has been generally adopted for this plant, this epithet having been transferred from *Decaneurum reticulatum* DC. in Wight Contrib. Bot. Ind. 7, 1834. But as this publication was antedated by *Ampherephis indica* Lessing in Linnaea, **6**, 687, 1831, the epithet *indica* must be retained.

* Continued from K.B. 1939, 662.

Centratherum Mayurii *C. E. C. Fischer*, sp. nov. [Compositae] ; *C. indico* (Less.) C. E. C. Fisch. affine, foliis ellipticis vel elliptico-oblanceolatis haud rugulosis haud reticulatis, involucri bracteis lineari-lanceolatis distinctum.

A robust *herb* ; stem terete, branched above, brown, striate, more or less densely furnished with multicellular black-banded (when dry) hairs from small, black tubercles. *Leaves* alternate, cauline (lower parts not seen) elliptic-oblanceolate, acute, base decurrent, 4–6·5 cm. long, 1–2·5 cm. wide, dark brown (when dry) above and abundantly furnished with crisped, pale-brown, multicellular hairs, below white-tomentose except the glabrous, brownish midrib and 9–10 pairs of parallel primary nerves, secondary nerves scalariform, obscure, margins sharply serrate ; petioles up to 5 mm. long ; uppermost leaves sessile, narrowly elliptic-lanceolate, margins nearly entire, otherwise like the lower. *Capitula* solitary, axillary on short peduncles or terminating leafless twigs, campanulate, 1 cm. diam., subtended by 2–3 leafy, apiculate, setose-ciliate bracts resembling the upper leaves, up to 2·5 cm. long. *Involucral bracts* 5-seriate, linear-lanceolate, pungently acuminate, 7·5–10·5 mm. long, innermost longest, the outermost with similar indumentum to that of the leafy bracts, the next 2 rows with the indumentum only in the apical half, the rest of the rows glabrous. *Receptacle* flat, naked. *Ovary* oblong, slightly obovate, 1·4 mm. long, 10-ribbed, glabrous. *Pappus* copious, white, 4·3–5 mm. long, of ascendingly long-barbellate setae. *Corolla* purple ; tube filiform, very slightly expanded at the mouth 5·5 mm. long ; lobes 5, linear, 1·5 mm. long. *Anthers* linear, base minutely 2-apiculate, 1·3 mm. long. *Style-arms* 2, linear, subacute, puberulous. *Achenes* like the ovary, pale-brown, 1·5–1·7 mm. long.

MYSORE STATE : Kemmangundi Hills, fls. and frt. Nov., *P. V. Mayuranathan* without number (type in Kew Herb.).

The species is named in honour of the collector.

Senecio kundaicus *C. E. C. Fischer*, sp. nov. [Compositae] ; *S. Wightii* (DC.) C. B. Clarke peraffinis, caulibus sparse puberulis, foliis lineari-oblongis obtusis minute dentatis, involucri bracteis numeriosioribus apice penicillatis, ligula 4-nervata pappo instructa differt.

A nearly glabrous *herb* ; stem sulcate, sparsely puberulous. *Leaves* alternate, upper cauline (lower parts not seen) sessile, linear-oblong, apex rounded, base amplexicaul, auricles rounded, 6–12 cm. long, 1–2·1 cm. wide, primary nerves about 10 pairs, obscure, margins minutely, rather distantly toothed ; the terminal leaf smaller and subacute, forming a bract to the corymb. *Corymbs* terminal, few-capitulate ; bracts at the divisions similar to the terminal leaf but much smaller. *Capitula* turbinate, 5–6 mm. diam. *Involucral bracts* about 30 in 1 series with 1–2 shorter at the base, linear, obtuse or subacute, 7–7·5 mm. long, glabrous except the penicillate tips. *Receptacle* flat, naked, smooth. *Ray florets* few

in 1 row ; ovary linear-oblong, trunctate, shallowly ribbed, 1·5 mm. long, glabrous, apparently fertile ; *pappus* ample, white, 5 mm. long ; *ligule* yellow, tubular portion very slender, 4 mm. long, limb elliptic-oblong, shortly 3-toothed and 4-nerved with the 2 central nerves forking near the apex and joining each other and the lateral in the teeth or 2-toothed with one lateral nerve evanescent near the apex and only one of the remaining central ones forking, 6·5 mm. long, 3 mm. wide ; *style-arms* 2, slender. *Disk florets* numerous, yellow ; *ovary* and *pappus* as in the ray florets ; *corolla* 5 mm. long, tube slender below, narrowly funnel-shaped in the upper third, lobes 5, triangular, acute, short, *anthers linear*, 1·5 mm. long, acute, base minutely 2-apiculate ; *style* shortly exserted, arms 2, short, truncate. *Achenes* not seen.

NILGIRI HILLS, on the Kundahs, fls. Sept., *P. V. Mayuranathan* without number (type in Kew Herb.).

VI—MISCELLANEOUS NOTES.

The Professorship of Forestry at Oxford.—MR. H. G. CHAMPION, M.A., I.F.S. has been elected to the Chair of Forestry at the University of Oxford in succession to the late Professor R. S. Troup, C.I.E., D.Sc., F.R.S. Mr. Champion has served with distinction for over 25 years in the Indian Forest Service. He was at one time Silviculturist at the Forest Research Institute at Dehra Dun and lately acted as Conservator of Forests in the United Provinces.

Mr. J. R. Sealy.—MR. J. R. SEALY, B.Sc., has been appointed by the Minister of Agriculture and Fisheries to the post of Assistant Botanist (Temporary) as from January 1st, 1940. Mr. Sealy has been assistant to the Editor of the Botanical Magazine since 1927.

SIDNEY ALFRED SKAN.—We record with deep regret the death on December 19th, 1939, at the age of 69, of Mr. S. A. Skan, who retired from the post of Botanist at the Herbarium in 1933 (K.B. 1933, 462).

Skan was born on August 30th, 1870, and received his early horticultural training at the Edgbaston Botanic Garden, under Mr. W. B. Latham. Mr. Latham, who had been trained at Kew, was an extremely successful horticultural instructor, and Skan was one of five young gardeners who came to Kew from Edgbaston during the nineties of last century.

Skan entered Kew as a Student Gardener on September 19th, 1892, and after working in the Arboretum and Temperate House pits, he sat for a competitive examination in 1894 for a post as Assistant in the Herbarium. He had always shown an interest in the botanical side of his work and he was very anxious to seize this chance of a botanical career. He worked every spare minute for six weeks before the examination and came out head of the list.

He was appointed Assistant on July 16th, 1894, and relieved Hemsley (then Principal Assistant) of the routine work of the Library ; this absorbed the major part of his time and energies to the end of his career. After 1899 he was, in fact, Librarian, though he was not actually given this title. He was responsible for the annual lists of additions to the Library from 1899 to 1916, and for the Supplement to the Library Catalogue published in 1919.

Among the reforms effected by Skan was the rearrangement of the main body of the tracts in a single alphabetical series, thus greatly facilitating consultation. The maintenance of the Library in a satisfactory condition and its judicious expansion were due largely to his unceasing care and skill. His devotion to the interests of the Library naturally left him but little time for scientific work. Nevertheless, he elaborated the *Juglandaceae*, *Cupuliferae-Quercineae*, *Ceratophyllaceae* and *Gnetaceae* for the " Index Florae Sinensis " (1899), and (with Hemsley) prepared the account of the *Scrophulariaceae* for the " Flora of Tropical Africa " (1906), describing 54 of the 59 new species. He retained his interest in horticulture, and contributed a series of annual lists of plants introduced into cultivation during the period 1897–1915. Their discontinuance removed a valuable source of information on the history of garden plants. A list of his publications up to the year 1906 is given in Kew Bull. 1907, App. 5, p. 136.

Skan's exceptionally good memory and very wide knowledge of botanical literature were always placed freely at the disposal of his colleagues and of visitors to Kew, and he often went to great trouble to help junior members of the staff in their difficulties, whether these were concerned with identifying some garden plant or in tracing an obscure reference. He will be remembered as an example of devotion to duty, and for consistently placing the interests of Kew before his own.

Scientific Collaboration between Britain and France.—Two members of the Delegation from the Centre National de la Recherche Scientifique, Professor L. Blaringhem, Professor of Botany at the Sorbonne, and Professor P. Chouard, Professor of Agriculture at the Conservatoire National des Arts et Métiers, visited Kew on Tuesday, January 30th, after an earlier visit to the John Innes Horticultural Institution at Merton. They were met by the Director and discussed co-operation in various fields with Dr. Metcalfe, and with Dr. Tincker, who came from Wisley to meet them. They also visited the Herbarium after a general tour of the Gardens.

Botanical Magazine.—Part 3 of vol. 162, which was published on December 30th, 1939, contains the following plant portraits : *Astragalus Durhamii* Turrill (t. 9579), a fine yellow-flowered species found by Lt.-Col. F. R. Durham on the Gallipoli Peninsula ;

Calorhabdos Brunoniana Bentham (t. 9580), a native of the East Central Himalaya and South-West China ; *Codonopsis convolvulacea* Kurz var. *Forrestii* (Diels) Ballard (t. 9581), a new variety from Yunnan and Szechwan ; *Leptospermum scoparium* J. R. et G. Forster var. *eximium* B. L. Burtt (t. 9582), a striking large-flowered new variety from Tasmania introduced by Mr. H. F. Comber ; *Crocus Sieheanus* Hort. Barr. ex B. L. Burtt (t. 9583), a new species or hybrid from the Taurus Mountains ; *Primula laciniata* Pax & K. Hoffm. (t. 9584), a native of West Szechwan ; *Leucojum trichophyllum* Schousboe (t. 9585), a dainty species found in Southern Portugal, Spain and the littoral regions of Morocco and Algeria ; *Nymphaea polychroma* A. Peter (t. 9586) a fine blue-flowered water-lily from Tanganyika Territory ; *Rhododendron fulvum* Balf. f. & W. W. Sm. (t. 9587), distributed from W. Yunnan to Upper Burma ; *Osbeckia yunnanensis* Franchet ex Craib (t. 9588), discovered by Delavay and found in Yunnan, Hupeh and Kweichow ; and *Arisaema sikokianum* Franchet & Savatier (t. 9589), a native of the island of Shikoku, Japan.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1940
ROYAL BOTANIC GARDENS, KEW

VII—TROPICAL AFRICAN PLANTS : XVIII.*

SAXIFRAGACEAE.

Vahlia Goddingii *E. A. Bruce*, sp. nov. [Saxifragaceae] ; affinis *V. somalensi* Chiov., sed caulibus et ramis glabris, receptaculo glabro vel nonnunquam basi pilis longis paucissimis instructo differt.

Herba erecta vel suberecta, 30–40 cm. alta, ramosa, caulibus erectis vel adscendentibus glabris, senioribus teretibus basi induratis 3–4 mm. diametro, junioribus subgracilibus circiter 1·5 mm. diametro, internodiis 1–3 cm. longis. *Folia* sessilia, chartacea, lanceolata vel ovato-lanceolata, apice acuta vel leviter acuminata, basi rotundata vel late cuneata, 1·3–3 cm. longa, 0·5–1·2 cm. lata, utrinque glabra, margine integra, nervis inconspicuis. *Flores* ex axillis foliorum superiorum 1–2 fasciculati vel brevissime pedunculati ; pedicelli 1–2 mm. longi ; bracteolae lineari-subulatae, circiter 2 mm. longae, parce pilosae. *Calyx* 5-partitus, lobis ovatis vel ovato-lanceolatis acute acuminatis circiter 5 mm. longis 2·5 mm. latis glabris, receptaculo subturbinato 2·5 mm. longo 3 mm. diametro valde 5-costato glabro vel basi pilis longis paucissimis instructo. *Petala* 5, flava, obovata, calycis lobis longiora, 5–6 mm. longa, 3–4 mm. lata, apice subrotundata. *Filamenta* circiter 5 mm. longa, parce pubescentia, basi squamula hyalina ± transverse elliptica 1 mm. lata parce lanato-pubescente ; antherae oblongae, 2 mm. longae. *Styli* 2, 6–7 mm. longi, parce et breviter pubescentes ; stigmata discoidea.

BRITISH SOMALILAND. Harradigit, 44° 31′E., 7° 40′ N., 981 m., Nov. 1934, *Godding* 237 (type) :—a small plant with yellow flowers ; native name " Wandeck."

BALSAMINACEAE.

Impatiens (Salpingochilon) **Tweedieae** *E. A. Bruce*, sp. nov. [Balsaminaceae] ; affinis *I. kilimanjari* Oliv. sed foliis acute serratis haud crenatis, alis corollae majoribus et valde inaequaliter bilobis differt.

Herba 30–45 cm. alta, erecta ; caules glabri vel apicem versus lepidoti, internodiis 2–4 cm. longis inferioribus longioribus. *Folia* opposita, petiolata ; petiolus 0·5–2·5 cm. longus, basi leviter ampliatus, glaber vel pilis paucis brevibus in sulco vestitus ; lamina elliptica vel ovato-elliptica, apice acute acuminata, basi cuneata, supra pilis paucis brevibus ornatis demum glabra, infra glabra,

* Continued from K.B. 1939, 247.

2·5–9 cm. longa, 1·5–3·5 cm. lata, margine acute glanduloso-serrato, nervis lateralibus utrinsecus circiter 8 arcuato-ascendentibus. *Flores* subglabri, in axillis foliorum superiorum 1 vel 2 dispositi, rosei et albi vel scarlatini, longe pedicellati, pedicellis 2–5 cm. longis glabris basi bracteatis; bracteae lineari-lanceolatae, acutae, circiter 2 mm. longae. *Sepala* 2, oblongo-lanceolata, 5 mm. longa, apice acuta, glabra. *Labellum* infundibuliforme, fauce obliquo, infra apiculatum, circiter 1 cm. diametro; calcar latum, basin versus angustatum, incurvatum, circiter 1·5 cm. longum, parte inferiore 0·5 cm. incurvato; alae ovatae, apice rotundatae, 1·2 cm. longae, profunde et inaequaliter bilobae, lobo inferiore majore late ovato 7 mm. longo 5 mm. lato, lobo superiore ovato-lanceolato 4 mm. longo 2 mm. lato; vexillum late ovatum, cucullatum, dorso carinatum, apice acutum, 7 mm. longum et latum. *Fructus* subcylindricus, basi et apice leviter angustatus, 1·4 cm. longus, 0·4 cm. diametro, glaber.

KENYA COLONY. Mt. Elgon, 3750 m. and higher, Nov. 1932 fl. & fr., *Mrs. Tweedie* A.2. East Elgon, 2850 m., by stream in forest, Jan. 1937 fl., *Mrs. Tweedie* 366 :—flowers a brilliant scarlet, plant up to 30 or 45 cm. high. East Elgon, 3240 m., on river bank in the tree-heath belt, grass and woodland, Jan. 1937 fl., *Mrs. Tweedie* 637 (type) :—lovely pink and white flowers. Mt. Elgon, about 3240 m., Feb. 1937 fl., *Mrs. Tweedie* 367A. (in spirit).

THYMELAEACEAE.

Lasiosiphon mollissimus *E. A. Bruce*, sp. nov. [Thymelaeaceae]; affinis *L. Hoepfneriano* Vatke, sed capitulis majoribus sessilibus vel subsessilibus, involucri bracteis oblongis vel ellipticis apice rotundatis vel subacutis nonnunquam apiculatis haud acuminatis differt; a *L. polyantho* Gilg involucri bracteis latioribus, calycis tubo breviore distinguendus.

Suffrutex. *Caules* multi, erecti, lignosi, brunnei, simplices vel parce ramosi, basi 3–5 mm. diametro, parce et molliter albido-pilosi. *Folia* spiraliter orta, sessilia vel subsessilia, congesta, oblonga vel oblanceolata, 2·5–3·5 cm. longa, 0·8–1 cm. lata, basin versus sensim angustata, apice subacuta interdum apiculata, utrinque et margine adpresse albido-sericeo-pilosa, supra nervis plus minusve inconspicuis, subtus costa media inferne prominula. *Capitula* terminalia, circiter 50-flora, sessilia vel subsessilia, 3·5–4·5 cm. diametro. *Involucri bracteae* circiter 10, imbricatae, oblongae vel ellipticae, foliis breviores, 1·3–1·7 cm. longae, 0·7–1·1 cm. latae, extra dense adpresse sericeo-pilosae, intus inferne brunneae glabraeque, superne breviter albido-tomentosae. *Flores* 5-meri, sessiles. *Calycis tubus* angustato-cylindricus, 1·4–1·7 cm. longus, vix 1·5 mm. diametro sed infra faucem (ubi stamina inserta) 2 mm. et basin versus (circa ovarium) 2·5 mm. ampliatus, 7 mm. supra basin articulatus, supra articulum dense adscendente albido-sericeo-pilosus, infra densissime adscendente penicillatus; calycis lobi flavidi, patentes, oblongi vel oblongo-elliptici, circiter 3 mm. longi, 2·5 mm. lati, apice late

rotundati vel emarginati, extra secus medium parce sericeo-pilosi, ceterum glabrescentes, intus glabri. *Petala* membranacea, ovata vel ovato-orbiculata, circiter 1·5 mm. longa, basi rotundata, apice rotundata plerumque abrupte breviterque acuminata. *Stamina* 10, biseriata, seriei superioris breviter exserta, inferioris in tubo faucem versus inserta; antherae sessiles vel subsessiles, circiter 1 mm. longae. *Ovarium* angustato-ellipsoideum, 3–4 mm. longum, circiter 1 mm. diametro, superne parce adscendente pilosum, inferne glabrum, in stylum sensim angustatum; stylus circiter 1 cm. longus, 3 mm. supra basin articulatus, stigmate, globoso 0·5 mm. diametro.

NORTHERN RHODESIA. Abercorn District. Near Malombe, on the road to Kambole, in short grass and " dambo " on plateau in *Brachystegia* forest, 1650–1800 m., 2 June 1936, *Burtt* 6115 (type) :—clumps of yellow flowers. In small seasonal swamps or " dambo " in high plateau country, *Burtt* 6111 :—clumps of honey-scented, orange flowers. On road to Issanga Estate, in stunted *Brachystegia* woodland on hill-tops, 1500 m., 21 April 1936, *Burtt* 6108 :—clumps of ochre-yellow flowers.

EUPHORBIACEAE.*

Euphorbia Daviesii *E. A. Bruce*, nom. nov.—*Euphorbia imbricata* E. A. Bruce in Kew Bull. 1933, 468, non *E. imbricata* Vahl Symb. Bot. **2**, 54 (1791).

Monadenium magnificum *E. A. Bruce*, sp. nov. [Euphorbiaceae]; affinis *M. asperrimo* Pax sed foliis majoribus caulis apicem versus aggregatis, pedunculis longioribus differt.

Planta 0·6–1·5 m. alta. *Radix* verosimiliter tuberosa. *Caules* 1–4 e radice orti, erecti, succulenti, 4 vel 5-angulati, apice circiter 2 cm. basin versus angustati 1–1·5 cm. diametro, cicatricibus foliorum paucis semi-orbicularibus 6 mm. diametro ornati; anguli caulis aculeati, aculeis rubris basi plerumque contiguis angustato-conicis 1–3 mm. longis induratis interdum furcatis. *Folia* viridia demum rubescentia 5 vel 6 apice caulis aggregata, sessilia, late elliptica vel obovata, 10–15 cm. longa, 6–10 cm. lata, glabra, apice rotundata, basi angustata, margine minutissime aculeato-denticulata, costa media infra aculeato-alata, nervis lateralibus inconspicuis. *Dichasia* pluria, apice caulis aggregata; pedunculi primarii 9–14 cm., secundarii 3–5 cm., tertiarii 1–3 cm., ultimi 0·5–1 cm. longi, omnes glabri, tetragoni, 3–5 mm. diametro, angulis aculeatis; bracteae late oblongae, vix 1 cm. longae, 4 mm. latae, dorso angustato-undulato-alatae; prophyllum cyathii speciosum, coccineum, oblongo-lanceolatum, 8 mm. longum, 4 mm. latum, glabrum, apice rotundatum vel subtruncatum, dorso aculeato-alatum. *Cyathium* prophyllo brevius, circiter 6 mm. longum, cupuliforme, glabrum, latere anteriore vix usque medium aperto, lobos interiores subquadratos fimbiatos superans, margine paullo incrassato. *Ovarium*

* For *Macaranga Dawei* see *Myricaceae* p. 53.

exsertum, reflexum, glabrum, 4 mm. longum et latum, 3-angulatum. *Styli* 1 mm. longi, triente inferiore connati, apice bilobati. *Capsula* 3-angulata, circiter 5 mm. longa, 4 mm. lata, angulis angustissimis alatis. *Semina* oblonga, tetragona, basi et apice truncata, albescentia, tuberculata.

TANGANYIKA TERRITORY. Gulwe Valley, near Mpwapa, 11 July 1937, fl. and fr., *Burtt* 6597 (type) :—a succulent 0·6–0·9 m. high, stem 4- to 5-angled with double spiny processes along the angles ; leaves green, turning red with age ; flowers scarlet and remarkably spectacular, borne at the apex of the stem ; 990 m., in *Commiphora-Acacia* bush in open seasonally flooded glades, 26 April 1932, fl., *Burtt* 3914 :—stem spiny, 4-angular, 0·6–0·9 m. high, with a crown of 5 or 6 green, lanceolate leaves ; flower-spike crimson lake. Dodoma Province : Gulwe, 840 m., common but scattered in *Commiphora*-Bush-Formation, 19 Aug., fl. and fr., *Greenway* 2408 :—Slender stemmed succulent plant up to 1·2 or 1·5 m. high, with red flowers ; stems not much branched, angular with numerous small red branched spines. Iringa Province : Pawaga District, 780–900 m., May-June 1936, fl. and fr., *Ward* P. 16.

Mr. Greenway notes that under cultivation 3 or 4 stems are produced and the plant has a somewhat bushy head 0·6–0·9 m. high.

PAPILIONACEAE.

Crotalaria diloloënsis *Bak. f.* in Rev. Zool. Bot. Afr. **21,** 297 (1932). *C. praecox* Milne-Redhead in Hook. Ic. Pl. **33**, t. 3244 (1934).

BELGIAN CONGO. Dilolo, *de Witte* 626 (type in Brussels Herb.).

NORTHERN RHODESIA. Mwinilunga District. In open space in *Brachystegia* woodland, after grass fire, near Matonchi Farm, 1 Sept. 1930, *Milne-Redhead* 1010 (type of *C. praecox*) :—perennial herb with running habit and thick rhizome ; flowers yellow with purple veinings ; old unburnt shoots much longer than young flowering shoots. Slope above Kalenda dambo west of Matonchi Farm, in open ground after burning, 8 Oct. 1937, *Milne-Redhead* 2639 :—perennial with running rootstock ; leaves rather glaucous ; flowers yellow marked with reddish-brown ; fruits unripe. Slope above Kalenda dambo west of Matonchi Farm, among *Lannea humilis*, *Sphenostylis erecta*, grasses, etc., 14 Febr. 1938, *Milne-Redhead* 2639A :—plants hidden by grass, not in flower ; leafy shoots 12–14 inches long. Near Kalene Hill, in scrub near edge of plain, Nov., *Miss Marks* 12 :—plant 6–8 inches high, grows in clumps ; flowers yellow. E. M-R.

Crotalaria Elisabethae *Bak. f.* in Journ. Linn. Soc. Bot. **42,** 301 (1914). *C. mumbwae* Bak. f. in Journ. Linn. Soc. Bot. **42,** 300 (1914), synon. nov.

BELGIAN CONGO. Elisabethville, in bush savannah, 17 May 1912, *Bequaert* 46 (type in Brussels Herb.). Elisabethville, 1927, *Quarré* 261.

NORTHERN RHODESIA. Solwezi District. In *Brachystegia* woodland near Mutanda Bridge, 20 June 1930, *Milne-Redhead* 542 :—erect annual 6–9 dm. high. On stony waste ground at quarry near Mutanda Bridge, 21 June 1930, *Milne-Redhead* 567 :—erect branched annual, 3 dm. high ; flowers yellow and purple-brown. Mumbwa District. Near Mumbwa, *Mrs. Macaulay* 399 (type of *C. mumbwae* Bak. f.), 736, 801 :—flowers yellow.

The additional gatherings now available show these species to be conspecific, though considerable variation is noticeable in the size and habit of the plants. The degree of indumentum on the calyx and petals is also rather variable. The type specimen of *C. mumbwae* is in fruit : the only keel petals remaining appear withered, which would account for the difference in sizes given in the descriptions, and used as a distinguishing character in the key. E. M-R.

MYRICACEAE.

The type specimen of *Macaranga Dawei* Prain, *Dawe* 595, has been dissected and proves to be synonymous with *Myrica salicifolia* Hochst. ex A. Rich. Prain in his diagnosis of *M. Dawei* in Kew Bull. 1911, 232 states :—" species nulli africanae arcte affinis "—so he evidently thought his new species was very distinct from the other species of *Macaranga*. Unfortunately neither female flowers nor fruits were present on the specimen, for if these had been available there would have been no doubt that the plant was not a member of the *Euphorbiaceae*. In reviewing the species of *Myrica* in connexion with the above problem, it is considered that *M. kilimandscharica* Engl. and *M. salicifolia* Hochst. ex A. Rich. are synonymous. Engler in describing the former species separated it from *M. salicifolia* on the character of the male flowers being *single* in the axils of the bracts. This character, however, is not constant. In the Flora of Tropical Africa the species are separated on leaf characters and on the density of lenticellation of the branches, neither of which characters seems to be very satisfactory. The shape, size and dentation of the leaf is very variable, as was mentioned by A. Richard in a note following his description of *M. salicifolia*, so that this cannot be taken as a character of specific importance. The synonymy is therefore as follows :—**Myrica salicifolia** *Hochst. ex A. Rich.*, Tent. Fl. Abyss. **2,** 277 (1851). *M. kilimandscharica* Engl., Hochgebirgsfl. Trop. Afr. 188 (1892). *M. kilimandscharica* Engl. var. *macrophylla* Engl. Jahrb. **28,** 375 (1900). *Macaranga Dawei* Prain in Kew Bull. 1911, 232. It is most probable that *Myrica salicifolia* Hochst. ex A. Rich. var. *subalpina* Engl. should be included under the above synonymy. Specimens from the type locality have been examined, but not the type numbers of the variety. E. A. B.

RUTACEAE.

Aeglopsis Eggelingii *M. R. F. Taylor*, sp. nov. [Rutaceae] ; ab *A. Chevalieri* Swingle habitu fruticoso, spinis axillaribus

nonnunquam binatis, pedicellis bracteatis, alabastris globosis, petalis 3 vel 4 ovatis nunquam lanceolatis, stamina petalis triplo numerosiora, ovario 7- vel 8-loculari differt.

Frutex ramosus, 4 m. altus, armatus, glaber. *Rami* teretes, juniores compressi, brunnei, internodiis 2–4 cm. longis, spinis axillaribus solitariis vel binatis 2–3 cm. longis rigidis rectis patentibus. *Folia* simplicia, alterna, subcoriacea ; petiolus 5–8 mm. longus, canaliculatus, pulvinatus ; lamina ovata vel ovato-lanceolata, 7–14 cm. longa, 3–5·5 cm. lata, apice obtusa vel acuta vel saepe acuminata, basi sensim cuneata, margine leviter et irregulariter crenata, supra fusco-viridis, subtus pallido-viridis, utrinque dense pellucido-punctata, costa prominente, nervis lateralibus utrinsecus 7–10 patentibus arcuatis. *Inflorescentiae* axillares, pauciflorae (circiter 5) ; pedunculi irregulariter ramosi, ramis brevissimis (usque 3 mm. longis) ; pedicelli 3 mm. longi, ampliati, bibracteati, glanduloso-punctati ; bracteae ovato-lanceolatae, 1 mm. longae, obtusae. *Flores* 1·5–2·5 cm. diametro, viridi-albi ; alabastra globosa vel leviter 3–4-lobata, circiter 4 mm. diametro. *Petala* 3–4, ovata, 1 cm. longa, 7–8 mm. lata, apice obtusa, basi truncata, crassa, glanduloso-punctata, supra longitudinaliter striata, margine apicem versus saepe leviter incurva. *Stamina* 9–12 (petalis triplo numerosiora) ; filamenta liguliformia, apicem versus attenuata, circiter 5 mm. longa, 1 mm. lata, compressa, crassa, incurva, connectivo apice glanduloso ; antherae oblongae, 2 mm. longae, circiter 1 mm. latae. *Discus* annularis, 5–6 mm. diametro, 1·5–2 mm. altus, lobatus, sulcatus. *Ovarium* ovoideum, 3–4 mm. longum, 2–3 mm. diametro, basi in disco immersum, loculis 7–8, ovulis numerosis. *Stylus* 2 mm. longus, 1 mm. diametro, teres ; stigma cylindricum, circiter 1·5 mm. diametro. *Fructus* subpyriformis, 9–11 cm. longus, 7–8 cm. diametro, odoratus, cortice sublignoso, 7-locularis, loculis amplis triangularibus polyspermis. *Semina* subellipsoidea, 1–1·5 cm. longa, 8 mm. lata, compressa.

ANGLO EGYPTIAN SUDAN. Mongalla Province : Lado, Yei River, 23 October, 1919 (fruit), *F. Sillitoe* 303 :—Small tree, very spinous, no flowers.

UGANDA. Bunyoro District : Siba Forest, on forest edge, May 1936 (flowers). *W. J. Eggeling* 3006 (type) :—A spiny bush 4 m. high ; spines straight and sharp, leaves and flower buds gland-dotted, flowers whitish green with 3 or 4 petals. Budongo, spiny shrub on forest edge, November, 1935 (fruit), *W. J. Eggeling* 2310 :—Leaves gland-dotted, fruit pear-shaped, woody, very like that of *Balsamocitrus Dawei* inside, and with a similar though less strong odour.

OLEACEAE.

Linociera latipetala *M. R. F. Taylor*, sp. nov. [Oleaceae] ; ab omnibus speciebus africanis pedunculis et pedicellis longioribus valde patentibus, lobis corollae latioribus facile distinguenda.

Arbor vel frutex scandens, valde ramosus, usque 13 m. altus. *Ramuli* glabri, plus minusve teretes, rigidi, patentes, cortice pallide griseo-brunneo. *Folia* opposita ; petiolus 5–6 mm. longus, basin versus dilatatus, supra canaliculatus ; lamina coriacea, elliptica vel anguste obovata, basi sensim angustata, apice caudata, 10–13·5 cm. longa, 3–5·5 cm. lata, utrinque glabra, margine integra, costa et nervis supra impressis subtus prominentibus, nervis lateralibus utrinsecus 4–8 procul a margine arcuatim confluentibus ; domatia saepe in axillis nervorum lateralium obvia. *Inflorescentiae* paniculatae, ex axillis foliorum pedunculatae, patentes, 7–13-florae ; pedunculi glabri, flexuosi, usque 7 cm. longi ; bracteae usque 1 mm. longae, ovatae, villoso-pubescentes ; pedicelli 1–2 cm. longi, valde patentes, apicem versus sensim dilatati, saepe bibracteolati, bracteolis ovatis minutis. *Flores* intus flavo-albidi, extra pallide rosei ; alabastra late ovoidea, sparse pubescentia. *Calyx* tenuiter cupuliformis vel patelliformis, extra leviter pubescens, crassus, lobis 4 patentibus latissime triangulatis 0·5–1 mm. longis 2–2·5 mm. latis. *Corolla* 4-lobata ; lobi induplicato-valvati, alternatim altius et brevius connati, itaque sinus oppositi duo altiores duo breviores, subcarnosi, ovati vel elliptici, apice obtusi vel acuti, 7–8 mm. longi, 4–5 mm. lati. *Stamina* 2 ; filamenta compressa, circiter 2 mm. longa, inter corollae lobos altius connatos inserta ; antherae reniformes, 2 mm. longae. *Ovarium* glabrum, biloculare, subglobosum, in stylum sensim attenuatum, 1·5–2 mm. altum, 1–1·5 mm. diametro ; ovula pro loculo 1–2 ; stylus crassus, profunde 4-sulcatus vel subalatus, 1–1·5 mm. longus ; stigma subcapitatum, demum mitriforme, 0·5 mm. longum, sparse pubescens. *Drupae* anguste ovoideae vel ellipsoideae, 1-loculae, usque 1·5 cm. longae, 1 cm. diametro, coccineae, stylis persistentibus. *Semen* 1.

UGANDA. Ankole district : Lake Lutoto, west of Ankole, at water's edge, August 1936, *W. J. Eggeling* 3186 (type) :—climber or scandent bush ; flowers with 4 petals, sub-fleshy, white-yellow within, pink outside. Bagube, in forest swamp, 1300 m., September, 1922, *R. A. Dummer* 5478 :—evergreen tree, 8 m. high ; flowers yellowish ; rare.

KENYA. Kericho forest, 2330 m., *E. Battiscombe* 1303 (fruiting material) :—a small tree, 6 m. high ; fruits bright red, no flowers seen ; only one specimen seen.

TANGANYIKA. Arusha district : South slope of Mt. Kilimanjaro between Umbwe and Weu Weru rivers, in Macaranga-Maesa forest at 1900 m. 1st September, 1932, *P. J. Greenway* 3222 :—a much branched evergreen tree up to 19 m. high, with green flowers ; not common.

ASCLEPIADACEAE.

Asclepias pauciflora (*Klotzsch*) *E. A. Bruce*, comb. nov.—*Gomphocarpus pauciflorus* Klotzsch in Peters, Reise Mossamb. Bot. 276 (1861). *Stathmostelma pauciflorum* (Klotzsch) K. Schum. in Engl. Jahrb. **17,** 132 (1893). *S. reflexum* Britten et Rendle in Trans. Linn. Soc. ser. 2, **4,** 27, t.6, figs. 4–6 (1894). *Asclepias reflexa* (Britten et Rendle) [Britten et Rendle (1894), nomen provisor.] N.E. Br. in Fl. Trop. Afr. **4,** pt. 1, 344 (1902).

Pentas pseudomagnifica *M. R. F. Taylor*, sp. nov. [Rubiaceae]; a *P. longituba* K. Schum. habitu graciliore, foliis minoribus manifesto longius petiolatis subtus nervis tantum asperiuscule pilosis, stipulorum fimbriis tenuissimis, calycis dentibus sursum spatulato-ampliatis vel interdum subfoliaceis haud subulatis, corollae tubo manifesto breviore, lobis minoribus satis distincta.

Frutex vel *suffrutex*, ramosus, usque 1 m. altus; caules teretes, breviter griseo- et crispato-subtomentelli, internodiis superne circiter 2–5 cm. longis. *Folia* petiolata, petiolo 0·5–1 cm. longo asperulo-pubescente; lamina anguste ovata, superne sensim angustata vel acuminata, apice acuta, basi cuneata, 4–8 cm. longa, 1·5–2·5 cm. lata, supra leviter asperulo-pilosa, subtus praesertim in costa et nervis lateralibus asperiuscule pilosa, nervis lateralibus subtus prominentissimis utrinsecus 7–11; stipulae breviter connatae, inter petiolos in lobos 4–6 usque 1·5 cm. longos apice glandulosos tenuissime filiformes divisae. *Cymae* terminales, e basi 3-ramosae subtomentellae, 1·5–4 cm. longae, apice irregulariter breviter ramulosae, 2–4-florae. *Flores* pentameri, albi, subsessiles vel breviter pedicellati, pedicellis usque 0·5 cm. longis. *Calyx* (receptaculo incluso) campanulatus, molliter pubescens; tubus 4–5 mm. longus, 3–4 mm. diametro, apice inter lobos glandulis 1–3 parvulis ornatus; lobi 5, spatulato-ampliati vel subfoliacei, apice acuti, 1–1·7 cm. longi et usque 5 mm. lati. *Corolla* longissime tubulosa; tubus 10–13 cm. longus, circiter 2 mm. diametro, sursum leviter dilatatus, extra pilis griseis crispato-subtomentosus, intus fauce et parte dilatata plus minusve dense et longe villosus, deorsum glabrescens et longitudinaliter striatus; lobi 5, patentes, anguste ovati, subacuti, 1–1·5 cm. longi, 5–7 mm. lati, extra pubescentes, intus glabri. *Stamina* 5, in parte tubi dilatata inclusa; antherae lineares, basi sagittatae, basin versus dorsifixae, subsessiles, glabrae, 8–8·5 mm. longae. *Ovarium* biloculare, placentis peltatis. *Stylus* 11–14 cm. longus, usque 1 cm. longus exsertus, superne lepidoto-puberulus, inferne glabrescens, apice stigmatosus, dilatatus, bilobatus, lobis 1·5 mm. longis. *Capsula* non visa.

TANGANYIKA TERRITORY. Morogoro District: Uluguru Mts., Lupanga Peak, 2060 m., 10 Dec. 1933, *B. D. Burtt* 4979 (type) :— Secondary shrub on mountain summit with handsome white tubular flowers. Same locality, 2340 m., 26 Dec. 1931, *B. D. Burtt* 3480 :— shrubby herb with dark green foliage and long tubular white flowers, rare. Same locality, near summit, 2330 m., 23rd Dec. 1933, *A. P. G. Michelmore* 857. Lukwangule Plateau, on the edge of mountain forest, 2400 m., 28 Nov. 1898, *W. Goetze* 258 (in Herb. Berol.) :—subshrub about 1 m. high with white flowers reddish on the outside. Same locality, in grassland on plateau, 2660 m., 30 Jan. 1935, *Miss E. M. Bruce* 701 :—0·5–1 m. shrub with showy white flowers, occasional.

All the specimens cited possess long-styled flowers, but doubtless heterostyly exists in this species as in the closely allied *P. graniticola* E. A. Bruce, of which both long- and short-styled specimens are preserved in the Kew Herbarium.

Pentas longituba *K. Schum.* var. **magnifica** (*Bullock*) *Bullock et M. R. F. Taylor*, stat. nov. *P. magnifica* Bullock in Hook. Ic. Pl. t.3265 (1935).

The description of this plant as a new species was due to a specimen (*Goetze* 852) in the Kew Herbarium from the Livingstone Mtns., having been wrongly labelled "P. longituba" by K. Schumann. Examination of the type of *P. longituba* (*Holst* 418), kindly sent on loan to Kew from Berlin, reveals that although *P. magnifica* is slightly different in facies and in various minor floral details, the differences are not sufficient to warrant specific distinction. This species is accordingly reduced to varietal rank. The *Goetze* specimen has now been identified as *P. nobilis* S. Moore (Journ. Bot. **46,** 37 : 1908).

Vangueriopsis (§ Calycophyllae) **Sillitoei** *Bullock*, sp. nov. [Rubiaceae]; a *V. discolori* (Benth.) Robyns inflorescentiis multo majoribus pedunculis satis crassis multo longioribus, calycis lobis minoribus haud foliaceis, corollae tubo breviore recedit.

Frutex scandens, ut videtur inermis. *Rami* annotini teretes, internodiis 6–7 cm. longis, cortice rubro-brunneo, parce lenticellato, hornotini glabrati, interdum pilis strictis adpressis levissime strigosi. *Stipulae* subpersistentes, e basi latiuscula 2 mm. vaginatim connatae, subulatae, extra glabrae, intus villosae, caudis carinatis 6–8 mm. attingentibus terminatae. *Folia* petiolata, discoloria, anguste oblongo-elliptica, 6–8 cm. longa, usque 2·5 cm. lata, apice late cuspidata, basi subacuta, supra viridia et pilis strigosis levissime obtecta, subtus albicantia et costa nervisque tantum similiter strigosa, nervis venisque subtus reticulatis; petioli 5–8 mm. longi. *Cymae* divaricatae, ex axillis foliorum delapsorum ortae, dichasialiter ramosae, multiflorae; pedunculi 2·5–3 cm. longi, ramis primariis 1–2 cm. longis, glabri vel pilis paucis levissime strigosi; bracteae deciduae, lineari-oblongae, 1–1·5 mm. longae vel minores. *Calyx* (hypanthio incluso) cupuliformis vel obconicus, circiter 1·5 mm. longus, limbo brevissimo subtruncato vel 5-denticulato, denticulis late triangularibus. *Corolla* alba; tubus cylindricus, 3 mm. longus, fauce villosus, ceterum glaber; lobi 5, ut videtur sub anthesi reflexi, triangulares, circiter 2 mm. longi, apice acuti, cucullati. *Stamina* fauce inserta, filamentis filiformibus brevissimis; antherae exsertae, reflexae, oblongae, apice brevissime acute appendiculatae, basi thecis sagittato-divergentibus. *Stylus* filiformis, 4·5 mm. longus, basi leviter bulboso-expansus; stigma exsertum, capitato-mitriforme, 1 mm. longum, apice bilobum. *Discus* carnosus, annularis. *Ovarium* parvum, vix 1 mm. longum. *Fructus* valde immaturi globosi, maturi non visi.

ANGLO-EGYPTIAN SUDAN. Yei River, Lado, *Sillitoe* 377 :—Strong scandent shrub ; [flowers] white.

Although the available material of this species is poor, it has been described with a view to its inclusion in a check-list of Sudanese trees and shrubs now in course of preparation by Major G. Aylmer, lately of the Sudan Forestry Department. It constitutes a new generic record for the Sudan, its nearest ally, *V. discolor* (Benth.) Robyns, being confined to West Tropical Africa, where it is found in Sierra Leone, French Guinea, and Ivory Coast.

Vangueriopsis discolor and *V. Sillitoei* differ from all other species of the genus in their discolorous leaves, which are markedly reticulate on the lower surface, and they may constitute a distinct genus intermediate between *Rytigynia* Blume and *Vangueriopsis* Robyns. Other species of the section *Calycophyllae* Robyns* seem to be more or less intermediate between *Vangueriopsis* and *Canthium* Lam.

COMPOSITAE.

Erlangea (Bothriocline) **auriculata** *M. R. F. Taylor*, sp. nov. (Compositae-Vernonieae) ; ab *E. amplexicaula* Muschler habitu elatiore, foliis siccitate nigrescentibus auriculatis lanceolatis majoribus, inflorescentiis laxius dispositis capitulis campanulatis differt ; ab *E. imatongensi* M. R. F. Taylor omnibus partibus majoribus, foliis auriculatis, involucri bracteis omnibus paleaceis exterioribus dense villosis valde distincta.

Herba lignosa vel suffrutex usque 4 m. altus. *Rami* patentes, teretes, leviter sulcati, apicem versus plus minusve dense flavo-brunneo-villosi, internodiis parte superiore 4–6 cm. longis. *Folia* opposita, decussata, sessilia, basi dilatata, connata ; lamina lanceolata, basi auriculata, apice sensim acuta, 10–15 cm. longa, 3·5–5 cm. lata, supra in statu sicco suffusco-nigra leviter villosa demum glabrescens, costa dense flavido-villosa, subtus dense flavido- vel griseo-tomentosa, margine irregulariter dentato-serrata, nervis lateralibus numerosis arcuantibus. *Inflorescentia* terminalis vel axillaris, valde ramosa, paniculato-corymbosa ; rami patentes, teretes, dense flavido-brunneo-villosi, bracteati ; bracteae foliis subsimiles sed minores ; capitula subsessilia, 2–6 in glomerulis pedunculatis disposita ; pedunculi 3–9 mm. longi. *Capitula* campanulata, circiter 6 mm. longa, 3 mm. diametro, floribus 12–15 instructa. *Involucri bracteae* 3–4-seriatae, imbricatae, omnino paleaceae ; bracteae exteriores ovato-lanceolatae vel late lanceolatae, 2·5–4 mm. longae, 1–2 mm. latae, apice acutae, dense flavido-villosae vel apicem versus villosae ; interiores late lanceolatae vel lineares, 4–5 mm. longae, 1·75–0·5 mm. latae, apice acutae vel acuminatae, interdum leviter reflexae, glabrae. *Corollae* ex involucro exsertae, pallidissime purpureae, circiter 6 mm. longae ; tubus infundibuliformis, 3·5–4 mm. longus ; lobi lineares, 2–2·5 mm. longi, acuti. *Filamenta* 1 mm. longa. *Antherae* vix exsertae,

* Robyns in Bull. Jard. Bot. Brux. **11**, 248 et seq. (1928).

1·75 mm. longae, basi rotundatae, apice acuminatae, membranaceae. *Stylus* cum stigmate usque 8 mm. longus ; lobi stigmatis circiter 2 mm. longis, subulatis, adpresse sericeo-pubescentibus. *Achaenia matura* turbinata vel oblonga, crassa, glabra, angulata, 1·25 mm. longa, 0·5–0·75 mm. lata, 7–9-costata, costis laevibus flavidis prominentibus, regionibus inter costas glandulis minutis brunneis obsitis. *Pappus* e setis 10–12 circiter 2 mm. longis stramineis erectis rigidis barbellatis caducissimis sistens.

UGANDA. Bugishu District. Mt. Elgon, from open forest above Bulambuli camp, 3260–3500 m., 1930, *L. C. C. Liebenberg* 1584 (type) :—when supported by other vegetation the stems grow up to 3·5 m. ; flowers very light purple. Mt. Elgon, bamboo zone, 3000 m., Jan. 1918. *R. A. Dummer* 3563 :—Occasional ; up to 1·5 m., flowers lilac. Bulambuli, upper forest zone, 3260 m., 6 Sept. 1932, *A. S. Thomas* 653 :—Very common ; shrub, 4 m., spreading ; flowers mauve, in large umbels. Bulambuli, just below bamboo zone, 3000 m. 12 Nov. 1933. *B. H. Tothill* 2330 :—Occasional ; few in bloom ; coarse herb. 3 m. high, flowers mauve.

Erlangea (Bothriocline) **imatongensis** *M. R. F. Taylor*, sp. nov. [Compositae-Vernonieae] ; ab *E. amplexicauli* Muschler omnibus partibus fere glabris, foliis siccitate saepe nigrescentibus minoribus haud tomentosis, involucri bracteis reflexis valde distincta.

Herba lignosa, usque 2 m. alta. *Rami* erecti, subteretes, sulcati, apicem versus sparse sericeo-villosi, inferne demum glabrescentes, internodiis 1–2 cm. longis. *Folia* opposita, decussata, sessilia vel subsessilia, basi valde dilatata, connata ; lamina ovato-lanceolata vel lanceolata, basi subamplexicaulis, apice acuta, 4·5–7 cm. longa, 2–3 cm. lata, supra saepe in statu sicco suffusco-nigra vel fusco-olivacea, glabra, subtus pallido-olivacea, nervis leviter villosa, margine dentato-serrata, dentibus apice saepe crassis ; nervi laterales utrinsecus 10–14, leviter arcuati, venis dense reticulatis. *Inflorescentia* terminalis, corymbosa, valde ramosa ; rami patentes, angulati, dense sericeo-villosi, bracteati ; bracteae foliis subsimiles sed minores ; capitula 3-6 in glomerulis fasciculatis spissis disposita. *Capitula* 8–12-flora, subcylindrica, 4–6 mm. longa, 2·5–3 mm. diametro. *Involucri bracteae* 3–4-seriatae, imbricatae, pallide virides, demum paleaceae ; bracteae exteriores ovatae, 1·5–2 mm. longae, 0·75–1·25 mm. latae, margine scariosae, sparse tomentosae ; interiores ovato-lanceolatae vel lanceolatae, 3–4 mm. longae, 1–1·6 mm. latae, apice obtusae vel acutae, reflexae, margine late scariosae, apicem versus saepe minute serratae, glabrae. *Corollae* ex involucro leviter exsertae, pallide purpureae, basin versus sparsissime piloso-glandulosae, 4·5–5 mm. longae ; tubus apicem versus ampliatus, circiter 3 mm. longus ; lobi lineares, circiter 1·75 mm. longi, obtusi. *Filamenta* circiter 1·5 mm. longa. *Antherae* vix exsertae, 1·5 mm. longae, apice acutae, membranaceae, basi rotundatae. *Stylus* cum stigmate usque 6 mm. longus ; lobi stigmatis circiter 1 mm. longi, filiformes, adpresse sericeo-pubescentes.

Achaenia matura turbinata vel oblonga, crassa, glabra, angulata, 1·5–2 mm. longa, 1–1·25 mm. lata, 8–10-costata, costis laevibus flavidis prominentibus, regionibus inter costas glandulis minutis brunneis obsitis. *Pappi setae* 20–25, rigidae, 1·5–2 mm. longae, barbellatae, caducae.

ANGLO-EGYPTIAN SUDAN. Imatong Mountains : Kippia, common in ravines, about 2916 m., 11 Febr. 1929, *T. F. Chipp* 92 (type) :—heliotrope flowered composite, 2 m. high. Rocky summit of Mt. Kineti, 330 m., 30 Dec. 1935, *A. S. Thomas* 1836 :—Abundant in scrub : subshrubby, height 1 m., flowers mauve. Mongalla, 1 Jan. 1936, *H. B. Johnston* 1449. No locality, 2330 m., 10 Febr. 1936, *H. B. Johnston* 1485. No locality, 3163 m., 12 Febr. 1936, *H. B. Johnston* 1522. No locality, 2633 m., 10 Febr. 1936, *H. B. Johnston* 1532.

Pentzia schistostephioides *M. R. F. Taylor*, sp. nov. [Compositae]; a *P. sabulosae* (Wolley-Dod) Hutch. habitu erecto, regione florifera tantum ramosa, omnibus partibus lanato-tomentosis, foliis saepe bipinnatisectis siccitate marginibus revolutis, capitulis minoribus numerosioribus, pappi squamis linearibus inter se distinctis facile distinguenda.

Herba perennis, aromatica, basi lignosa, erecta, usque 2 m. alta, apicem versus (regione florifera) ramosa ; caules crassi, teretes, longitudinaliter striati, griseo- vel albido-lanati, internodiis 1-2 cm. longis. *Folia* ambitu ovata vel late lanceolata, 3–7 cm. longa, 1–4 cm. lata, pinnatisecta, utrinque lanato-tomentosa, infra costa et nervis lateralibus prominentibus, basi auriculata, segmentis utrinsecus 4–7 oppositis 3–7-lobatis, lobis ultimis oblongis apice rotundatis 1-nerviis marginibus integris valde revolutis. *Inflorescentiae* terminales, compactae, corymbosae, capitulis numerosis ; rami inflorescentiarum crassi, dense-lanati, ex axillis foliorum valde redactorum orti, et bracteis foliaceis paucis integris 3–5 mm. longis praediti ; pedunculi graciles, 2–4 mm. longi, apice ramorum dense conferti. *Capitula* subglobosa, circiter 4 mm. alta et 5 mm. lata, discoidea, homogama, flava. *Involucri bracteae* 3–4-seriatae, imbricatae ; exteriores 1 mm. longae, lineares, paucae ; intermediae 2–2·5 mm. longae, lineari-lanceolatae, acutae, marginibus scariosis laciniatis ; interiores oblongae vel spatulatae, 2–3 mm. longae, 0·5 mm. latae, obtusae, marginibus late scariosis nonnunquam laciniatis ; receptaculum convexum, alveolatum. *Flores* circiter 70. *Corollae tubus* 2–2·5 mm. longus, inferne cylindricus et parce glandulosus, superne ampliatus, subcampanulatus vel campanulatus, glaber. *Corollae lobi* 5, carnosi, globosi, glabri, 0·25 mm. diametro. *Antherae* 1 mm. longae, basi rotundatae. *Stigmata* 0·2 mm. longa, truncata, crassa. *Achaenia* immatura 1–1·5 mm. longa, crassa, basin versus angustata, leviter costata, glabra ; pappi squamae circiter 10, lineares, 0·25 mm. longae, uniseriatae, inter se distinctae.

S. RHODESIA. Inyanga, 2000 m., 19 October 1935, *F. Eyles* 8479 (type) :—plant 5–6 ft., by water. Inyanga Downs, 1660–2000 m., September 1934, *F. Eyles* 7927.

This very distinct species extends the range of the genus, hitherto almost exclusively South African, to Southern Rhodesia. The erect, woody, almost unbranched stems, comparatively large deeply divided leaves and dense many-headed corymbs give it the appearance of the allied genus *Schistostephium*, hence the specific name. This species falls into the section *Corymbosae* (see Hutchinson in Kew Bulletin 1916, p. 241 et seq.).

Pleiotaxis argentea *M. R. F. Taylor*, sp. nov. [Compositae-Mutisieae] ; a *P. arenaria* Milne-Redhead racemis haud axillaribus, capitulis majoribus, involucri phyllis majoribus acutis, foliis majoribus albo-tomentosis differt.

Suffrutex usque 1 m. altus. *Rami* divaricati, longitudinaliter striati, albido-araneo-tomentosi, inferne demum glabrescentes ; internodiis 1–2 cm. longis. *Folia* alterna, sessilia, elliptica vel ovato-elliptica, basi amplexicaulia, apice obtusa vel acuta, 5–8 cm. longa, 2·5–4 cm. lata, supra rugosa, griseo-araneosa, praecipue secus nervos, infra dense albo-araneosa, margine dentata, dentibus interdum breviter calloso-spinosis ; nervi laterales utrinsecus 10–14, venis dense reticulatis supra impressis et subtus prominentibus. *Capitula* 1–4 in racemos terminales disposita, subcylindrica, vix 3 cm. longa, circiter 1 cm. lata, breviter pedunculata, pedunculis 1–3·5 cm. longis, bracteis paucis lineari-lanceolatis circiter 8 mm. longis. *Involucri bracteae* 4–5-seriatae, imbricatae, apicem versus sanguineae vel purpureae, margine inconspicue scariosae ; exteriores ovatae vel ovato-lanceolatae, 6–8 mm. longae, 3–4 mm. latae, basi crassae, apice acutae, dense araneo-tomentosae ; interiores lanceolatae, usque 1·8 cm. longae, 4 mm. latae, apice scariosae acutae vel acuminatae, leviter tomentosae demum glabrescentes. *Corollae* exsertae, pallido-sanguineae ; tubus 1·5 cm. longus, parte inferiore anguste cylindricus, parte superiore urceolatus, 2–3 mm. longus ; lobi attenuati, 4 mm. longi, reflexi. *Stamina* apice partis tubi inflatae affixa ; filamenta 2 mm. longa ; antherae exsertae, 5 mm. longae, caudis 1 mm. longis villosis. *Ovarium* angustum, circiter 5 mm. longum, dense adpresso-sericeo-villosum ; stylus circiter 1·8 cm. longus ; stigmatis lobi obtusi, 1 mm. longi. *Achaenia* immatura 1 cm. longa. *Pappi setae* pallide fulvae, 1·2 cm. longae, barbellatae.

NORTHERN RHODESIA. Abercorn District : Lunzua Escarpment between Malombe and the Lunzua river, 2000 m., 2 June 1936, *B. D. Burtt* 6437 (type) :—Among rocks of steep rocky escarpment clothed with *Brachystegia microphylla*. A pale-scarlet flowered bushy perennial herb 1 m. high, with silvery green leaves. Locally common near summit.

Kleinia kleinioides (*Sch. Bip.*) *M. R. F. Taylor*, comb. nov. [Compositae-Senecioneae]. *Notonia kleinioides* Sch. Bip. in

Schweinf. Fl. Aethiop. **151** (1867); *Senecio kleinioides* Oliv. & Hiern. in Fl. Trop. Afr. **3,** 421 (1877); *Kleinia violacea* A. Berger in Monatschr. Kakt. **15,** 38 (1905).

BORAGINACEAE.

The type specimen of *Cordia unyorensis* Stapf (*Dawe* 798 from Uganda) described in Journ. Linn. Soc. **37,** 527 (1906), has been carefully examined and proves to be a mixture. The leaves and flowering shoots belong to *Cordia abyssinica* R.Br., whilst the detached fruits are those of *C. Milleni* Baker. The name is therefore discarded and in part referred to the synonymy of these two species. That of *C. Milleni* Bak. has been enlarged to include the following species, which appear to be conspecific :—**Cordia Milleni** *Bak.* in Kew Bull. 1894, 27. *C. longipes* Bak. l.c.; *C. chrysoclada* Bak. l.c.; *C. Irvingii* Bak. quoad *Dr. Rowland s.n.*, l.c. 1895, 113. *C. Liebrechtiana* De Wild. et Th. Dur. in Bull. Soc. Bot. Belg. **38,** 38 (1899). *C. unyorensis* Stapf, quoad fruct. *C. Yombomba* Vaupel in Engl. Jahrb. **48,** 526 (1912). *C. ugandensis* S. Moore in Journ. Bot. **54,** 288 (1916). E. A. B.

CONVOLVULACEAE.

Ipomoea latisepala *E. A. Bruce*, sp. nov. [Convolvulaceae]; affinis *I. nephrosepalae* Chiov. sed foliis basi cordatis breviter pubescentibus, bracteolis late ovatis vel suborbicularibus majoribus differt.

Suffrutex; rami pallido-brunnei vel cinerei, leviter striati, apicem versus griseo-tomentosi, inferne pubescentes demum glabrescentes, basi circiter 5 mm. diametro; internodia 1–2 cm. longi; nodi basibus crassis petiolorum cicatricosi. *Folia* petiolata; petiolus 1·5–3 cm. longus, tomentosus; lamina siccitate subflavescens, cordata vel ovato-cordata, basi late cordata, apice rotundata, 2–4 cm. longa, 1·5–4 cm. lata, utrinque tomentosa, margine integra vel leviter undulata; nervi laterales utrinsecus 4–6, supra impressi, subtus prominentes. *Flores* solitarii, in axillis foliorum superiorum pedicellati; pedicelli 1–1·5 cm. longi, dense tomentosi, apicem versus bracteolis duabus calycem includentibus; bracteolae membranaceae, late ovatae vel orbiculares, apice rotundatae nonnunquam apiculatae, basi brevissime unguiculatae, 1·2–1·8 cm. longae, 1·2–2 cm. latae, extra pubescentes, intus glabrae et conspicue venosae. *Calyx* membranaceus, usque ad basin 5-lobatus; lobi contorti, subaequales, transverse oblongo-elliptici, apice late rotundati vel subtruncati, basin versus angustati brevissime unguinculati, circiter 1 cm. longi et 1·5 cm. lati, extra sericeo-tomentosi, intus glabri et venosi. *Corolla* infundibuliformis, superne flava, inferne lilacina, 3–3·5 cm. longa, fauce 2–2·5 cm. diametro, alabastro sericeo-tomentoso, matura extra glabra cum vittis 5 pilosis circiter 4 mm. latis e basi ad apicem angustatis dentibus minutis terminatis. *Stamina* 5, 3–4 mm. supra basin corollae inserta; filamenta glabra, compressa, 1·2–1·3 cm. longa; antherae oblongae, 3·5 mm. longae,

basi breviter sagittatae. *Ovarium* hemisphaericum, 1·5 mm. altum, 2 mm. diametro, glabrum, disco annulari; stylus simplex, 1·2–1·4 cm. longus, per 2 mm. basin versus leviter ampliatus et basi supra ovarium constrictus; stigmata duo, globosa, vix 1 mm. crassa.

BRITISH SOMALILAND. Harradigit, 44° 31′ E., 7° 45′ N., 981 m., Nov. 1934, *Godding* 233 (type) :—small plant with yellow-mauve flowers : vernacular name "Defao."

Material of **Jacquemontia capitata** (*Desr.*) *G. Don* from the type locality, Senegal, has been compared with material and with the type figure of *Jacquemontia tamnifolia* (L.) Griseb. from South Carolina, North America. It is considered that the African species is synonymous with *J. tamnifolia* (L.) Griseb. This latter was founded on the pre-Linnean species *Volubilis carolinensis, tamnifolio subhirsuto* in Dill. Hort. Elth. 428, t. 318, fig. 410 (1732). The synonymy is as follows :—**Jacquemontia tamnifolia** (*L.*) *Griseb.* Fl. Brit. W. Ind. 474 (1861). *J. capitata* (Desr.) G. Don, Gen. Syst. **4,** 283 (1837). *J. capitata* (Desr.) G. Don var. *pauciflora* N.E. Br. in Dyer, Fl. Trop. Afr. **4,** pt. 2, 86 (1905). *Ipomoea tamnifolia* L. Sp. Pl. 162 (1753). *I. guineensis* G. Don, Gen. Syst. **4,** 269 (1837). *I. macropoda* Boj. Hort. Maur. 229 (1837). *I. capitata* Choisy in DC. Prodr. **9,** 365 (1845). *Convolvulus capitatus* Desr. in Lam. Encycl. **3,** 554 (1791). *C. tamnifolius* G. F. W. Mey. Prim. Fl. Esseq. 95 (1818). *C. guineënsis* Schum. et Thonn. Beskr. Guin. Pl. 90 (1827). *C. pycnantha* Hochst. ex Choisy in DC. Prodr. **9,** 365 (1845). E. A. B.

SCROPHULARIACEAE.

Sutera *Roth*, Bot. Bemerk. 172 (1807).—There has been some slight confusion over this genus as it was reduced by Wildenow and later revived by Roth. In 1807 Roth[1] published the two species *Sutera foetida* and *S. brachiata*: the former was founded on *Buchnera foetida* Andr.[2] and is the type of the genus *Sutera*, the latter is a synonym of *Manulea hispida* Thunb.[3], for which the new combination *Sutera hispida* (Thunb.) Druce[4] has been made. In 1809 Wildenow[5] reduced *Sutera* to *Manulea*, but twelve years later, in 1821, Roth[6] revived the genus and added another species *Sutera glandulosa* Roth. This species is, however, synonymous with *Capraria dissecta* Del.[7] and the new combination *Sutera dissecta* (Del.) Walp.[8] was made. In 1836 Bentham[9] founded three new genera, *Chaenostoma*, *Lyperia* and *Sphenandra* and incorporated *Sutera foetida* and *Manulea hispida* in his genus *Chaenostoma*. In 1891 Kuntze[10] replaced Bentham's *Chaenostoma* into *Sutera* Roth (1807) and created a new genus, *Jamesbrittenia*[10], for the species

[1]Roth, Bot. Bemerk. 172 (1807). [2]Andr. Bot. Rep. **2,** t. 80 (1800). [3]Thunb. Prod. Pl. Cap. 102 (1800). [4]Druce, Rep. Bot. Exch. Cl. Brit. Isles, 1916, 649 (1917). [5]Willdenow, Enum. Plant. Hort. Berol. 653 (1809). [6]Roth, Nov. Pl. Spec. 291 (1821). [7]Del. Fl. Egypte, 95, t. 32, fig. 2 (1812). [8]Walp. Rep. **3,** 271 (1844). [9]Benth. in Hook. Comp. Bot. Mag. **1,** 374 (1836). [10]Kuntze, Rev. Gen. 461, 466 (1891).

founded on *Sutera glandulosa* Roth. In 1897 Diels[11] revived *Chaenostoma* but treated *Lyperia* and *Sphenandra* as sections of this genus. A few years later *Chaenostoma*, as conceived by Diels, was again reduced to *Sutera* by Hiern.[12] Hemsley and Skan[13] adhered to this arrangement, but still considered *Jamesbrittenia*, founded on *Sutera glandulosa*, to be a distinct genus. They separated this from *Sutera* on the character of the shortly two-lobed style. The type of *Jamesbrittenia* has been examined and the minutely bilobed style is present, but this is also present in *Sutera Elliotensis* Hiern, so cannot be taken as a separating generic character. There appear to be no characters on which *Jamesbrittenia* can be excluded from *Sutera* Roth 1807. *Sutera* Roth 1821 is therefore synonymous with *Sutera* Roth 1807 and the generic name *Jamesbrittenia* is not required and becomes a synonym :

Sutera dissecta (*Del.*) *Walp.* Rep. **3,** 271 (1844).
Sutera glandulosa Roth, Nov. Pl. Spec. 291 (1821).
Capraria dissecta Del. Fl. Egypte, 95, t. 32, fig. 2 (1812).
Jamesbrittenia dissecta Kuntze, Rev. Gen. 46 (1891).

E. A. B.

ACANTHACEAE.

Hypoëstes rosea *Beauv.* Fl. Oware & Ben. **2,** 66, t. 100 (1818) ; Nees in DC. Prodr. **11,** 506 (1847) ; Benth. in Hook. Niger Fl. 484 (1849), pro parte, quoad spec. Beauv. ; C. B. Cl. in Dyer, Fl. Trop. Afr. **5,** 248 (1900), pro parte, excl. descr., quoad spec. Beauv. ; Hutch. & Dalz. Fl. W. Trop. Afr. **2,** 268 (1931), excl. diagn., quoad spec. ex Benin. *H. Barteri* T. Anders. in Journ. Linn. Soc. Bot. **7,** 49 (1864) ; Lindau in Engl. & Prantl, Pflanzenfam. **4,** 313, 333 (1895) ; C. B. Cl. in Dyer, Fl. Trop. Afr. **5,** 246 (1900) ; S. Moore in Cat. Pl. Talb. Nig. 141 (1913) ; Hutch. & Dalz. Fl. W. Trop. Afr. **2,** 268 (1931).

When Anderson enumerated the African species of *Hypoëstes* he failed to mention *H. rosea* Beauv. whilst he described a new species based on a specimen collected by Barter, which he named *H. Barteri*. Apparently Clarke never saw Beauvois' specimen of *H. rosea*, for he misidentified it with *H. consanguinea* Lindau. He also identified a specimen in the Natural History Museum Herbarium collected by Don in São Thomé as *H. rosea*.

Comparison of Don's specimen with *Preuss* 599, the type specimen of *H. consanguinea* Lindau, showed the former to be a distinct species. In order to try to settle its identity, the type specimen of *H. rosea* Beauv. was examined. This was found to be identical with *H. Barteri* T. Anders., which name becomes a synonym of *H. rosea*. The name *H. consanguinea* Lindau is restored to the species based on *Preuss* 599, but the specimen from São Thomé, being rather scanty, has not yet been identified. E. M-R.

[11]Diels in Engl. Jahrb. **23,** 492 (1897). [12]Hiern in Dyer, Fl. Cap. **4,** pt. 2, 243. [13]Hemsley et Skan in Dyer, Fl. Trop. Afr. **4,** pt. 2, 298, 299 (1906).

Barleria (Somalia) Phaylopsis *Milne-Redhead*, sp. nov. [Acanthaceae] ; a *B. diffusa* (Oliv.) Lindau habitu herbaceo nec suffruticoso, foliis multo majoribus cystolithiis instructis, inflorescentiis substrobiliformibus differt.

Herba perennis, caulibus pluribus decumbentibus e caudice ortis ; caules simplices vel interdum perpauci ramis axillaribus basin versus instructi, usque 25 cm. longi, setoso-hirsuti, ad nodos flexi, internodiis 2–6 cm. longis. *Folia* oblanceolata, apice subobtusa, basi attenuata, sessilia, usque 9 cm. longa, 2·8 cm. lata, costa et margine setoso-hirsuta, ceterum glabra, utrinque cystolithiis inspersis instructa. *Inflorescentiae* ut videtur terminales, substrobiliformes, cymis 1-floris ex axillis foliorum superiorum redactorum exortis ; folia superiora usque 12 mm. longa, 2·5 mm. lata, redacta, glandulosa ; bracteae oppositae, lanceolatae, apice subacutae, basi attenuatae, circiter 10 mm. longae, dense glandulosae. *Calyx* usque ad basin 4-partitus, pilis glandulosis et eglandulosis intermixtis hirsutus ; segmentum posticum lanceolatum, acutum, 13 mm. longum, 2·5 mm. latum, trinerve ; anticum alte bifidum, 12 mm. longum, 2·2 mm. latum, binerve ; segmenta lateralia linearisubulata, 10·5 mm. longa, 0·8 mm. lata. *Corolla* lilacina, 19 mm. longa ; tubus cylindricus, 10 mm. longus ; segmenta subsimilia, obovata ; segmentum anticum apice emarginatum, 7 mm. latum ; duo postica 3·5 mm. lata ; duo lateralia 5·5 mm. lata. *Stamina* 2, circiter 3 mm. a basi tubi affixa ; filamenta filiformia, 10 mm. longa ; antherae biloculares, loculis lineari-oblongis 2·5 mm. longis leviter divergentibus ; staminodia plus minusve obsoleta. *Ovarium* oblongum, 2·5 mm. altum, puberulum, apice in stylum filiformem 9·5 mm. longum apice integrum anguste attenuatum, 4-ovulatum, ovulis duobus inferioribus abortivis minutis ; discus minutus. *Capsula* puberula, 12 mm. longa, superne in rostrum 6 mm. longum contracta.

NORTHERN RHODESIA. Solwezi District : in *Brachystegia* woodland by the Mbulungu Stream west of Mutanda Bridge, 9 July 1930, *Milne-Redhead* 690 :—Tufted perennial ; flowers lilac, with or without markings.

LABIATAE.

Acrocephalus (Acrocephalus § Holochili) **speciosus** *E. A. Bruce*, sp. nov. [Labiatae] ; affinis *A. tuberoso* Robyns et Lebrun sed capitulis paucioribus majoribus cylindricis, foliis et caulibus dense albido- vel stramineo-pilosis differt.

Herba perennis, erecta, circiter 7·5 dm. alta ; caules erecti, sublignosi, parce ramosi, rigidi, sulcati, basi circiter 5 mm. diametro, dense adscendente albido- vel stramineo-pilosi apicem versus densius, internodiis 4–7 cm. longis. *Folia* sessilia vel subsessilia, opposita, lanceolata vel oblongo-lanceolata, basi late cuneata, apice acuta vel subacuta, 4–10 cm. longa, 1–3 cm. lata, margine crenulata, utrinque praesertim nervis parce pilosa, nervis lateralibus utrinsecus circiter

10 supra impressis subtus valde prominentibus. *Capitula* terminalia et caules laterales terminantia, cylindrica, usque 9 cm. pedunculata, 1·5–3 cm. longa, circiter 1·5 cm. diametro, multiflora; bracteae exteriores viridescentes, foliis similes sed minores; bracteae interiores ovato-cordatae, basi late cordatae, apice caudato-acuminatae, extra pilosae, intus glabrae, margine piloso-ciliatae, usque 1·4 cm. longae et 1·2 cm. latae. *Flores* vulgo 3 pro bractea. *Calyx* bilabiatus; tubus campanulatus, 1·5 mm. longus, extra pilis albidis longissimis sericeis usque 5 mm. longis dense indutus, intus glaber; lobus anticus lanceolatus, usque 2 mm. longus, apice acutus; lobus posticus semi-orbicularis, circiter 0·8 mm. longus, apice subtruncatus vel late rotundatus. *Corolla* exserta, usque 9 mm. longa; tubus anguste cylindricus, faucem versus leviter dilitatus, usque 7 mm. longus, basi 1 mm. fauce 2 mm. diametro; labium anticum integrum, ovato-ellipticum, vix 2 mm. longum, apice acutum; labium posticum trilobatum, lobis lateralibus ovato-triangularibus 1 mm. longis, lobo medio obovato 1·5 mm. longo, omnibus ciliatis. *Stamina* infra faucem inserta, demum exserta, filamentis 4 mm. longis, antheris subrotundatis; stylus minute bifidus, circiter 7 mm. longus.

NORTHERN RHODESIA. Abercorn District: Near Issoko, 1050 m., 27 Oct. 1936, *B. D. Burtt* 6100 (type) :—In clumps in hilly *Brachystegia* country. Abercorn Lake, 1500 m., 19 July 1930, *Hutchinson & Gillett* 3881 :—7·5 dm. high.

Iboza multiflora (*Benth.*) *E. A. Bruce*, comb. nov.—*Plectranthus multiflorus* Hochst. ex Benth. in DC. Prodr. **12**, 49 (1848), nomen. *Moschosma multiflorum* Benth. l.c.

Iboza urticifolia (*Baker*) *E. A. Bruce*, comb. nov.—*Moschosma urticifolium* Baker in Dyer, Fl. Trop. Afr. **5**, 353 (1900).

VIII—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS: XXV.*

E. M. MARSDEN-JONES AND W. B. TURRILL.

INVESTIGATIONS OF PLANTS FROM FEARNAN, LOCH TAY, SCOTLAND.

In August, 1929, we received through Prof. K. W. Braid seeds of *S. vulgaris* collected near Fearnan, on the shore of Loch Tay, by Mr. D. A. Haggert. The following information was received from the collector: "It is mixed seed of red and white plants. The plant is still in good form at Fearnan though the white now predominates. When I first discovered it the shore plant was almost all red-purple. The white is now more common."

Amongst the plants raised from this seed, and in the families obtained by selfing certain of them, were white and coloured flowered individuals. These have been classified into four groups as follows:

*Continued from K.B. 1939, 473.

Dark: upper surface of petals Laelia Pink, lower surface Tourmaline Pink (Ridgway Pl. XXXVIII).

Medium: upper and lower surface Pale Laelia Pink, lower surface with veins Tourmaline Pink.

Pale: upper and lower surface very dilute Pale Laelia Pink, lower surface in veins Pale Laelia Pink.

White: with no trace of colour.

All the plants dealt with in this paper come within the species *S. vulgaris* and all died down completely to ground level for a typical hemicryptophytic winter condition.

Three of the plants from the original wild seed (grown at Potterne under the symbol L.1) were chosen as stock plants and are described below.

B.37. *Habit*: compact, stems erect, up to 4·6 dm. long; with medium anthocyanin in vegetative parts; glabrous; not strict.

Leaves: narrow lanceolate, averaging for well developed leaves 5 cm. long, 1·5 cm. broad, glabrous, margins not ciliated but sometimes minutely crenulate.

Inflorescence and sex: with up to 15 flowers; flowers zygomorphic; bracts at first green herbaceous many becoming later scarious, eciliated; hermaphrodite.

Calyx: subinflated with medium anthocyanin.

Corolla: with petals bilobed, divided ¾ length of lamina, petals and segments not contiguous or overlapping, 1·9 cm. long, 8 mm. broad, boss, blotch present, colour medium.

Filaments: purple; anthers purple.

Stigmata: purple; immature seeds white.

Mature capsules: ovoid-ellipsoid, 7 mm. long (excluding teeth), 6·5 mm. diam., teeth 1·5 mm. long, erect, mouth 2 mm. diam., carpophore 2 mm. long, 2 mm. diam.

Mature seeds: tubercled.

B.38. *Habit*: compact, stems erect, up to 6·2 dm. long; with medium anthocyanin in vegetative parts; glabrous; not strict.

Leaves: narrow oblanceolate to lanceolate, averaging for well developed leaves 5·5 cm. long, 1·8 cm. broad, glabrous, margins ciliated.

Inflorescence and sex: with up to 34 flowers; flowers zygomorphic; bracts as for B.37; hermaphrodite.

Calyx: subinflated, with medium anthocyanin.

Corolla: with petals bilobed, divided ¾ length of lamina, petals and segments not contiguous or overlapping, 1·7 cm. long, 8 mm. broad, boss, blotch absent, colour pale.

Filaments: purple; anthers purple.

Stigmata: purple; immature seeds white.

Mature capsules: ovoid-ellipsoid, 7 mm. long (excluding teeth), 7 mm. diam., teeth 1·5 mm. long, erect, mouth 2 mm. diam., carpophore 2 mm. long, 2 mm. diam.

Mature seeds: armadillo.

B.39. *Habit* : spreading and ascending, stems up to 5·5 dm. long ; with much anthocyanin in vegetative parts ; glabrous ; semi-strict.

Leaves : lanceolate to linear lanceolate, averaging for well developed leaves 6·5 cm. long, 1·7 cm. broad, glabrous, margins more or less ciliated.

Inflorescence and sex : with up to 15 flowers ; flowers zygomorphic ; bracts as for B.37 ; hermaphrodite.

Calyx : subinflated, with medium anthocyanin.

Corolla : with petals bilobed, divided ¾ length of lamina, petals and segments not contiguous or overlapping, 2 cm. long, 8 mm. broad, small scale, blotch absent, colour pale.

Filaments : purple, anthers purple.

Stigmata : purple ; immature seeds white.

Mature capsules : ovoid-ellipsoid, 6·5 mm. long (excluding teeth), 6·5 mm. broad, teeth 1·5 mm. long, erect, mouth 2 mm. diam., carpophore 2 mm. long, 1·5 mm. diam.

Mature seeds : armadillo.

The F_1 and F_2 families derived from these stock plants, after controlled pollinations, have been designated as follows :

N.120=B.39 selfed.
  N.267=N.120 plant 3 selfed.
  N.285=N.120 plant 1 selfed.
  N.286=N.120 plant 4 selfed.
N.121=B.37 selfed.
  N.311=N.121 plant 6 selfed.
N.122=B.38 selfed.

N.120=B.39 selfed. 60 plants in the family.

Habit : for all plants spreading and ascending ; stems up to 6·1 dm. long ; with much anthocyanin in vegetative parts ; glabrous ; mat ; 8 strict : 34 semi-strict : 18 not strict.

Leaves : as in parent.

Inflorescence and sex : with up to 23 flowers ; flowers zygomorphic, 38 hermaphrodite : 1 hermaphrodite and female : 10 female.

Calyx : plants segregated for inflated, subinflated, and narrow calyces, but owing to bad attacks of *Marssonina* a large majority of the plants could not be scored for calyx shape ; 34 medium anthocyanin : 10 little anthocyanin.

Corolla : petals all bilobed, with ¾ lobing ; all petals and segments not overlapping or contiguous ; all with no anthocyanin blotch ; 45 with small scale : 4 with boss ; colour 2 dark : 18 medium : 15 pale : 12 white.

Filaments : all purple (when present) ; anthers all purple (when present).

Stigmata : all purple ; immature seeds all white.

Mature capsules : all of *vulgaris* type.

Mature seeds : all armadillo.

N.267=N.120 plant 3 selfed. 17 plants in the family.

Habit : for all plants spreading and ascending ; stems up to 7·8 dm. long ; with much anthocyanin in vegetative parts ; glabrous ; mat ; all not strict.

Leaves : as in parent.

Inflorescence and sex : with up to 48 flowers ; flowers zygomorphic ; 13 hermaphrodite : 1 hermaphrodite and female : 3 female.

Calyx : 2 inflated : 10 subinflated : 5 narrow ; all with medium anthocyanin.

Corolla : petals all bilobed, with ¾ lobing ; all petals and segments not overlapping or contiguous except for slight overlapping in one plant ; anthocyanin blotch 1 present : 16 absent ; 13 with scale : 3 with small scale : 1 with boss ; colour 1 medium : 16 pale.

Filaments : 1 purple : 13 white ; anthers all purple (when present).

Stigmata : 14 purple : 3 white ; immature seeds all white.

Mature capsules : all of *vulgaris* type.

Mature seeds : all armadillo.

N.285=N.120 plant 1 selfed. 22 plants in the family.

Habit : for all plants spreading and ascending ; stems up to 3·1 dm. with much anthocyanin in vegetative parts ; glabrous ; mat ; 3 semi-strict : 19 not strict.

Leaves : as in parent.

Inflorescence and sex : with up to 44 flowers ; flowers zygomorphic ; 6 hermaphrodite : 1 hermaphrodite and female : 11 female.

Calyx : all subinflated ; all with medium anthocyanin.

Corolla : all petals and segments not overlapping or contiguous ; anthocyanin blotch absent in all ; 1 scale : 10 small scale : 7 boss ; colour all white except for one plant with a tinge of pink.

Filaments : all purple (where scorable) ; anthers all purple (where scorable).

Stigmata : 17 purple : 1 white (remainder not scorable) ; immature seeds all white.

Mature capsules : all of *vulgaris* type (where scorable).

Mature seeds : all armadillo (where scorable).

N.286=N.120 plant 4 selfed. 54 plants in the family.

Habit : for all plants spreading and ascending ; stems up to 6·3 dm. long ; with much anthocyanin in vegetative parts ; glabrous ; mat ; 11 semi-strict : 43 not strict.

Leaves : as in parent.

Inflorescence and sex : with up to 40 flowers ; flowers zygomorphic ; 31 hermaphrodite : 2 hermaphrodite and female : 21 female.

Calyx : 13 inflated : 41 subinflated ; 51 with medium anthocyanin : 3 with little.

Corolla: petals all bilobed; all with ¾ lobing; petals and segments all not overlapping or contiguous; anthocyanin blotch absent in all; 14 small scale : 40 boss; colour 34 pale : 20 white.

Filaments: 15 purple : 18 white; anthers all purple (when present).

Stigmata: 41 purple : 13 white; immature seeds all white.

Mature capsules: all of *vulgaris* type (where scorable).

Mature seeds: all armadillo (where scorable).

N.121=B.37 selfed. 28 plants in the family.

Habit: rather compact and ascending; stems up to 6·3 dm. long; with medium anthocyanin in vegetative parts; glabrous; mat; 4 semi-strict : 24 not strict.

Leaves: as in parent.

Inflorescence and sex: with up to 44 flowers; flowers zygomorphic; 14 hermaphrodite : 2 female (remainder unscorable). 12 plants were completely unscorable for flower characters as they either did not produce flowering stems or these failed to flower properly, and others could only be partially scored. Plants were badly attacked by *Marssonina*, and a few also by *Ustilago*, but in addition there were obviously genetical factors concerned in the failure to produce functioning flowering stems (see N.311).

Calyx: 1 inflated : 3 subinflated (remainder unscorable); 5 medium : 2 little anthocyanin.

Corolla: petals all bilobed, with ¾ lobing; all petals and segments not overlapping or contiguous; anthocyanin blotch absent (where scorable); 1 small scale : 15 boss; colour 4 dark : 7 medium : 1 pale : 4 white.

Filaments: all purple (where scorable); anthers all purple (where scorable).

Stigmata: all purple (where scorable); immature seeds all white (where scorable).

Mature capsules: 6 *vulgaris* type (remainder did not produce fruits).

Mature seeds: 4 tubercled (remainder did not produce seeds).

N.311=N.121 plant 6 selfed. 57 plants in the family.

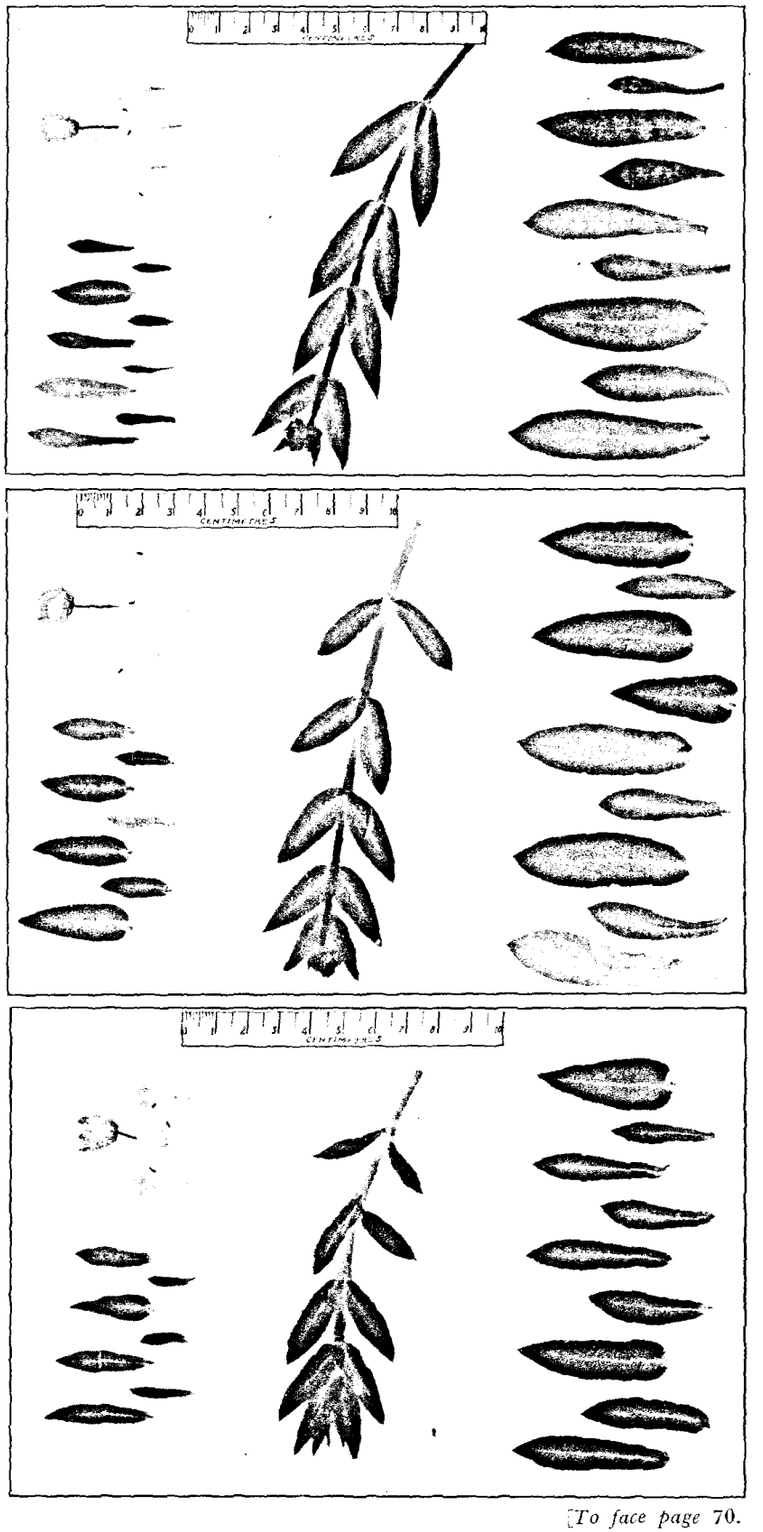
The plants all showed a low strangely compact and stunted growth, without the production of normal flowering stems. 14 plants actually produced each a few flowers in the course of the season, but only a certain number of characters could be scored for these. No seed at all was set except by 4 plants and the infructescences of plants other than these 4 bore only shrivelled calyces surrounding collapsed ovaries. In the 4 plants the capsules were of *vulgaris* type and the seeds were tubercled.

N.122=B.38 selfed. 29 plants in the family.

Habit: rather compact and ascending; stems up to 4·4 dm. long; with medium anthocyanin in vegetative parts; glabrous; mat; all not strict.

PLATE IV.

Stock Plants. Fig. 1, no. B.37. Fig. 2, no. B.38. Fig. 3, no. B.39.



[*To face page* 70.

Leaves : as in parent.

Inflorescence and sex : with up to 28 flowers ; flowers zygomorphic ; 19 hermaphrodite : 3 hermaphrodite and female : 6 female.

Calyx : 1 inflated : 7 subinflated : 1 narrow ; 14 with medium anthocyanin : 3 with little.

Corolla : petals all bilobed, with $\frac{3}{4}$ lobing ; all petals and segments not overlapping or contiguous ; anthocyanin blotch absent (where petals scorable) ; 7 small scale : 19 boss ; colour 4 dark : 12 medium : 6 pale : 6 white.

Filaments : all purple (where scorable), except in one plant, in which no colour was detectable ; anthers all purple (where scorable).

Stigmata : all purple (where scorable), except in one plant with white stigmata ; immature seeds all white.

Mature capsules : all of *vulgaris* type (where scorable).

Mature seeds : all armadillo (where scorable).

Discussion.

The Loch Tay plants and their offspring as dealt with in this paper are classified under *S. vulgaris* since they show the following characters : all died down in the winter to the hemicryptophytic state normal for this species ; relatively large leaf size ; inflorescence many-flowered (up to 48 flowers) ; flowers zygomorphic ; calyx shape of *vulgaris* ; petals and segments nearly all not overlapping or contiguous ; mature capsules of *vulgaris* shape with erect teeth. The experiments were made in the hope of throwing light on the genetics of petal colour. In addition there have appeared effects due to a gene (or genes) reducing or preventing the production of flowering stems. Scorings for certain other characters are also discussed but because of general uniformity of behaviour in the three parents and in all F_1 and F_2 families the following need not be mentioned again in this paper : indumentum (all plants glabrous) ; leaf-shape and size (all plants within the usual range for the species) ; flowers (zygomorphic) ; petal lobing (bilobed, $\frac{3}{4}$ lobing) ; petals and segments (not contiguous or overlapping, with one exception which may represent merely a phenotypic variation) ; anthers (purple) ; immature seeds (white) ; mature capsules (of ordinary *vulgaris* type and ovoid-ellipsoid in shape).

Habit : the compact habit of B.37 and B.38, and the more spreading habit of B.39 appeared also in the F_1 and F_2 offspring ; B.39 had much anthocyanin in the vegetative parts, B.37 and B.38 had medium anthocyanin, and the offspring families all bred true respectively for these characters ; B.37 and B.38 were not strict and the offspring bred true to this character (as far as it was determinable), B.39 was semi-strict and threw a 4 : 17 : 9 ratio for strict : semi-strict : not strict, but the F_2 families from semi-strict parents threw 3 semi-strict : 19 not strict and 11 semi-strict : 43 not strict respectively, while the one family from a not strict plant gave only

not strict offspring. It is probable that this character has a genetic basis but is easily modified by environmental conditions (especially water supply, which in turn is modified by disease).

Sex: the three stock plants and the F_1 plants used as parents for F_2 families were all hermaphrodite. All the families segregated for hermaphrodite : female but individual families gave diverse ratios. Summation of all families gave 127 hermaphrodite : 8 hermaphrodite with some female : 53 female. This for hermaphrodite (a few with female flowers as well) : female only gives the ratio 2·55 : 1. Since in the course of our work on this species and the morphologically and genetically closely allied *Silene maritima* we have recorded the sex of many thousands of individuals and have never found a plant which we could describe as " male " (i.e., male-fertile, female-sterile) we have to assume that if an M F scheme is the basis of sex in these species the F gene (or genes) is extremely stable. The corresponding F gene (or genes) in *Ranunculus acris* and other species of this genus are also very stable and a male plant has only once been recorded (by us) from the wild.

Calyx: the stock plants had subinflated calyces with medium anthocyanin. There was segregation for shape in four families but owing to the impossibility of scoring many plants for this character it need not be further discussed here. All offspring plants had anthocyanin, and most showed a medium amount but four families showed some plants with little. It is possible that N.120, N.121, and N.122 really show 3 : 1 ratios for medium : little, while N.267, 285 (certainly) and possibly also N.286 are homozygous for medium anthocyanin, the 3 plants with little being phenotypically modified medium plants.

Corolla: anthocyanin blotch was present in B.37 but absent in B.38 and B.39. All offspring had no blotch except for one plant derived (as an F_2 plant) from B.39. It must be noted that the scoring for anthocyanin blotch in coloured petals is difficult and sometimes unsatisfactory. We have, however, previously had reason to suspect mutations occurring for this character. B.37 and B.38 had bosses, B.39 had small scales. It is significant that scales appeared only in F_2 offspring from B.39 (from F_1 plants with small scales) and the " small scales " recorded in offspring from B.37 and B.38 may well be enlarged bosses such as occur in many wild populations of *S. vulgaris*.

Petal colour: the degrees of colour form a continuous series and the limits of the classes D, M, and P are arbitrary, as is the scoring of " border-line " plants. The figures for colour : white on summation of all five families scored for petal colour, and excepting N.285 which was derived from a white-flowered plant and on selfing gave only white flowers, were 120 coloured to 42 white, which suggests a 3 : 1 ratio. Figures for the individual families suggest that dark, medium, and pale may all be phenotypic modifications of one genotype.

Filaments: all stock-plants had purple filaments and families N.120, N.285, N.121, and (probably) N.122 bred true to this character. N.267 gave 1 purple : 13 white and N.286 gave 15 purple : 18 white, both from plants with purple filaments. These figures cannot at present be explained.

Stigmata: the three stock plants had purple stigmata as had all plants of N.120, N.121, N. 122, and (with one possible exception) N.285. As with the filaments it is again N.267 and N.286 which threw plants with white stigmata, though with different figures from those recorded for filaments, namely 14 : 3 and 41 : 13 respectively, which may represent 3 : 1 ratios.

Mature seeds: B.37 had tubercled, B.38 and B.39 had armadillo seeds and the offspring families bred true to these characters respectively.

Non-flowering: families N.121 and N.311 contained a gene or genes which more or less inhibited the production of flowering stems to normal maturity. The gene or genes came from B.37 but as this plant died before it was realized that a genetical basis must be postulated for the abnormal behaviour (which was especially prominent in the F_2 family N.311, affecting in this family all the plants in greater or less degree) it is not possible to repeat the experiments. For the family N.121 the figure 12 for plants not flowering properly is probably too low since every effort was made to score as many flower characters as possible even in those plants in which development of flowering stems and inflorescences was very poor. The plants were highly susceptible to *Marssonina* and some also suffered from *Ustilago* and it was thought at the scoring time of this family that these parasitic fungi might alone be responsible for the abnormal development. This now seems highly improbable, but their occurrence explains why it is not possible to determine the exact genetic behaviour of the stunted growth from our figures.

Summary.

An account is given of plants grown from wild seed collected near Loch Tay and of breeding carried out with certain individuals selected as stock plants. Characters which showed segregation were concerned with habit, sex, calyx shape, anthocyanin in calyx, possibly anthocyanin blotch in petals, corona, petal colour, filament colour, stigma colour, and flowering. Coloured petals versus white petals show a very close approximation to a 3 : 1 ratio, and depths of colour may well be due to phenotypic variation of one genotype. The presence of a gene (or genes) more or less preventing the proper development of flowering stems is strongly suggested in two families derived from one stock-plant.

The research on which this paper is based has been aided by a Royal Society Government Grant.

IX—NOTES ON TWO ASIATIC GENERA OF LAURACEAE. H. K. AIRY-SHAW.

I. CARYODAPHNOPSIS, GEN. NOV.

Three species currently referred to *Nothaphoebe* have evidently little or no affinity with that genus. These are: *N. tonkinensis* Lecomte, *N. baviensis* Lecomte and *N. pyriformis* (Elm.) Merr. They appear to have been referred to this genus on account of their 4-locellate anthers and minute outer perianth-segments. But in most other characters they differ widely from *Nothaphoebe*, and the following new genus is therefore proposed for their reception.

Caryodaphnopsis *Airy-Shaw*, gen. nov. (Lauraceae—? Apollonieae); foliis oppositis triplinerviis, perianthii segmentis exterioribus minutis, interioribus pro rata majusculis valvatis, staminibus fertilibus 9, iis seriei intimae extrorsis, antheris 4-locellatis, staminodiis 3, fructu magno pyriformi pedicello aliquantum incrassato ab omnibus ceteris *Lauraceis* facile distinguendum.

Perianthii tubus subnullus; segmenta 6, exteriora minuta, deltoïdea, aestivatione aperta, interiora pro rata magna, late triangulari-ovata, aestivatione valvata. *Stamina* 9, vel clavato-oblonga filamento vix distincto, vel anthera quadrata filamento distincto, applanata, 4-locellata, ordinis I et II introrsa, ordinis III extrorsa, haec tantum ut videtur basi glandulifera, glandulis subsessilibus; staminodia 3, breviter sagittiformia, breviter stipitata. *Ovarium* parvum, ovoïdeum, in stylum brevem attenuatum, stigmate parvo 2–3-lobo. *Fructus* (e descr. cl. Elmer et Liou Ho et specim. imperfectis Elmerianis tantum mihi cognitus) magnus, obovoïdeus seu pyriformis, drupaceus, durus, nitenti-viridis; pedicello plus minus incrassato, apice expanso; perianthii segmenta caduca. *Semen* (e descr.) magnum, conforme.

Arbores mediocres vel parvi. *Ramuli* teretes. *Folia* opposita vel subopposita, triplinervia, tenuiter coriacea, petiolata. *Flores* hermaphroditi, in thyrsos laxos axillares saepe seriales minute bracteatos dispositi.

Species 3, Yunnan, Tonkin, Ins. Philippinarum Borneonisque borealis incolae. Typus: *C. tonkinensis* (Lecomte) Airy-Shaw.

The affinities of this genus are not very clear, but I have no doubt about its distinctness. The name has been taken from the striking resemblance of the leaves to those of certain species of *Cryptocarya* Sect. *Caryodaphne* (=*Pseudocryptocarya* Teschner), *e.g. C. laevigata* Bl. In characters of flower and fruit, however, the genus is much more like *Dehaasia*. But it differs from both these genera in the opposite arrangement of the leaves and in the 4-locellate anthers. The question of what tribe it should be placed in must await a rational revision of the entire *Lauraceae*, for its affinities are evidently rather with the genera with 2-locellate anthers (*Cryptocaryeae* and *Apollonieae*) than with other 4-locellate genera (*Cinnamomeae*).

Clavis Specierum

Ramuli, petioli, folia subtus tenuissime ferrugineo-tomentella..... 3. *baviensis*

Ramuli, petioli, folia glaberrima:

Inflorescentia floresque dense tomentella; flores majusculi, 3·5 mm. diametro; stamina clavata, filamento vix distincto..... 1. *tonkinensis*

Inflorescentia floresque minutissime puberula; flores subduplo minores, circiter 2 mm. diametro; antherae quadratae, filamento distincto ..... 2. *Henryi*

1. **Caryodaphnopsis tonkinensis** (*Lecomte*) *Airy-Shaw*, comb. nov.

Nothaphoebe tonkinensis Lecomte in Nouv. Arch. Mus. [Par.] **5,** 106 (1913) et in Lecomte, Fl. Gén. Indoch. **5,** 118 (1914); Liou Ho, Laur. Chine et Indoch. 76 (1934).

Persea pyriformis Elm. Leafl. Philipp. Bot. **8,** 2727 (1915); Merr. Enum. Philipp. Fl. Pl. **2,** 188 (1923); *synon. nov.*

Nothaphoebe pyriformis (Elm.) Merr. in Univ. Calif. Publ. Bot. **15,** 77 (1929).

TONKIN. Tu-Phap, dans les bois, Apr. 1887, *Balansa* 2441 (typus in Herb. Mus. Par., dupl. in Herb. Kew.). Also *Poilane* 13021, 13036, ex Liou Ho, l.c. (not seen).

ANNAM. *Poilane* 1406, ex Liou Ho, l.c. (not seen).

PHILIPPINES. Samar & Mindanao: see Merr. Enum. l.c.; also Bukidnon Prov., Mar.–Apr. 1926, *Ablaza* in *For. Bur.* 30282. Leyte, Mt. Abucayan, Feb. 1923, *Edaño* in *Bur. Sci.* 41720. Sulu Prov., Tawi-tawi, July–Aug. 1924, *Ramos & Edaño* in *Bur. Sci.* 43955.

BRIT. N. BORNEO. Near Tawao, Oct. 1922–Mar. 1923, *Elmer* 21857.

The Philippine and Bornean material referred to *Persea* or *Nothaphoebe pyriformis* agrees perfectly with the type-collection of *N. tonkinensis*. Balansa calls the plant a shrub, but Elmer and Poilane refer to it as a tree 8–15 m. in height. It is readily distinguished from the other two species by its relatively large, densely tomentellous flowers.

2. **Caryodaphnopsis Henryi** *Airy-Shaw*, sp. nov.

Nothaphoebe tonkinensis f. *brevipedicellata* Liou Ho, l.c. 77.

A *C. tonkinensi* foliis basi rotundatis, floribus subduplo minoribus glaberrimis, a *C. baviensi* ramis petiolis nervis subtus glabris, ab utraque antheris subquadratis filamento distincto recedit.

Arbor parva, 3–4·5 m. alta. *Ramuli* graciles, usque 3·5 mm. diametro, teretes, cortice laevi obscure griseo minute et parcissime lenticellato. *Folia* opposita, ovata, interdum fere elliptico-oblonga, basi optime rotundata, raro levissime subcordata vel subcuneata, apice breviter acuminata, acuta, 9–15 cm. longa, 4·5–6·5 cm. lata, integerrima, chartacea, glabra, siccitate supra obscure brunnea,

subtus glaucescentia; costa supra subplana, subtus prominula; nervi laterales 3–4-jugi, uno jugo subrecto paullo supra basin e costa orto (unde folia triplinervia) et longe ultra medium folium procurrente, ceteris supra medium ortis valde arcuatis prope marginem anastomosantibus; nervi secundarii e lateralibus marginem versus extensi, procurvi; omnes graciles, subtus prominuli; venulae minores tenuissimae, omnes cum costa angulum rectum efformantes et sibi parallelae, venulis ultimis reticulum subtilissimum efformantibus; petioli 10–12 mm. longi, vix 1·5 mm. crassi, supra plani, subtus teretes. *Inflorescentiae* axillares, thyrsoïdeae, 4–7 cm. longae, graciles, ramosae, ramis oppositis 5–8 mm. longis, sub lente minutissime puberulae, statu valde juvenili parcissime ferrugineo-pubescentes, bracteis minutis brunnescentibus. *Flores* per 6–8 in apice ramorum cymose dispositi, pedicellis 2–3 mm. longis. *Perianthii* segmenta exteriora minuta, deltoïdea, vix 0·4 mm. longa; segmenta interiora late triangulari-ovata, 2 mm. longa et lata, subacuta, extra minute puberula, intus sparsiuscule ferrugineo-tomentella. *Stamina* ordinis I et II simillima, 1 mm. longa, anthera plana ovato-quadrata apice truncata, filamento distincto, ordinis III longiora, 1·5 mm. longa, glandulis binis magnis basalibus anthera haud multo minoribus; omnium filamenta (maxime dorso) pubescentia. *Staminodia* breviter sagittata, 0·8 mm. longa, glabra, stipitata, stipite pubescente. *Ovarium* ovoïdeum, glabrum, in stylum brevem attenuatum, totum 1 mm. longum, stigmate parvo. *Fructus* ignotus.

YUNNAN. Fêng Chen Lin, S. of Red River, mountain forests, 2100 m., *Henry* 10692 (Herb. Kew.): " Tree 10′–15′."

This was treated merely as a form of *N. tonkinensis* by Liou Ho, but the flowers are so different that it must be considered specifically distinct.

3. **Caryodaphnopsis baviensis** (*Lecomte*) *Airy-Shaw*, comb. nov.

Nothaphoebe baviensis Lecomte in Nouv. Arch. Mus. [Par.] l.c. 107, et in Lecomte, Fl. Gén. Indoch. l.c.; Liou Ho, l.c. 77.

TONKIN. Ravins à la base du Mont Bavi, 1888, *Balansa* 2445 (typus in Herb. Mus. Par., dupl. in Herb. Kew.): " Arbrisseau à rameaux un peu sarmenteux. Corolle jaunâtre."

Differs from the other species in the close fine dark brown tomentum of the branches, petioles and nerves beneath.

II. STEMMATODAPHNE IN BORNEO.

The monotypic genus **Stemmatodaphne** *Gamble* (in Kew Bull. 1910, 227) must be closely related to *Dehaasia* and *Beilschmiedia* (Tribe *Apollonieae*), though Gamble places it next to *Phoebe* (Tribe *Cinnamomeae*). The character of the 2- or 4-locellate anthers seems to have had too much importance attached to it in the classification of the *Lauraceae*; in this instance it certainly separates related genera. I find that Merrill has independently described the species as a *Beilschmiedia* from Borneo.

S. perakensis *Gamble*, l.c., et in Journ. As. Soc. Beng. **75,** 111 (1912); Stapf in Hook. Ic. Pl. **30,** t. 2984 (1913).

Beilschmiedia longipedicellata Merr. in Univ. Calif. Publ. Bot. **15,** 83 (1929), non Ridley in Kew Bull. 1926, 475; *synon. nov.*

SARAWAK. Entoyut River, Baram District, Dec. 1894, *Hose* 408.

BRIT. N. BORNEO. Near Tawao, 1922/3, *Elmer* 20782, 20875.

The genus has not previously been recorded as such from Borneo. Merrill reports only six stamens for his *Beilschmiedia longipedicellata*, but in the Kew material of *Elmer* 20875 there were nine perfectly developed stamens in the two flowers which I examined.

X—BERBERIS CHRYSOSPHAERA: A NEW SPECIES FROM SOUTHERN TIBET.

B. O. MULLIGAN (Royal Horticultural Society's Gardens, Wisley).

The continued exploration by Captain Kingdon Ward of the mountainous area at the eastern end of the Himalayan chain, which includes parts of Burma, Assam and Tibet, has already brought to light a number of new species of evergreen *Berberis* of the section *Wallichianae*, notably *B. amabilis* Schneider,* *B. calliantha* Mulligan, *B. hypokerina* Airy-Shaw, *B. incrassata* Ahrendt, and *B. Wardii* Schneider.* To these must now be added another, quite distinct from any other in cultivation, but in habit and botanical details most closely resembling *B. candidula* Schneider, a native of Central China which has been known in gardens for many years.

The field note of Capt. Ward's plant is as follows:

" K.W. 11036. Berberis sp. nov.?

" A low growing and spreading, almost dwarf, evergreen bush, thickly clothed with highly polished dark green rigid leaves interspersed in winter with scarlet leaves, brilliant white-silver beneath.

" There are the usual thorns, and the leaves also are prickly as in *B. Wallichii*. Flowers solitary, yellow, on long but stiff pedicels in the leaf axils; fruits erect, blue-violet. Apparently very rare. I found one clump on the granite cliffs, approaching the Dri Pass, at about 10,000 ft. altitude. Both flowers and fruits were present on 10th December, but the plant normally blooms in the summer. One of the most beautiful foliage species I have seen, though flowers and fruit add nothing to—and take nothing away from—the plant. Zayul."

Very similar information is given by the same author in " A Plant Hunter in Tibet," 277 (1934), and in the " Gardeners' Chronicle," **98,** 124 (17th August, 1935), although in neither case is the collector's number mentioned. Capt. Ward, however, has confirmed the former reference as relating to this species, as well as the occurrence, so far as his observation went, in one situation only. We may, therefore, consider ourselves lucky that it has been successfully introduced to Britain from the few seeds obtained. I am informed

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by Prof. Sir W. Wright Smith that it is also growing at the Royal Botanic Garden, Edinburgh, although it has not yet flowered there. The seeds received at Wisley were sown on 24th April, and germinated on 15th May, 1934. Subsequently the plants were potted and later transferred to the shrub nursery, whence in the spring of 1937 they were transferred—nine in number—to the Berberis collection in Seven Acres. By the early autumn of 1939 the largest plants were eighteen inches high and two and a half feet across, measurements which clearly admit it to the limited number of shrubs suitable for the rock garden, and give some indication both of its growth rate and of the limits imposed by the alpine habitat. In the Gardens a position fully exposed to the south was chosen, in light and sandy soil somewhat inclined to drought in summer; the fact that it has thriven under such conditions suggests considerable toleration and gives one encouragement to prophesy that this glossy-leaved dwarf Berberis may well become popular when it is known more widely and has been propagated in quantity. Further, as one might expect from its native habitat, it seems to be perfectly winter-hardy, since it passed through the severe weather of January, 1940, when the ground temperature descended to 0°F., with no more than slight browning of some of the leaves.. A detailed description follows.

Berberis (sect. **Wallichianae**) **chrysosphaera** *Mulligan*, sp. nov.; affinis *B. candidulae* C. K. Schn., a qua ramulis juvenilibus plus minus erectis rubellis, foliis hypodermate instructis majoribus obtusioribus plerumque oblanceolatis dentibus numerosioribus, pedicellis longioribus, floribus magnis, et ut videtur ovulis circiter 9–12 differt.

Fruticulus densus, surculosus, usque 0·6–0·7 m. altus ut videtur; *ramuli* minute verrucosi, juventute rubelli. *Folia* coriacea, supra atro-viridia, nitida, subtus alba, cerifera. *Flores* solitarii, circiter 1·7 cm. diam.; pedicelli validi, circiter 2·5 cm. longi. *Fructus* non visi, e collectore caeruleo-violacei.

A small bush at present 45 cm. tall, 75 cm. in width, of suckering habit, the young *branches* more or less upright, tinged red, minutely verrucose, slightly angled, those of the previous year brown, striate, the bark peeling off in strips. *Thorns* trifid, slender, on the young shoots usually 10 mm. but up to 13 mm. long, the central one usually the longest, green with a light brown tip; on the older wood becoming brown and somewhat harder but not rigid. Internodes 2–2·5(–3) cm. long; *petiole* of the smaller leaves 1·5–3 mm., of the largest 6–9 mm., glabrous, tinged red at the base; stipules 2, filiform, 1–2 mm. long. *Leaves* of current year's shoots in fascicles of (3–)4–6(–7), on the shorter lateral branches (two years old or more) of 5–8(–9), oblanceolate, elliptic-lanceolate, or the smaller elliptic, (1·7–)2·5–4 cm. long including the petiole, 0·5–1·1 cm. wide, coriaceous, apex obtuse to acute, mucronate, base cuneate and decurrent along the petiole, margin recurved, frequently undulate with from a few up to fourteen teeth 0·75–2 mm. long on each side, either spreading or pointing forward, upper side dark green and shining, the midrib impressed and some of the secondary veins visible, underside waxy white with a thick covering of papillae, the wax disappearing with age, midrib conspicuously raised but lateral veins only rarely visible. Hypoderm present beneath the epidermis, moderately thick-walled.

Flowers produced at the end of April or early in May at least a week before *B. candidula* Schn. or *B. calliantha* Mulligan, singly from the fascicles of leaves on one or two year old wood; bud scales triangular-lanceolate, glabrous, 5–6 mm. long, the outer tinged red; *pedicels* about 2·5 cm. long, green or red-tinged on the upper side, glabrous, stout, decurved in the upper half and thickened below the flower; flower 1·7–1·8 cm. diam., the six sepals spreading almost horizontally to expose the flattened-spherical petals; *outer sepals* 3, ovate to elliptic-ovate, slightly concave, 6–7·5 by 5–6 mm., subacute, greenish outside yellow within; *inner sepals* 3, obovate, slightly concave, 10 by 7·5 mm., obtuse, yellow with a greenish main vein; *outer petals* 3, obovate to nearly obcordate, concave, about 8 by 6 mm., butter yellow, emarginate, with a pair of basal nectaries at the point of adhesion with the filament; *inner petals* 3, obovate-oblong, concave, 7 by 5 mm., slightly emarginate and undulate, of similar colour and having nectaries like the outer petals; *stamens* 5 mm. long, filament 3 mm., flattened, apex truncate, the slightly swollen portion immediately below the anther markedly papillose; *ovary* 4 mm. long including the capitate stigma; ovules frosted in material available at Wisley (1st May, 1939) but apparently numbering about 9–12. Fruit not seen.

S.E. TIBET. Zayul, near the Dri-La Pass, Rongtö Valley, *Kingdon Ward* 11036 (in Herb. Brit. Mus.); in flower.

The name *chrysosphaera* is derived from the Greek words χρυσὸς and σφαῖρα and has reference to the colour and shape of the open flower.

The habit of the plant is quite different from that of *B. candidula* which tends to form a low compact mound and does not make the longish upright shoots of *B. chrysosphaera*, nor are they tinged red as in the latter. In the foliage distinctions may be seen in the larger size, the presence of a hypoderm, the predominatingly oblanceolate as opposed to the sharply elliptic leaves of *B. candidula*, with the greater number of spreading teeth, whilst the earlier and larger flowers on longer pedicels, besides the probably greater number of ovules, all serve to mark this off as a new and distinct species of the section *Wallichianae*.

Acknowledgments are here gratefully made to Dr. T. A. Sprague, of the Herbarium, Royal Botanic Gardens, Kew, for reading through and making suggestions for improving the Latin diagnosis and description and to Dr. G. Taylor of the British Museum (Natural History) for seeking out the type and providing me with the necessary information.

XI—MISCELLANEOUS NOTES.

The Lily Year-Book.*—The Lily Year-Book published by the Royal Horticultural Society contains many papers of interest to botanists as well as horticulturists. There are four main papers of scientific importance: (1) a carefully compiled and complete list of hybrid lilies, by A. Simmonds, with references, details as to parents and other notes; (2) observations concerning the root-system of lilies, by M. A. H. Tincker, based on research carried out at the Wisley Laboratory; (3) an interesting and original survey of European lilies of the Isolirion Section, by F. Stoker, and (4) an account of *Lilium pardalinum* and its varieties and allies, by A. Vollmer. There are several other notes of botanical interest and four papers dealing with the genus *Fritillaria*. On the horticultural side there are important articles on the cultivation of lilies in Canada, United States and the British Isles, and a number of miscellaneous notes on subjects of interest.

Municipal Parks.†—It is fitting that this book, which is the first dealing with municipal parks, should have been compiled by Mr. W. W. Pettigrew who has an unrivalled knowledge of the subject. During his forty years and more of municipal work at Manchester he has had to face the whole range of problems of administration connected with the running of a Parks Department.

The subject is dealt with very exhaustively and Mr. Pettigrew has put his information before his readers in a clear and concise form that can be readily assimilated. The method of treating individually subjects such as tennis courts, bowling greens, office staffs, etc., is a particularly wise one, as all that can be said about each subject is easily accessible without cross-references. Many prices given are subject to locality, but the method of comparing estimates is very sound, and one that can well be adopted by other officers in this class of municipal work.

The book makes interesting reading and is one that will benefit not only the Park Superintendent, but also young members of the profession; it would be of great assistance if it were available to members of Parks Committees as well. The illustrations given are perhaps rather few in number, but in quality are quite in keeping with the standard of the book.

* "Lily Year Book, No. 8, 1939." Royal Horticultural Society, London, 1939. Pp. 183, 30 figs. Price 5*s.* paper, 6*s.* cloth.

† "Municipal Parks, Layout, Management and Administration," by W. W. Pettigrew, V.M.H. London: The Journal of Park Administration, Ltd., Bank Chambers, 329, High Holborn, W.C.1. 1937. Pp. 279, 56 plates, plans, and forms. Price 21*s.* post free.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1940
ROYAL BOTANIC GARDENS, KEW

XII — ADDITIONAL NOMINA GENERICA CONSERVANDA (PTERIDOPHYTA AND PHANEROGAMAE).

The generic names contained in the following list have been conserved by the Special Committee for Phanerogamae and Pteridophyta appointed by the 6th International Botanical Congress, Amsterdam (1935), and have been communicated to the undersigned (as Secretary of the Executive Committee of Nomenclature) by the Secretary of the Special Committee (M. L. Green). The list would normally have appeared in a Supplement to the International Rules of Botanical Nomenclature, ed. 3. As the publication of such a Supplement seems to be impracticable under present international conditions, it has seemed best to publish the list of Nomina Conservanda separately for the information of all concerned.

The names referred to the Committee included those in the lists printed in the International Rules, ed. 3 (1935), pp. 131–138, in Sprague, Synopsis of Proposals (1935), pp. 68–73, and in Sprague, Preliminary Opinions (1935), p. 25, as well as over 300 later generic homonyms listed and discussed in Kew Bulletin, 1935, pp. 342–544. The list contained in International Rules, ed. 3, had been considered previously by a small Special Committee for Phanerogamae and Pteridophyta appointed by the International Botanical Congress, Cambridge (1930). Exception having been taken at Amsterdam, however, to certain decisions of that Committee, as recorded in the list, the latter was re-submitted to the much larger new Committee for Phanerogamae and Pteridophyta appointed at Amsterdam. In all cases, however, where no specific objection had been raised—either at the Amsterdam Congress or afterwards, by members of the new Committee—the decisions of the previous Committee were confirmed by a general vote.

As the result of the new voting on disputed cases, five additional names were conserved, namely, 381* *Scolochloa*, 1502 *Zeuxine*, 2821 *Lindera*, 4623 *Denhamia*, 8909 *Celmisia*; and the decision concerning *Statice* L. was varied, 6350 *Armeria* and 6351 *Limonium* being conserved against *Statice* L. em. Mill. and *Statice* L. em. Willd. respectively. The corrected spelling, 469 *Heleocharis*, was rejected by the new Committee in favour of the original spelling *Eleocharis*, which accordingly stands without conservation.

* The numbers prefixed to generic names are those of Dalla Torre et Harms, Genera Siphonogamarum (1900-07).

In view of the decision of the Amsterdam Congress, that nomina provisoria are not validly published, it now appears to be unnecessary to conserve 384 *Puccinellia* Parl. against *Atropis* Rupr. It is unnecessary to conserve 6130 *Laser* Borkh., because the two prior names for the genus, *Bradlaeia* Neck. and *Siler* Ludw., are later homonyms, the former of *Bradlea* Adans. (vide Kew Bull. 1928, p. 348; Internat. Rules, ed. 3, Art. 70, Examples of orthographic variants), and the latter of *Siler* Mill. For reasons already given in International Rules ed. 3, pp. 131–137, it is unnecessary to conserve 134 partim *Anadelphia* Hack., 1504 *Goodyera* R. Br., 3557 *Hoffmanseggia* Cav., 5957 *Oreomyrrhis* Endl., and 7569 *Microdon* Choisy.

One of the generic names proposed for conservation in " Synopsis of Proposals," pp. 68–73, 512 *Eriospora* Hochst. (Cyperaceae), was withdrawn owing to the existence of the earlier homonym *Eriospora* Berk. et Br. (Sphaeropsideae), which is kept up by mycologists (vide Proc. Bot. Congr. Amsterdam, 1935, I. p. 359). The Committee was in favour of retaining 7692 *Haussmannia*, but did not place it on the list, as its conservation against *Hausmania* Dunker, the name of a genus of fossil plants, appeared to be unnecessary. The former commemorates Baron George Eugène Haussmann (1809–1891), whose name is associated with the rebuilding of Paris, whereas the latter was dedicated to J. F. L. Hausmann (1782–1859). 8474 *Emeorhiza* Pohl (1825), nomen (Prelim. Opin. p. 25) was not conserved, since the conservation of 2811 partim *Endlicheria* Nees precludes the adoption of 8474 *Endlichera* Presl. Hence the name *Emeorhiza* Pohl ex Endl. stands without conservation for the Rubiaceous genus concerned. Endlicher's spelling *Emmeorhiza* may be treated as a typographic error or as an unintentional orthographic error, since he erroneously attributed that spelling to Pohl. The name evidently refers to the emetic properties of the root, as stated by Wittstein (Etym.-bot. Handwörterb. ed. 2, p. 320: 1856), and there was no etymological justification for the insertion of an additional " m." Hence the name may be kept up as *Emeorhiza* Pohl ex Endl. (" *Emmeorhiza* ").

The Committee was in favour of the retention of 2813 (Lauraceae) *Cryptocarya* R. Br. (Prelim. Opin. p. 25), but it was pointed out that it was advisable, in any case, to conserve 2759 (Monimiaceae) *Peumus* Mol., with *P. Boldus* Mol. as lectotype, for the genus of Monimiaceae for which the name *Peumus* had been adopted in Bentham and Hooker's Genera Plantarum, Engler and Prantl's Die Natürlichen Pflanzenfamilien, and Perkins' monograph of Monimiaceae in Engler's Pflanzenreich. The Committee accordingly recommend the conservation of 2759 *Peumus* Mol., and if this recommendation is confirmed by the next International Botanical Congress, it will be unnecessary to conserve *Cryptocarya* Br. against *Peumus* Mol. pro parte majore. Such confirmation appears to be necessary, as 2759 *Peumus* Mol. was not one of the names previously recommended

for conservation and referred, with power of decision, to the Committee.

Some of the names in the list which follows are marked with the symbol † in order to indicate that their conservation is apparently unnecessary. These cases will be considered by the Editorial Committee in due course, and it may be thought desirable to refer some of them to the Executive Committee for decision, under Art. 73 (1), if substantial doubt is found to exist as to the interpretation of the relevant rules.

One of the questions that seems to have offered most difficulty is that of deciding whether a particular generic name which is almost the same as another should be treated as an orthographic variant of it or as a different name under Art. 70. Note 3 of that Article is as follows: " In deciding whether two or more slightly different names should be treated as distinct or as orthographic variants, the essential consideration is whether they may be confused with one another or not: if there is serious risk of confusion, they should be treated as orthographic variants. Doubtful cases should be referred to the Executive Committee."

No doubt arises when two generic names *begin* with a different letter, except where the difference lies in the presence or absence of an initial H (e.g., *Heleocharis* and *Eleocharis*): *Durvillea* and *Urvillea* are given as examples of different names.

Differences in the middle of the name offer more difficulty: *Gerrardina* (commemorating W. T. Gerrard) and *Gerardiina* (like a *Gerardia*, that genus in its turn being dedicated to John Gerard), differing in two letters and with different derivations are treated as different names; so also are *Symphyostemon* (Iridaceae) and *Symphostemon* (Labiatae) which differ only in the presence or absence of the letter " y," the derivation being the same. On the other hand there is obviously grave risk of confusion between *Asterostemma* Decne. and *Astrostemma* Benth., belonging to the *same family*, Asclepiadaceae: the first parts of the generic names, " astero " and " astro " being orthographic variants employed in Greek for compounds of aster (ἀστήρ, a star). These are accordingly treated as orthographic variants, and the same applies to *Pleuripetalum* and *Pleuropetalum* since they differ only in the connecting-vowel, " i " or " o."

As regards the last syllable or last two syllables, generic names ending respectively in the masculine, feminine and neuter terminations *-us*, *-a*, *-um*, are held to be different: thus *Peponium* Engl. (Cucurbitaceae) is treated as a different name from *Peponia* Grev. (Bacillariaceae). No confusion can arise between *Peponium* Engl. and *Peponia* Naud. because they are nomenclatural (i.e. absolute) synonyms. Similarly *Peltophorus* (Gramineae) and *Peltophorum* (Leguminosae) are treated as different names.

On the other hand, where two names commemorate the same person, a difference of termination in -a or -ia does not warrant their

being treated as different names: *Columella* and *Columellia* both commemorating Columella, the Roman writer on agriculture, are orthographic variants; so also are *Eschweilera* and *Eschweileria*, though it does not appear to be known whether they commemorated the same Eschweiler or not. The four names *Bradlea* Adans., *Bradlaeia* Neck., *Bradleja* Banks ex Gaertn. and *Braddleya* Vell. all commemorating Richard Bradley (1675–1732), are treated as orthographic variants, because each of them has been spelt by subsequent authors both as "*Bradleia*" and as "*Bradleya*," and only one can be used without serious risk of confusion.

On the basis of the foregoing analysis of the provisions and examples given under Art. 70 regarding orthographic variants and different names, and of the Amsterdam decision regarding nomina provisoria, it has been possible to frame preliminary opinions on whether it is necessary or not to conserve the various names marked in the list with the symbol †. Reasons for these opinions are put forward for consideration by those concerned.

I. Names Not Requiring Conservation owing to their Earlier Homonyms being Nomina Provisoria.

417 Gramineae *Phyllostachys* Sieb. et Zucc.
7878 Gesneriaceae *Seemannia* Regel

II. Name perhaps Requiring Conservation owing to Possible Doubt as to the Prior Synonym being a Nomen Provisorium.

384 Gramineae *Puccinellia* Parl.

The prior synonym *Atropis* Rupr. (1845) is considered by the writer to be a nomen provisorium, on the ground that Ruprecht treated it as a section of *Poa* in the text of his "Flores Samojedorum Cisuralensium," p. 61, n. 313 (Beitr. Pflanzenk. Russ. Reich. II: 1845). Different interpretations, however, have been given of his remark on p. 64: "E conditione glumarum generum series fortasse sequens: *Dupontia, Arctophila, Poa, Atropis, Catabrosa, Phippsia, Coleanthus.*" It might be translated: "On the basis of the nature of the glumes, the following series of genera might perhaps be distinguished." Others have considered that the word "fortasse" qualified "sequens," and that the list of generic names was put forward as an alternative classification. The fact that Ruprecht published five new binary combinations under *Arctophila* and two under *Dupontia* on plates IV–VI of his work lends a certain amount of colour to the latter view. Hence it might be best to retain *Puccinellia* on the list of nomina conservanda, in order to avoid any possible doubt as to the correct name of the genus under International Rules.

III. Names apparently Not Requiring Conservation owing to Slightly Different Earlier Names being Different Names.

3022 *Lepidostemon* Hook. f. et Thoms. (1861) and *Lepistemon* Blume (1825)—vide Kew Bull. 1935, 424.

1. The two names differ by the *internal addition* of two letters—cf. *Symphyostemon* and *Symphostemon, Gerrardina* and *Gerardiina*, given as examples of different names under Art. 70.

2. Though *Lepistemon* was "corrected" to *Lepidostemon* by Hasskarl (1844), it has been consistently spelt *Lepistemon* in standard taxonomic works of reference such as Benth. et Hook. f., Gen. Pl., Engl. u. Prantl; Nat. Pflanzenfam., and the various floras concerned. No confusion between the two names has arisen.

3967 *Augea* Thunb. (1794) and *Augia* Lour. (1790)—vide Kew Bull. 1935, 363.

These are here treated as different names for the following reasons:

1. *Augea* commemorates Andreas Auge, whereas *Augia* is derived from the Greek word αὐγή.

2. The two generic names seem always to have been spelt differently.

3. *Augea* belongs to the Zygophyllaceae, whereas *Augia*, according to Merrill (Trans. Amer. Phil. Soc. n.s. XXIV, pt. 2, 244: 1935) was based on a mixture of *Rhus succedanea* L. (Anacardiaceae) and a flower belonging to some other family, possibly of a *Calophyllum* (Guttiferae).

4. No confusion between the two names is likely to arise, since *Augia* Lour. is relegated to synonymy.

5036 *Cumingia* Vidal (1885) and *Cummingia* D. Don (1828)—vide Kew Bull. 1935, 419.

1. *Cumingia* commemorates Hugh Cuming (1791-1865), whereas *Cummingia* commemorates Lady Gordon Cumming.

2. *Cumingia* belongs to the Bombacaceae, *Cummingia* to the Amaryllidaceae.

3. No confusion appears to have occurred between the two generic names, although *Cummingia* was mis-spelt *Cumingia* by Kunth (1843) and Baker (1879).

5311 *Byrsanthus* Guill. (1837) and *Byrsanthes* C. Presl (1836)—vide Kew Bull. 1935, 395.

1. Their final elements are etymologically distinct, that of *Byrsanthus* being the latinized form of the substantive anthos, a flower, whereas that of *Byrsanthes* is the adjectival suffix -anthes, -flowering, provided with a flower.

2. The two generic names seem always to have been spelt differently. Schönland (Engl. u. Prantl, Nat. Pflanzenf. IV. Abt. 5, 66: 1894), who treated *Byrsanthes* C. Presl as a section of *Siphocampylus* Pohl, cited the sectional name as "Sect. III. *Byrsanthus* Presl (als Gatt.)," but this seems to have been due to a lapsus calami or printer's error.

3. The two genera belong to different families, *Byrsanthus* to Flacourtiaceae, *Byrsanthes* to Campanulaceae (-Lobelioideae).

It seems clear that no confusion either has arisen or is likely to arise between the two generic names.

(Boraginac.) *Vaupelia* Brand (1914) and *Vaupellia* Griseb. (1861)—vide Kew Bull. 1935, 528.

1. The spelling of the two names differs internally.

2. *Vaupelia* is dedicated to F. Vaupel, whereas *Vaupellia* commemorates C. T. Vaupell (1821–1862)—vide Christensen, Den Danske Botaniks Historie, II. 289 (1925).

3. *Vaupelia* belongs to the Boraginaceae, *Vaupellia* to the Gesneriaceae.

9150 *Podanthus* Lag. (1816) and *Podanthes* Haw. (1812)—vide Kew Bull. 1935, 451.

1. The final elements *-anthus* and *-anthes* are etymologically distinct—see the case of 5311 *Byrsanthus* and *Byrsanthes*.

2. The two names have been used for many years without any confusion arising. Both are kept up in Bentham and Hooker's Genera Plantarum, vol. II.

3. The two genera belong to different families, *Podanthus* to Compositae, *Podanthes* to Asclepiadaceae.

IV. Names apparently Requiring Conservation owing to Slightly Different Earlier Names being Orthographic Variants.

1386 *Arachnitis* Phil. (1864) and *Arachnites* F. W. Schmidt (1793)—vide Kew Bull. 1935, 361.

1. Both names refer to the spider-like appearance of the flower.

2. *Arachnitis* Phil. was spelt *Arachnites* by Philippi himself in a later paper (1865), and the spelling *Arachnites* was adopted in Benth. et Hook. f., Gen. Pl. (1883), Engl. u. Prantl, Nat. Pflanzenf. (1889), Dalla Torre et Harms, Gen. Siphonog. (1900) and Skottsberg (1916).

3. The two genera belong to closely related families, Corsiaceae and Orchidaceae.

These considerations suggest that the two names should be treated as orthographic variants.

(Orchidac.) *Symphyglossum* Schlechter (1919) and *Symphyoglossum* Turcz. (1848)—vide Kew Bull. 1935, 506.

The two names differ only in presence or absence of the connecting vowel " o," and should accordingly be treated as orthographic variants, since *Pleuripetalum* and *Pleuropetalum*, which have different connecting vowels, are treated as such under Art. 70.

3931 *Wendtia* Meyen (1834) and *Wendia* Hoffm. (1814)—vide Kew Bull. 1935, 538.

1. *Wendtia* Meyen was dedicated to Captain W. Wendt, who was in command of the Prinzess Louise during Meyen's travels round the world (1830–32). *Wendia* Hoffm. commemorated Dr. Wendt, Professor of Medicine at Erlangen and successor of Schreber (Friedr. von Wendt, fide Wittstein, Etym.-bot. Handwörterb., ed. 2, 932 : 1856).

2. The spelling of *Wendia* Hoffm. was " corrected " to *Wendtia* by De Candolle in 1830, and this " corrected " spelling has been adopted by numerous authors, including Woronow (1917), who published new combinations under it.

3. Although *Wendtia* Meyen belongs to the Geraniaceae, and *Wendia* Hoffm. to the Umbelliferae, there is evidently risk of confusion between the two names.

9365 *Peyrousea* DC. (1837) and *Peyrousia* Poir. (1826)—vide Kew Bull. 1935, 447.

1. *Peyrousea* DC. was a new name for *Lapeirousia* Thunb. (1800), and *Peyrousia* Poir. was a new name for *Lapeirousia* Pourr. (1788).

2. *Peyrousea* DC. was dedicated to the traveller " T. Fr. Galaup de La Peyrouse " [i.e., J. Fr. Galaup de La Pérouse], whereas *Peyrousia* Poir. commemorated the botanist P. P. de La Peyrouse.

3. The personal generic names *Eschweilera* and *Eschweileria*, treated as orthographic variants under Art. 70, differ in the terminations being *-a* and *-ia* respectively. There seems to be hardly any more difference between the terminations *-ea* and *-ia*, where personal generic names are concerned.

4. Confusion can easily arise between *Peyrousea* and *Peyrousia* since they were substitutes for two generic names each spelt *Lapeirousia*.

V. Names apparently Not Requiring Conservation because their Prior Synonyms are Orthographic Variants (i.e. Later Homonyms) of Earlier Names.

1502 *Zeuxine* Lindl. (1826).

The prior synonym *Adenostylis* Blume (1825) should be treated as an orthographic variant (i.e. as a later homonym) of *Adenostyles* Cass. (1816).

1. The etymology of the two names is different, *Adenostylis* being a compound of the substantive stylis a diminutive of stylos, and *Adenostyles* a compound of the adjective -styles.

2. *Adenostylis* Blume has, however, been spelt " *Adenostyles* " by Endlicher (1841), and by Bentham and Hooker (1883), who cited it in synonymy ; and *Adenostyles* Cass. was " corrected " to " *Adenostylis* " by Post et Kuntze, Lexic. Gen. Phan. 10 (1903).

3. Hence both generic names could hardly be accepted without serious risk of confusion.

3050 *Dontostemon* Andrz. ex Ledeb. (1831)—vide Kew Bull. 1935, 356 (sub *Andrzeiowskia*).

The prior synonym, *Andreoskia* DC. (1824) should be treated as an orthographic variant of *Andrzeiowskia* Reichb. (1823) for the following reasons.

1. Both commemorate A. L. Andrzeiowski (1784–1868).

2. *Andrzeiowskia* has been spelt *Andreoskia* by Spach, Boissier, Prantl and Dalla Torre et Harms.

3. Both genera belong to the Cruciferae.

4. Confusion between the two generic names has actually occurred, namely, in Durand et Jackson, Index Kewensis, Supplementum Primum, 26 (1902), where the combination *Andreoskia cardaminefolia* " Prantl " [i.e. (DC.) Boiss.] is erroneously placed under *Andreoskia* DC.

It may be well to emphasize three points : (1) that the conclusions reached in the foregoing analysis represent merely the personal views of the writer, put forward for the consideration of the Editorial Committee and, if thought necessary or desirable, of the Executive Committee of Nomenclature ; (2) that the list should be examined by the other Special Committees, in order to ascertain whether any of the names in it are homonyms of names accepted in other groups of recent plants, or for fossil plants, this being the procedure indicated in Proc. Internat. Bot. Congr. Amsterdam, 1935, I. 359, 361 ; any such cases discovered would be re-considered in the light of the new facts ; (3) that the absence of a name in the space for Nomina Rejicienda does not necessarily mean that there are no synonyms for the generic name concerned. T. A. SPRAGUE.

Special Committee for Phanerogamae and Pteridophyta appointed by the Sixth International Botanical Congress, Amsterdam, 1935.

Secretary : M. L. Green (Kew).

A. H. G. Alston (London) ; A. Becherer* (Genève) ; R. C. Ching (Nanking) ; C. Christensen (Copenhagen) ; J. E. Dandy (London) ; J. Th. Henrard (Leiden) ; A. S. Hitchcock† (Washington) ; B. P. G. Hochreutiner (Genève) ; J. Lanjouw (Utrecht) ; R. Mansfeld (Berlin) ; F. Pellegrin (Paris) ; A. Rehder (Jamaica Plain, Mass.) ; Hans Schinz (Zürich) ; C. Skottsberg (Göteborg) ; H. Uittien (Utrecht) ; C. A. Weatherby (Cambridge, Mass.) ; F. J. Widder (Graz) ; A. J. Wilmott* (London) ; and the following, ex officio : H. Harms (President, Executive Committee), T. A. Sprague (Secretary, Executive Committee).

* Resigned. † Deceased.

NOMINA CONSERVANDA

POLYPODIACEAE

Ceterach Garsault, Fig. Pl. II. (1764) t.212 ; Lam. et DC. Fl. Franç. ed. 3, II. (1805) 566.—T. : *C. officinarum* Lam. et DC.

Cystopteris Bernh. in Schrad. Journ. I. (1806) pars 2, 5, 26.—T. : *C. fragilis* (L.) Bernh.

Dryopteris Adans. Fam. Pl. II. (1763) 20.—T. : *D. Filix-mas* (L.) Schott.

Pteridium Scop. Fl. Carniol. ed. 1 (1760), 169, partim, nomen abortivum ; Kuhn, Bot. Ost-Afr. Deck. Reise, III. pars 3 (1879), 11.—T. : *P. aquilinum* (L.) Kuhn.

TAXACEAE

17. **Torreya** Arn. in Ann. Nat. Hist. I. (1838) 130 ; non Rafin. in Amer. Monthly Mag. (1818) 356 ; nec Rafin. in Journ. de Phys. LXXXIX. (1819) 105 ; nec Spreng. Neue Entdeck. II. (1821) 121 ; nec Eaton, Man. Bot. N. Amer. ed. 7 (1836), 560 ; nec Croom ex Meissn. Gen. II. (1843) 340.—T. : *T. taxifolia* Arn.

POTAMOGETONACEAE

57. **Posidonia** Konig in Konig et Sims, Ann. Bot. II. (1805) 95, t.6.—T. : *P. Caulini* Konig.

NOMINA REJICIENDA

Ceterac Adans. Fam. Pl. II. (1763) 20, partim.

Filix Adans. Fam. Pl. II. (1763) 20, 558 ; nec *Filix* Hill (1755).

Filix Hill, Family Herbal (1755), 171 ; non Ludw. (1757) ; nec Adans. (1763).

Filix mas Hill, Brit. Herbal (1756), 527 et Index.

Thelypteris Schmidel, Ic. Pl., ed. J. C. Keller (1762), 45, tt. 11, 13 ; non Adans. (1763).

Eupteris Newman in Phytologist, II. (1845) 278.

Cincinnalis Gleditsch, Syst. Pl. (1764) 296.

Tumion Rafin. Amen. Nat. (1840) 63 ; Greene, Pittonia, II. pars 10 (1891), 193.

Alga Boehm. in Ludw. Defin. Gen. Pl. ed. Boehm. (1780) 503.

NOMINA CONSERVANDA	NOMINA REJICIENDA
GRAMINEAE	
124. **Vossia** Wall. et Griff. in Journ. Asiat. Soc. Bengal, V. (1836) 572; non Adans. Fam. Pl. II. (1763) 243; *nec Thümen in* Oesterr. Bot. Zeitschr. XXIX. (1879) 18.—T.: *V. cuspidata* (Roxb.) Griff.	*Rhaphis* Lour. Fl. Cochinch. (1790) 552.
134, partim. **Diectomis** Kunth in Mém. Mus. Hist. Nat. Paris, II. (1815) 69; H.B.K. Nov. Gen. I. (1816) 193; non Beauv. (1812).—T.: *D. fastigiata* (Swartz) H.B.K.	[*Pollinia* Spreng. Pugill. II. (1813) 10, partim; non Trin. (1833).]
134, partim. **Chrysopogon** Trin. Fund. Agrost. (1820) 187.—T.: *C. Gryllus* (L.) Trin.	*Centrophorum* Trin. Fund. Agrost. (1820) 106.
	Chaetochloa Scribn. in U.S. Dep. Agric. Div. Agrost., Bull. IV. (1897) 38.
171. **Setaria** Beauv. Agrost. (1812) 51, 178, explic. planches, 9, t. 13, fig. 3; Fl. Owar. II. (1818) 80, t.110, fig. 2; non Ach. (1798), Michx. (1803).—T.: *S. viridis* (L.) Beauv.	*Ginannia* Bub. Fl. Pyren. IV. (1901) 321; non Scop. (1777).
257. **Holcus** L. Sp. Pl. ed. 1 (1753), 1047, partim; Gen. Pl. ed. 5 (1754), 469, partim; emend. Swartz in Schrad. Neues Journ. Bot. 1808, II. pars 2, 39.—T.: *H. lanatus* L.	*Notholcus* Nash ex Hitchcock in Jepson, Fl. Calif. I. (1912) 126.
	Notholcus Nash in Britt. et Brown, Ill. Fl. ed. 2, I. (1913) 214.
312. **Schmidtia** Steud. in J. A. Schmidt, Beitr. Fl. Cap Verd. Ins. (1852) 144; non Moench, Meth. Suppl. (1802) 217; *nec* Tratt. Fl. Oesterr. Kaiserth. I. (1816) 12, t.10, nomen rejic.—T.: *S. pappophoroides* Steud.	*Antoschmidtia* Steud. Syn. Pl. Gram. (1855) 199, in syn.; Boiss. Fl. Or. V. (1884) 559.
329. **Cortaderia** Stapf in Gard. Chron., Ser. 3, XXII. (1897) 378, 396.—T.: *C. argentea* (Nees) Stapf.	*Moorea* Lemaire in Ill. Hort. II. (1854) Misc. 15, in obs.
381. **Scolochloa** Link, Hort. Berol. I. (1827) 136, non Mert. et Koch, Deutsch. Fl. I. (1823) 374, 528.—T.: *S. festucacea* (Willd.) Link.	*Flaminia* Fries, Summ. Veg. Scand. I. (1846) 247.
384. †**Puccinellia** Parl. Fl. Ital. I. (1848) 366.—T.: *P. distans* (L.) Parl.	*Atropis* Rupr. in Beitr. Pflanzenk. Russ. Reich. II. (1845) 61, nomen provisorium.
417. †**Phyllostachys** Sieb. et Zucc. in Abh. Akad. München, III. (1843) 745, t.5; non Torr. in Ann. Lyc. New York, III. (1836) 404, in obs., nomen provisorium.—T.: *P. bambusifolia* Sieb. et Zucc.	
CYPERACEAE	
459, partim. **Mariscus** Gaertn. Fruct. I. (1788) 11; Vahl, Enum. II. (1806) 372; non Zinn, Cat. Pl. Hort. Gott. (1757) 79.—T.: *M. capillaris* Vahl.	
462. **Kyllinga** Rottb. Descr. et Icon. Pl. (1773) 12; non *Killinga* Adans. Fam. Pl. II. (1763) 498, 539.—T.: *K. monocephala* Rottb.	*Thryocephalon* J. R. et G. Forst. Char. Gen. Pl. (1776) 129, t.65.
468, partim. **Blysmus** Panz. ex Schultes, Mant. II. (1824), 41.—T.: *B. compressus* (L.) Panz.	*Nomochloa* Beauv. ex Lestib. Ess. Fam. Cypérac. (1819) 37.
471, partim. **Bulbostylis** Kunth, Enum. Pl. II. (1837) 205; non Stev. in Mém. Soc. Nat. Mosc. V. (1813) 355; nec DC. Prodr. V. (1836) 138.—T.: *B. capillaris* (L.) C. B. Clarke.	*Stenophyllus* Rafin. Neogen. (1825) 4.
492. **Rhynchospora** Vahl [corr. Willd. Enum. Pl. Hort. Berol. (1809) 71] Enum. II. (1806), fol. 2, verso n. 113 et 229.—T.: *R. alba* (L.) Vahl.	[*Triodon* L. C. Rich. *in* Pers. Syn. I. (1805) 60, col. 1, n. 48, pro syn.]
PALMAE	
543. **Washingtonia** H. Wendl. in Bot. Zeit. XXXVII. (1879) p. lxi. 68, 148; non Rafin. in Amer. Monthly Mag. II. (1818) 176; nec Winslow in Calif. Pharm. (Sept. 1854) ex Hook. Kew Journ. Bot. VII. (1855) 29.—T.: *W. filifera* H. Wendl.	*Neowashingtonia* Sudw. in U.S. Dep. Agric. Forestry Bull. No. 14 (1897) 105; No. 17 (1898) 38.
567. **Pigafetta** Becc. Malesia, I. (1877) 89; non Adans. Fam. Pl. II. (1763) 223.—T.: *P. papuana* Becc.=*P. filaris* (Bl.) Becc.	

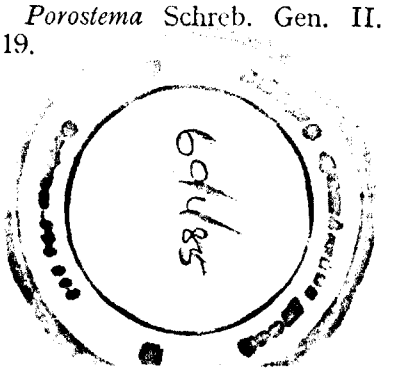
NOMINA CONSERVANDA	NOMINA REJICIENDA
PALMAE	
639. **Veitchia** H. Wendl. in Seemann, Fl. Vitiens. (1868) 270, t.81 ; non Lindl. in Gard. Chron. (1861) 265.—T. : *V. Storckii* H. Wendl.	
657. **Orbignya** Mart. ex Endl. Gen. (1837) 257 ; non Bert. in Mercurio Chileno (1829), 737.—T. : *O. phalerata* Mart.	
660. **Maximiliana** Mart. Hist. Nat. Palm. II. (1823–50 ; 1824 ?) 131 ; non *Maximilianea* Mart. apud Schrank in Flora, II. (1819) 451.—T. : *M. regia* Mart.	*Englerophoenix* Kuntze, Rev. Gen. II. (1891) 728.
CYCLANTHACEAE	
682. **Ludovia** Brongn. in Ann. Sc. Nat., Sér. 4, XV. (1861) 361 ; non Pers. Syn. II (1807) 576.—T. : *L. lancifolia* Brongn.	
RESTIONACEAE	
808. **Leptocarpus** R. Br. Prodr. Fl. Nov. Holland. I. (1810) 250.—T. : *L. aristatus* R. Br.	*Schoenodum* Labill. Nov. Holland Pl. Specim. II. (1805) 79 ; emend. Kunth, Enum. Pl. III. (1841) 445.
COMMELINACEAE	
894. **Palisota** Reichb. [Consp. Reg. Veg. (1828) 59, nomen nudum] ex Endl. Gen. Pl. (1836) 125, in obs.—T. : *P. ambigua* (Beauv.) C. B. Clarke (*Commelina ambigua*).	*Duchekia* Kostel. Allgem. Med. Pharm. Fl. I. (1831) 213.
PONTEDERIACEAE	
923. **Reussia** Endl. Gen. I. (1836) 139, n.1089 ; non Dennst. Schluess. Hort. Malab. (1818) 33.—T. : *R. triflora* Seub.	
LILIACEAE	
957. **Stenanthium** (A. Gray) Kunth, Enum. IV. (1843) 189.—T. : *S. angustifolium* (Pursh) Kunth.	*Anepsa* Rafin. Fl. Tellur. pars 4 (1836–38), 27.
962. **Schelhammera** R. Br. Prodr. (1810) 273 ; non Moench, Meth., Suppl. (1802) 119.—T. : *S. undulata* R. Br.	*Parduyna* Salisb. Gen. Pl. (1866) 58, 59.
968. **Burchardia** R. Br. Prodr. (1810) 272 ; non Neck. Elem. II. (1790) 76.—T. : *B. umbellata* R. Br.	*Reya* Kuntze, Rev. Gen. II. (1891) 845.
974. **Anguillaria** R. Br. Prodr. (1810) 273 ; non Gaertn. Fruct. I. (1788) 372.—T. : *A. dioica* R. Br.	*Anguillaraea* Post et Kuntze, Lexic. Gen. Phan. (1903) 276.
1011. **Bowiea** Harv. ex Hook. f. in Bot. Mag. (1867) t.5619 ; non Haw. in Phil. Mag. LXIV. (1824) 299.—T. : *B. volubilis* Harv.	*Ophiobostryx* Skeels in U.S. Dep. Agric. Bur. Pl. Industry, Bull. 223 (1911), 45. *Schizobasopsis* Macbride in Contrib. Gray Herb. n. s. LVI. (1918) 3.
1021. **Blandfordia** Sm. Exot. Bot. I. (Dec. 1804) 5, t.4 ; non Andr. Bot. Rep. V. (Feb. 1804) t.343.—T. : *B. nobilis* Sm.	
1032. **Laxmannia** R. Br. Prodr. Fl. Nov. Holland. I. (1810) 285 ; non J. R. et G. Forst. Char. Gen. Pl. (1776) 93, t.47 ; nec Schreb. in L. Gen. Pl. ed. 8, II. (1791) 800.—. T : *L. gracilis* R. Br.	[*Bartlingia* F. Muell. [ex Benth. Fl. Austral. VII. (1878) 63, in obs., nomen synonymum et] in Journ. and Proc. R. Soc. New S. Wales, XV. (1882) 232 ; non Reichb. in Flora, VII. pars 1 (1824), 241 ; nec Brongn. in Ann. Sc. Nat., Sér. 1, X. (1827) 373.]
1037. **Johnsonia** R. Br. Prodr. Fl. Nov. Holland. I. (1810) 287 ; non Dale ex Mill. Gard. Dict. Abridg. ed. 4, II. (1754) ; nec Adans. Fam. Pl. II. (1763) 343.—T. : *J. lupulina* R. Br.	
1044. **Baxteria** R. Br. ex Hook. Lond. Journ. Bot. II. (1843) 492 ; non *Baxtera* Reichb. Consp. (1828) 131.—T. : *B. australis* R. Br.	
1047. **Tulbaghia** L. Mant. II. (1771) 148 ; non Heist. Descr. Nov. Gen. Brunsvig. (1753) p.x., in obs., et in adnot., et Beschr. Brunsvig. (1753) 15, in obs., et in adnot., nomen rejic.—T. : *T. capensis* L.	*Omentaria* Salisb. Gen. Pl. (1866) 87.
1055. **Bessera** Schult. f. in Linnaea, IV. (1829) 121 ; non Schult. Obs. Bot. (1809) 27 ; nec Spreng. Pugill. II. (1815) 90 ; nec Vell. Fl. Flum. (1825) 147.—T. : *B. elegans* Schult. f.	*Pharium* Herb. in Bot. Reg. XVIII. (1832) t. 1546.

NOMINA CONSERVANDA	NOMINA REJICIENDA
LILIACEAE	
1077. **Lloydia** Salisb. in Trans. Hort. Soc. I. (1812) 328; non *Lioidya* Neck. Elem. I. (1790) 4.—T.: *L. alpina* Salisb.=*L. serotina* (L.) Sweet.	[*Rhabdocrinum* Reichb. Consp. (1828 65, sine descr.] *Nectarobothrium* Ledeb. Fl. Altaica II. (1830) 36.
1112. **Milligania** Hook. f. in Hook. Kew Journ. Bot. V. (1853) 296, t.9; non Hook. f. in Hook. Ic. Pl. (1840) t.299.—T: *M. longifolia* Hook. f.	
1140. **Ophiopogon** Ker-Gawl. in Bot. Mag. (1807) t.1063.—T.: *O. japonicus* Ker-Gawl.	*Mondo* Adans. Fam. Pl. II. (1763) 496.
AMARYLLIDACEAE	
1178. **Vallota** Herb. App. Bot. Reg. (1821) 29; non *Valota* Adans. Fam. Pl. II. (1763) 495; T.: *V. purpurea*=*V. speciosa* (L.f.) Voss.	
1181. **Zephyranthes** Herb. App. Bot. Reg. (1821) 36.—T.: *Z. Atamasco* (L.) Herb.	*Atamosco* (*Atamosko*) Adans. Fam. Pl. II. (1763) 57, 522.
1236. **Lanaria** Ait. Hort. Kew. ed. 1, I. (1789) 462; non Adans. Fam. Pl. II. (1763) 225.—T.: *L. plumosa* Ait.	*Argolasia* Juss. Gen. (1789) 60.
DIOSCOREACEAE	
1258. **Petermannia** F. Muell. Fragm. II. (1860) 92; non Klotzsch in Abh. Akad. Berlin, 1854 (1855), 74.—T.: *P. cirrosa* F. Muell.	
IRIDACEAE	
1260. **Syringodea** Hook. f. in Bot. Mag. (1873) t.6072; non D. Don in Edinb. New Phil. Journ. XVII. (1834) 155.—T.: *S. pulchella* Hook. f.	
1265. **Moraea** L. Sp. Pl. ed. 2 (1762), 59; Gen. Pl. ed. 6 (1764), 27.—T.: *M. juncea* L.	*Morea* Mill. Fig. Pl. II. (1758) 159, t.239.
1302. **Ixia** L. Sp. Pl. ed. 2 (1762), 51, partim; emend. Ker-Gawl. in Konig et Sims, Ann. Bot. I. (1804) 226, excl. sp.; Baker in Journ. Linn. Soc., Bot. XVI. (1877) 90; non L. Sp. Pl. ed. 1 (1753), 36.—T.: *I. polystachya* L.	[*Hyalis* Salisb. in Trans. Hort. Soc. I. (1812) 317, sine descr.] *Morphixia* Ker-Gawl. Irid. Gen. (1827) 105. [*Freesia* Eckl. Verz. Pflanzensamml. (1827) 30, sine descr.] *Wuerthia* Regel in Bot. Zeit. IX. (1851) 595.
1313. **Micranthus** Eckl. Verz. Pflanzensamml. (1827) 43; non Wendl. Bot. Beob. (1798) 38, 39.—T.: *M. alopecuroideus* (L.) Eckl.	*Beilia* Eckl. Verz. Pflanzensamml. (1827) 43; Kuntze, Rev. Gen. III. sect. 2, pars 2 (1898) 305.
ZINGIBERACEAE	
1324. **Zingiber** Boehm. in Ludw. Defin. Gen. Pl. ed. Boehm. (1760) 89.—T.: *Z. officinale* Rosc. (*Amomum Zingiber* L.).	*Zinziber* Mill. Gard. Dict. Abridg. ed. 4, III. (1754).
1328. **Alpinia** Roxb. in As. Research. XI. (1810) 350; non L. Sp. Pl. ed. 1 (1753), 2.—T.: *A. Galanga* (L.) Willd. (*Maranta Galanga* L. Sp. Pl. ed. 2 (1762), 3).	*Languas* Koenig in Retz. Observ. III. (1783) 64.
1331. **Renealmia** L. f. Suppl. (1781) 7.—T.: *R. exaltata* L. f.	*Alpinia* L. Sp. Pl. ed. 1 (1753), 2.
1332. **Riedelia** Oliv. in Hook. Ic. Pl. XV. (1883) t.1419; non Cham. in Linnaea, VII. (1832) 240; nec Meissn. in Mart. Fl. Bras. VII. (1863) 171; nec Trin. ex Kunth, Enum. Pl. I. (1833) 515, in syn.—T.: *R. curviflora* Oliv.	*Nyctophylax* Zipp. in Alg. Konst. en Letterb. I. (1829) 298.
BURMANNIACEAE (nunc CORSIACEAE)	
1386. **Arachnitis** Philippi in Bot. Zeit. XXII. (1864) 217; non *Arachnites* F. W. Schmidt, Fl. Boëm. I. (1793) 74.—T.: *A. uniflora* Philippi.	*Achratinis* Kuntze in Post et Kuntze, Lexic. Gen. Phan. (1903) 4.
ORCHIDACEAE	
1393A. **Paphiopedilum** Pfitz. [Morph. Stud. Orchideenbl. (1886) 11, in adnot., partim; et] in Engl. et Prantl, Nat. Pflanzenfam. II. (1889), Abt. 6, 84, descr., partim; emend. Rolfe in Orchid Rev. IV. (1896) 363.—T.: *P. insigne* (Wall.) Pfitz.	*Cordula* Rafin. Fl. Tellur. IV. (1836) 46. *Stimegas* Rafin. l.c. 45.

NOMINA CONSERVANDA	NOMINA REJICIENDA
ORCHIDACEAE	
1397. **Serapias** L. Sp. Pl. ed. 1 (1753), 949, partim ; emend. Swartz in Vet. Akad. Handl. Stockholm, XXI. (1800) 225.—T. : *S. lingua* L.	*Serapiastrum* Kuntze, Rev. Gen. III. sect. 2, pars 1 (1898), 141.
1408. **Holothrix** L. C. Rich. [in Mém. Mus. Hist. Nat. Paris, IV. (1818) 55, in obs., nomen nudum] ex Lindl. Gen. and Sp. Orchid. Pl. (1835) 257, 283.—T.: *H. hispidula* (L. f.) Dur. et Schinz (*Orchis hispidula* L. f.).	*Tryphia* Lindl. [in Edw. Bot. Reg. XX. (1834) sub t. 1701, nomen nudum] Gen. and Sp. Orchid. Pl. (1835) 258, 333. *Scopularia* Lindl. in Edw. Bot. Reg. XX. (1834) sub t.1701. *Monotris* Lindl. loc. cit. *Saccidium* Lindl. Gen.and Sp. Orchid. Pl. (1835) 258, 301.
1430. **Satyrium** Swartz in Vet. Akad. Handl. Stockholm, XXI. (1800) 214 ; non L. Sp. Pl. ed. 1 (1753), 944.—T. : *S. bicorne* (L.) Swartz.	*Diplecthrum* Pers. Syn. II. (1807) 508. *Hipporkis* Thou. in Nouv. Bull. Soc. Philom. Paris, I. (1809) 317. *Hipporchis* Thou. Fl. Iles Austr. Afr. Orch. (1822) Tabl. Genres, genus f, t.21. *Satyridium* Lindl. Gen. and Sp. Orchid. Pl. (1838) 345.
1482. **Epipactis** [Zinn. Cat. Pl. Gott. (1757) 85, partim, nomen abortivum] Swartz in Vet. Akad. Handl. Stockholm, XXI. (1800) 232, partim ; emend. L. C. Rich. in Mém. Mus. Hist. Nat. Paris, IV. (1818) 51, 60.—T. : *E. Helleborine* (L.) Crantz.	*Aviceps* Lindl. l.c. *Serapias* L. Sp. Pl. ed. 1 (1753), 949, partim ; Gen. Pl. ed. 5 (1754), 406, partim ; emend. Kuntze, Rev. Gen. III, sect. 2, pars 1 (1898), 141. [*Helleborine* Mill. Gard. Dict. Abridg. ed. 4 (1754) partim, nomen abortivum ; Schinz et Thell. in Schinz et Keller, Fl. Schweiz, ed. 4, I. (1923) 166.]
1483. **Limodorum** L. C. Rich. in Mém. Mus. Hist. Nat. Paris, IV. (1818) 50 ; non L. Sp. Pl. ed. 1 (1753), 950.—T. : *L. abortivum* Swartz.	[*Helleborine* Hill, Brit. Herbal (1756), 477, nomen abortivum ; emend. Druce in Ann. Scott. Nat. Hist. (1905) 48 ; Druce, List Brit. Pl. (1908) 67 ; Lond. Cat. Brit. Pl. ed. 10 (1908), 37.] *Amesia* A. Nels. et Macbr. in Bot. Gaz. LVI. (1913) 472 ; Ames, Enum. Orch. U.S. and Can. (1924) 13.
1488. **Pelexia** Poit. ex [L. C. Rich. in Mém. Mus. Hist. Nat. Paris, IV. (1818) 59, nomen nudum] Lindl. in Edw. Bot. Reg. XII. (1826) sub t.985.—T. : *P. adnata* (Swartz) Spreng. (*Neottia adnata* (Swartz) Swartz).	[*Centrosis* Swartz, Adnot. Bot. (1829) 52 ; non Thou. (1822)] *Jonorchis* Beck, Fl. Niederösterr. (1890) 215. *Lequestia* Bubani, Fl. Pyren. II. (1901) 57. *Collea* Lindl. in Edw. Bot. Reg. IX. (1823) sub t. 760, in obs.
1500. **Anoectochilus** Blume, Pl. Jav. (1828) praef. p. vi. in adnot.—T. : *A. setaceus* (Blume) Lindl. (*Anecochilus setaceus*).	*Anecochilus* Blume, Bijdr. (1825) 411. *Chrysobaphus* Wall. Tent. Fl. Napal. Illustr. (1826) 37.
1502. †**Zeuxine** ("Zeuxina") Lindl. Collect. Bot., App. (1826) n. 18 ; Lindl. Orch. Scel. (1826) 9.—T. : *Z. sulcata* Lindl.	*Adenostylis* Blume, Bijdr. (1825) 414 ; non *Adenostyles* Cass. in Dict. Sc. Nat. I. Suppl. (1816) 59. *Cytherea* [Salisb. in Trans. Hort. Soc. I. (1812) 301, nomen nudum] House in Bull. Torr. Bot. Club, XXXII. (1905) 383.
1559. **Calypso** Salisb. Parad. Lond. (1807), t.89 ; non Thou. Hist. Vég. Isles de France etc. ed. 1, I. (1804) 29, t.6.—T. : *C. bulbosa* (L.) Oakes.	*Orchidium* Swartz, Summa Veg. Scand. (1814) 32, et in Svensk. Bot. (1819) t.518.

NOMINA CONSERVANDA	NOMINA REJICIENDA
ORCHIDACEAE	
1569. **Claderia** Hook. f. Fl. Brit. Ind. V. (1890) 810; non Rafin. Sylv. Tellur. (1838) 12.—T.: *C. viridiflora* Hook. f.	*Phaedrosanthus* (*Phadrosanthus*) Neck. Elem. III. (1790) 133, partim.
1614. **Epidendrum** L. Sp. Pl. ed. 2 (1763), 1347; Gen. Pl. ed. 6 (1764), 464; emend. Swartz in Nov. Act. Soc. Sc. Upsal. VI. (1799) 66, t.5, fig. 2, et in Schrad. Neues Journ. Bot. II. (1799) 209, t.1, fig. 2; Lindl. Gen. and Sp. Orchid. Pl. (1831) 96; non L. Sp. Pl. ed. 1 (1753), 952.—T.: *E. nocturnum* Jacq.	
1617. **Laelia** Lindl. Gen. and Sp. Orchid. Pl. (1831) 96, 115; non Adans. Fam. Pl. II. (1763) 423.—T.: *L. grandiflora* (La Llave et Lex.) Lindl.	*Amalia* Reichb. Nom. I. (1841) 52.
1704. **Cirrhopetalum** Lindl. [in Edw. Bot. Reg. X. (1824) sub t. 832, nomen nudum] Gen. and Sp. Orchid. Pl. (1830) 58.—T.: *C. Thouarsii* Lindl. (*Bulbophyllum longiflorum* Thou.).	*Zygoglossum* Reinw. [ex Bl. Cat. Gewass. Lands Plantent. Buitenz. (1823) 100, nomen nudum] apud Hornsch. in Syll. Pl. Nov., Ratisb. II. (1828) 4. *Ephippium* Blume, Bijdr. (1825) 308. *Hippoglossum* Breda, Gen. et Sp. Orchid. (1827).
1714. **Panisea** (Lindl.) Lindl. Fol. Orchid. (1854).—T.: *P. parviflora* (Lindl.) Lindl. (*Coelogyne parviflora* Lindl.).	*Androgyne* Griff. Notul. Pl. As. III. (1851) 279.
1739. **Warmingia** Reichb. f. Otia Bot. Hamburg. (1881) 87; non Engl. in Mart. Fl. Bras. XII. pars 2 (1874), 86, 92.—T.: *W. Eugenii* Reichb. f.	
1751. **Brachtia** Reichb. f. in Linnaea, XXII. (1849) 853; non Trevisan, Alghe Coccot. (1848) 57.—T.: *B. glumacea* Reichb. f.	*Oncodia* Lindl. Fol. Orchid. (Feb. 1853).
1778. **Miltonia** Lindl. in Edw. Bot. Reg. XXIII. (1837) sub t.1976, in obs.—T.: *M. spectabilis* Lindl.	*Gynizodon* Rafin. Fl. Tellur. IV. (1836) 40.
——. **Symphyglossum** Schlechter in Orchis, XIII. (1919) 8; non *Symphyoglossum* Turcz. in Bull. Soc. Nat. Mosc. XXI. pars 1 (1848), 255.—T.: *S. sanguineum* (Reichb. f.) Schlechter.	
ULMACEAE	
1904. **Aphananthe** Planch. in Ann. Sc. Nat., Sér. 3, X. (1848) 265, 337; non Link, Enum. Hort. Berol. I. (1821) 383.—T.: *A. philippinensis* Planch.	*Homoioceltis* Blume, Mus. Bot. Lugd.-Bat. II. (1852) 64, t.34.
MORACEAE	
1923. **Broussonetia** L'Hérit. ex Vent. Tabl. III. (1799) 547; non Ortega, Nov. Pl. Descr. Decad. (1798) 61, t.7.—T.: *B. papyrifera* (L.) Vent.	*Papyrus* Lam. Illustr. (1798) t.762.
1937. **Clarisia** Ruiz et Pav. Fl. Peruv. et Chil. Prodr. (1794) 128, t.28; non Abat in Act. Soc. Med. Sevilla, X. (1792) 418.—T.: *C. racemosa* Ruiz et Pav.	*Soaresia* Fr. Allem. in Rev. Bras. I. (1857) 210, homonymum rejiciendum.
1942. **Cudrania** Tréc. in Ann. Sc. Nat., Sér. 3, VIII. (1847) 122, t.3, ff.76–85.—T.: *C. javanensis* Tréc.	*Vanieria* Lour. Fl. Cochinch. (1790) 564.
URTICACEAE	
1987. **Pellionia** Gaudich. in Freyc. Voy. Bot. (1826) 494, t.119.—T.: *P. elatostemoides* Gaudich.	*Polychroa* Lour. Fl. Cochinch. (1790) 559.
1988. **Elatostema** J. R. et G. Forst. Char. Gen. Pl. (1776) 105, partim; emend. Wedd. Monogr. Urtic. (1856) 290.—T.: *E. sessile* J. R. et G. Forst.	*Langeveldia* Gaudich. in Freyc. Voy. Uranie, Bot. (1826) 494.
PROTEACEAE	
2068. **Banksia** L. f. Suppl. Pl. (1781) 15; non J. R. et G. Forst. Char. Gen. Pl. (1776) 7, t.4.—T.: *B. serrata* L.f.	*Sirmuellera* Kuntze, Rev. Gen. II. (1891) 581.
LORANTHACEAE	
2074. **Loranthus** L. Sp. Pl. ed. 2 (1762), 472; non L. Sp. Pl. ed. 1 (1753), 331.—T.: *L. Scurrula* L.	*Scurrula* L. Sp. Pl. ed. 1 (1753), 110; Gen. Pl. ed. 5 (1754), 48.
SANTALACEAE	
2120. **Quinchamalium** Juss. Gen. (1789) 75; non Molina, Saggio Chile, ed. 1 (1782) 151.—T.: *Q. chilense* Mol. emend. Lam.	

NOMINA CONSERVANDA	NOMINA REJICIENDA
POLYGONACEAE	
2208. **Muehlenbeckia** Meissn. Gen. 316, Comm. 227 (1840).—T.: *M. australis* (Forst.) Meissn.	*Calacinum* Rafin. Fl. Tellur. II. (1836) 33. *Karkinetron* Rafin. l.c. III. (1836) 11. *Sarcogonum* G. Don in Sweet, Hort. Brit. ed. 3 (1839), 557.
AMARANTHACEAE	
2312. **Cyathula** Blume, Bijdr. (1825) 548; non Lour. Fl. Cochinch. I. (1790) 101.—T.: *C. prostrata* (L.) Blume.	[Nomen *Desmochaeta* DC. Cat. Hort. Monsp. (1813) 101, a. b. Hiern. Cat. Afr. Pl. Welw. (1900) 890 pro hoc genere acceptum revera pro synonymo *Pupaliae* adjudicandum.]
NYCTAGINACEAE	
2350. **Bougainvillea** Comm. corr. Spach, Veg. Phan. X. (1841) 516.—T.: *B. spectabilis* Willd.	*Buginvillaea* Comm. ex Juss. Gen. (1789) 91.
PORTULACACEAE	
2412. **Anacampseros** Sims, Bot. Mag. XXXIII. (1811) t.1367; non Mill. Gard. Dict. Abridg. ed. 4 (1754); nec. P. Br. Nat. Hist. Jam. (1756) 234.—T.: *A. filamentosa* (Haw.) Sims.	*Ruelingia* Ehrh. Beitr. III. (1788) 132, nomen rejic. *Telephiastrum* Medik. Phil. Bot. I. (1789) 100.
CARYOPHYLLACEAE	
2432. **Moenchia** Ehrh. Beitr. II. (1788) 177; non Roth, Tent. Fl. Germ. I. (1788) 273.—T.: *M. quaternella* Ehrh.=*M. erecta* (L.) Gaertn. Mey. et Scherb.	*Alsinella* Moench, Meth. (1794) 222.
2467. **Pollichia** Soland. in Ait. Hort. Kew. ed. 1, I. (1789) 5; non Schrank in Acta Acad. Mogunt. Erfurt (1781), 35; nec Medik. Bot. Beob. (1783) 247, nom. rejic.—T.: *P. campestris* Soland.	*Meerburghia* Moench, Meth., Suppl. 116 (1802).
NYMPHAEACEAE	
2513. **Nymphaea** L. Sp. Pl. ed. 1 (1753), 510, partim; emend. Smith in Sibth. et Smith, Fl. Graec. Prodr. I. (1808–9) 360.—T.: *N. alba* L.	*Castalia* Salisb. in Ann. Bot. II. No. 4 (1805), 71.
2514. **Nuphar** Smith in Sibth. et Smith, Fl. Graec. Prodr. I. 361 (1808 anno exeunte vel 1809).—T.: *N. luteum* (L.) Sibth. et Sm.	*Nymphaea* L. Sp. Pl. ed. 1 (1753), 510, partim; emend. Salisb. in Ann. Bot. II. No. 4 (1805), 71. *Nymphozanthus* L. C. Rich. Anal. du Fruit, 63, 68 (*Nymphosanthus*) 103 (Maio 1808); Ann. Mus. Paris, XVII. (1811) 230.
CALYCANTHACEAE	
2663, partim. **Chimonanthus** Lindl. in Bot. Reg. V. (1819) sub t.404.—T.: *C. praecox* (L.) Link.	*Meratia* Lois. Herb. Gén. Amat. (1818) t.173.
ANNONACEAE	
2684. **Cananga** Hook. f. et Thoms. Fl. Ind. I. (1855) 129; non Aubl. Hist. Pl. Guian. Franç. I. (1775) 607.—T.: *C. odorata* (Lam.) Hook. f. et Thoms. (*Uvaria odorata*).	*Fitzgeraldia* F. Muell. Fragm. Phyt. Austral. VI. (1867) 1. *Canangium* Baill. Hist. Pl. I. (1868) 213.
MONIMIACEAE	
2759. **Peumus** Mol. Saggio Chile, 185, 350 (1782), partim; emend. Pers. Syn. II. 629 (1807); non Mol. (1782) quoad sp. typ.—T.: *P. Boldus* Mol.	*Boldu* Feuill. ex. Adans. Fam. Pl. II. (1763) 446.
LAURACEAE	
2790. **Nectandra** Roland. ex Rottboell in Acta Litt. Univ. Hafn. I. (1778) 279; non Berg. Descr. Fl. Cap. (1767) 131.—T.: *N. sanguinea* Roland. ex Rottb.	*Porostema* Schreb. Gen. II. (1791) 519.
2804. **Bernieria** Baill. in Bull. Soc. Linn. Paris, I. (1884) 434; non *Berniera* DC. Prodr. VII. (1838) 18.—T.: *B. madagascariensis* Baill.	



NOMINA CONSERVANDA	NOMINA REJICIENDA
LAURACEAE	
2811, partim. **Endlicheria** Nees in Linnaea, VIII. (1853) 37.—T. : *E. hirsuta* (Schott) Nees.	*Schauera* Nees in Lindl. Introd. Nat. Syst. ed. 2 (1836), 202, in adnot.
2821. **Lindera** Thunb. Nov. Gen. III. (1783) 44 ; Blume in Mus. Bot. Lugd.-Bat. I. (1851) 323 ; non Adans. Fam. Pl. II. (1763) 499. —T. : *L. umbellata* Thunb.	*Benzoin* Fabricius, Enum. Pl. Hort. Helmst. ed. 2 (1763), 401.
CRUCIFERAE	
2884. **Coronopus** Boehm. in Ludw. Def. Gen. Pl. ed. 3 (1760), 22 ; Gaertn. Fruct. II. (1791) 293 ; non Mill. Gard. Dict. Abridg. ed. 4 (1754).—T. : *C. procumbens* Gilib.	*Carara* Medic. Pflanzengatt. I. (1792) 34.
2902. **Bivonaea** DC. in Mém. Hist. Nat. Mus. Paris, VII. (1821) 241 ; Syst. II. (1821) 554 ; non *Bivonea* Rafin. Fl. Ludov. (1817) 138 ; nec *Bivonia* Spreng. Neue Entdeck. II. (1821) 116.—T. : *B. lutea* DC.	*Pastorea* Tod. ex Bertol. Fl. Ital. X. (1854) 520.
2940. **Schouwia** DC. Syst. II. (1821) 643 ; non Schrad. Gött. Gel. Anz. (1821) 717.—T. : *S. arabica* DC.=*S. purpurea* (Forsk.) Schweinf.	*Subularia* Forsk. Fl. Aegypt. Arab., (1775) 117 ; non L. (1753). *Cyclopterygium* Hochst. in Flora, XXXI. (1848) 175.
2973. **Mancoa** Wedd. Chloris And. I. (1857) t.86 ; non Rafin. Fl. Tellur. III. (1836) 56.—T. : *M. hispida* Wedd.	
3022. †**Lepidostemon** Hook. f. et Thoms. in Journ. Linn. Soc. V. (1861) 131 ; non *Lepistemon* Blume, Bijdr. 722 (1825) ; Hassk. Cat. Pl. Hort. Bogor. (1844) 141.—T. : *L. pedunculosus* Hook. f. et Thoms.	
3042. **Matthiola** R. Br. (" Mathiola ") in Ait. Hort. Kew. ed. 2, IV. (1812) 119 ; non L. Sp. Pl. ed. 1 (1753), 1192.—T. : *M. incana* R. Br.	
3050. †**Dontostemon** Andrz. ex [DC. Prodr. I. (1824) 190, pro syn. ;] Ledeb. Fl. Alt. III. (1831) 4, 118.—T. : *D. integrifolius* (L.) Ledeb.	*Andreoskia* DC. in DC. Prodr. I. (1824) 190 ; non *Andrzeiowskia* Reichb. Iconogr. Bot. seu Pl. Crit. I. (1823) 15, t.13.
3051. **Chorispora** R. Br. ex DC. Syst. II. (1821) 435.—T. : *C. tenella* (Pall.) DC.	*Ormycarpus* Neck. Elem. III. (1790) 82. *Chorispermum* R. Br. in Ait. Hort. Kew. ed. 2, IV. (1812) 129.
TOVARIACEAE	
3081. **Tovaria** Ruiz et Pav. Fl. Peruv. et Chil. Prodr. (1794) 49, t.8 ; non Neck. Elem. III. (1790) 190, nomen rejic.—T. : *T. pendula* Ruiz et Pav.	[*Cavaria* Steud. Nom. ed. 1 (1821), 169, nomen]. [*Bancroftia* Macf. Fl. Jam. I. (1837) 112 ; non Billb. (1833).]
CAPPARIDACEAE	
3106. **Boscia** Lam. Encycl. Méth., Illustr. Genr. (1797) t.395 ; non Thunb. Prodr. Fl. Cap. (1794) pp. x. et 32.—T. : *B. senegalensis* (Pers.) Lam. ex Poir. (*Podoria senegalensis*).	*Podoria* Pers. Syn. II. (1806) 5.
CRASSULACEAE	
3171. **Rochea** DC. Pl. Hist. Succul. (1806 ?) t.103 ; non Scop. Introd. (1777) 296.—T. : *R. coccinea* (L.) DC.	*Larochea* Pers. Syn. I. (1805) 337.
SAXIFRAGACEAE	
3182. **Bergenia** Moench, Meth. (1794) 664 ; non *Bergena* Adans. Fam. Pl. II. (1763) 345 ; nec *Bergenia* Neck. Elem. II. (1790) 108.—T. : *B. bifolia* Moench=*B. crassifolia* (L.) Fritsch.	*Geryonia* Schrank in Flora, I. (1818) 230. *Megasea* Haw. Saxifr. Enum. (1821) 6.
3185. **Boykinia** Nutt. in Journ. Acad. Nat. Sc. Philad. VII. (1834) 113 ; non Rafin. Neogen. (1825) 2.—T. : *B. aconitifolia* Nutt.	*Therofon* Rafin. N. Am. Pl. IV. (1836) 66. *Telesonix* Rafin. Fl. Tellur. II. (1836) 69.
3204. **Donatia** J. R. et G. Forst. Char. Gen. Pl. (1776) 9, t.5 (nunc Stylidiac.) ; non Loefl. Iter. Hispan. (1758) 193.—T. : *D. fascicularis* J. R. et G. Forst.	[*Orites* Banks et Soland. ex Hook. f. Bot. Antarct. Voy. I. pars 2 (1846), 282, pro syn.]
3209. **Jamesia** Torr. et Gray, Fl. N. Amer. I. (1840) 593 ; non Rafin. in Atl. Journ. (1832) 145.—T. : *J. americana* Torr. et Gray.	*Edwinia* Heller in Bull. Torr. Bot. Club, XXIV. (1897) 477.

NOMINA CONSERVANDA	NOMINA REJICIENDA
CUNONIACEAE	
3269. **Platylophus** D. Don in Edinb. New Phil. Journ. IX. (1830) 92 ; non Cass. in Dict. Sc. Nat. XLIV. (1826) 36.—T. : *P. trifoliatus* D. Don.	*Trimerisma* C. Presl, Bot. Bemerk. (1844) 73.
BRUNIACEAE	
3284. **Thamnea** Soland. ex R. Br. in Abel, Narr. Journ. (1818) 374, nomen ; et ex Brongn. in Ann. Sc. Nat. VIII. (1826) 386, t.38 ; non *Thamnia* P. Br. Hist. Jam. (1756) 245.—T. : *T. uniflora* Soland.	*Schinzafra* Kuntze, Rev. Gen. I. (1891) 234.
3285. **Tittmannia** Brongn. in Ann. Sc. Nat. VIII. (1826) 385 ; non Reichb. Ic. Exot. I. (1824) 26, t. 38.—T. : *T. lateriflora* Brongn. =*T. laxa* (Thunb.) Presl.	*Moesslera* Reichb. Consp. (1828) 160.
ROSACEAE	
3328. **Lindleya** H. B. K. Nov. Gen. et Sp. VI. (1823) 239 ; non Nees in Flora, IV. (1821) 299, nom. rejic. ; nec H.B.K. Nov. Gen. et Sp. V. (1821) tt.479 et 480 ; Kunth, Malvac. (1822) 10.—T. : *L. mespiloides* H.B.K.	*Lindleyella* Rydb. in N. Amer. Fl. XXII. (1908) 259.
3377. **Aremonia** Neck. Elem. II. (1790) 100.—T. : *A. Agrimonoides* (L.) DC.	*Agrimonoides* Mill. Gard. Dict. Abridg. ed. 4 (1754).
LEGUMINOSAE	
3448. **Schrankia** Willd. Sp. Pl. IV. (1806) 1041 ; non Medic. Pflanzengatt. I. (1792) 42.—T. : *S. quadrivalvis* (L.) Merr. (*S. aculeata* Willd.)	*Leptoglottis* DC. Mém. Leg. (1825) 451. *Morongia* Britton in Mem. Torr. Bot. Cl. V. (1894) 191.
3452. **Dichrostachys** Wight et Arn. Prodr. I. (1834) 271.—T. : *D. cinerea* (L.) Wight et Arn.	*Cailliea* Guill. et Perr. Fl. Seneg. (1833) 239.
3509. **Afzelia** Sm. in Trans. Linn. Soc. IV. (1798) 221 ; non J. F. Gmelin, Syst. Nat. ed. 13, II. (1791) 927.—T. : *A. africana* Sm.	*Afrafzelia* Pierre, Fl. For. Cochinch. V. (1899) sub t.388.
3516. **Berlinia** Soland. ex Hook. f. et Benth. in Hook. Niger Fl. (1849) 326.—T. : *B. acuminata* Soland.	*Westia* Vahl in Skrivt. Naturh.-Selsk. VI. (1810) 117.
3532. **Apuleia** Mart. Herb. Fl. Bras. (1837) 123 (in Flora, Beibl. (1837) II.) ; non Gaertn. Fruct. II. (1791) 439.—T. : *A. praecox* Mart.=*A. leiocarpa* (Vogel) Macbr.	*Apoleya* Gleason in Phytologist, I. (1935) 143.
3558. **Zuccagnia** Cav. Icon. V. (1799) 2, t.403 ; non *Zuccangnia* Thunb. Nov. Gen. Pl. IX. (1798) 127 ; nec *Zuccagnia* Thunb. in Roemers Arch. II. pars 1 (1799), 2.—T. : *Z. punctata* Cav.	
3575. **Aldina** Endl. Gen. (1841) 1322 ; non Adans. Fam. Pl. II. (1763) 328 ; nec *Aldinia* Scop. Introd. (1777) 173.—T. : *A. insignis* (Benth.) Endl. (*Allania insignis*).	[*Allania* Benth. in Hook. Lond. Journ. Bot. II. (1840) 91 ; non Endl. (1836).]
3582. **Sweetia** Spreng. Syst. II. (1825) 171, 213 ; non DC. Prodr. II. (1825) 381.—T. : *S. fruticosa* Spreng.	*Acosmium* Schott in Spreng. Syst. IV. Cur. Post. (1827) 406.
3589. **Camoënsia** Welw. ex Benth. et Hook. f. Gen. Pl. I. (1865) 557.—T. : *C. maxima* Welw. ex Benth.	*Giganthemum* Welw. Apont. Phytogeogr. (1859) 585 (Annaes de Conselho Ultramarino, Ser. I. : Dec. 1858).
3608. **Virgilia** Lam. Illustr. II. (1793) 454, t.326 ; non L.Hérit. Diss. (1788), et ex DC. Prodr. V. (1836) 652.—T. : *V. capensis* Lam.	*Andrastis* Rafin. ex Kunth in Ann. Mus. Wien, II. (1838) 86.
3619. **Pickeringia** Nutt. ex Torr. et Gray, Fl. N. Amer. I. (1840) 389 ; non Nutt. in Journ. Acad. Sc. Philad. VII. (1834) 95.—T. : *P. montana* Nutt.	*Xylothermia* Greene in Pittonia, II. (1891) 188.
3647. **Walpersia** Harv. in Harv. et Sond. Fl. Cap. II. (1861) 26 ; non Reissek ex Endl. Gen. (1839) 1100, n. 5736 ; nec Meissn. ex Krauss in Flora, XXVII. (1844) 357.—T. : *W. burtonioides* Harv. et Sond.	
3659. **Rothia** Pers. Syn. II. (1807) 638 ; non Schreb. Gen. (1791) 531 ; nec Lam. in Journ. Hist. Nat. Paris, I. (1792) 16 ; nec Borkh. Tent. Dispos. Fl. Germ. (1792) 43.—T. : *R. trifoliata* (Roth) Pers.=*R. indica* (L.) Druce.	[*Dillwynia* Roth, Cat. Bot. III. (1806) 71 ; non Sm. (1805).] *Westonia* Spreng. Syst. III. (1826) 152, 230.
3661. **Wiborgia** Thunb. Nov. Gen. et Spec. X. (1800) 137 ; non Roth, Cat. Bot. II. (1800) 112 ; nec *Viborgia* Moench, Meth. (1794) 132.—T. : *W. obcordata* Thunb.	*Jacksonago* Kuntze, Rev. Gen. I. (1891) 191.

NOMINA CONSERVANDA	NOMINA REJICIENDA
LEGUMINOSAE	
3676. **Petteria** C. Presl, Bot. Bemerk. (1844) 139; Abh. Boehm. Ges. Wiss., Ser. 5, III. (1845) 569; non *Pettera* Reichb. Ic. Fl. Germ. V. (1841) 33, t.220; Nomencl. (1841) 205.—T.: *P. ramentacea* C. Presl.	
3709. **Dalea** Juss. Gen. (1789) 355; non Mill. Gard. Dict. Abridg. ed. 4 (1754); nec P. Br. Hist. Jam. (1756) 239; nec. P. Br. l.c. (1756) 314; nec Gaertn. Fruct. I. (1788) 235, t. 51.—T.: *D. alopecuroides* Willd. (*Psoralea Dalea* L.)	*Parosela* Cav. Descr. Pl. (1802) 185.
3745. **Cracca** Benth. in Vidensk. Meddel. Nat. For. Kjøbenh. (1853) 8; non L. Sp. Pl. ed. 1 (1753), 752, nom. rejic.; nec Medic. Vorles. Churpf. Phys. Ges. II. (1787) 359.—T.: *C. glandulifera* Benth.	*Benthamantha* Alef. in Bonplandia, X. (1862) 264.
3754. **Sutherlandia** R. Br. in Ait. Hort. Kew. ed. 2, IV. (1812) 327; non J. F. Gmel. Syst. II. (1791) 1027.—T.: *S. frutescens* (L.) R. Br.	
3784. **Nissolia** Jacq. Enum. Pl. Carib. (1760) 7; non Mill. Gard. Dict. Abridg. ed. 4 (1754).—T.: *N. fruticosa* Jacq.	
3789. **Poiretia** Vent. Choix (1803), t. 42; non J. F. Gmel. Syst. II. (1791) 263; nec Cav. Icon. IV. (1797) 25, t.343.—T.: *P. scandens* Vent.	
3853. †**Lens** Mill. Gard. Dict. Abridg. ed. 4 (1754); Druce in Rep. Bot. Exch. Cl. Brit. Isles, III. (1913) 433 [non Stickmann, Herb. Amb. (1754) 18, et L. Amoen. Acad. IV. (1760) 128, 143, nomen, sine descr., icone Rumphiana citata].—T.: *L. esculenta* Moench.	
3863. **Shuteria** Wight et Arn. Prodr. Fl. Pen. Ind. Or. I. (1834) 207; non *Shutereia* Choisy in Mém. Soc. Genève, VI. (1833) 485.—T.: *S. vestita* (Graham) Wight et Arn.	
3871. †**Rhodopis** Urb. Symb. Antill. II. (1900) 304; non *Rhodopsis* Lilja, Fl. Sverig. Suppl. I. (1840) 42; nec Reichb. Nom. (1841) 168.—T.: *R. planisiliqua* (L.) Urb. (*Erythrina planisiliqua*).	
3874. **Apios** Medik. in Vorles Churpf. Phys.-ökon. Ges. II. (1787) 573; Moench, Meth. (1794) 165.—T.: *A. americana* Medik. =*A. tuberosa* Moench 1794.	*Glycine* L. Gen. Pl. ed. 5 (1754), 334; L. Sp. Pl. ed. 1 (1753), 753, partim, quoad spec. 1. *Bradlea* Adans. Fam. Pl. II. (1763) 324, 527, quoad syn. *Apios* Corn.
GERANIACEAE	
3931. **Wendtia** Meyen, Reise, I. (1834) 307; non *Wendia* Hoffm. Gen. Umbellif. (1814) 136.—T.: *W. gracilis* Meyen.	*Hyperum* C. Presl, Epim. Bot. (1849) 211.
3932. **Balbisia** Cav. in Anal. Cienc. Nat. VIII. (1804) 62; non Willd. Sp. Pl. III. (1803) 2214; nec DC. in Guillem. Arch. Bot. II. (1833) 233, et in DC. Prodr. VI. (1837) 447.—T.: *D. verticillata* Cav.	*Ledocarpon* Desf. in Mém. Mus. Hist. Nat. Paris, IV. (1818) 250.
HUMIRIACEAE	
3953. **Humiria** Jaume St. Hil. Expos. II. (1805) 374.—T.: *H. balsamifera* (Aubl.) Jaume St. Hil.	*Houmiri* Aubl. Hist. Pl. Guiane Franç. I. (1775) 564, t.225.
ZYGOPHYLLACEAE	
3967. †**Augea** Thunb. Prodr. Fl. Cap. (1794) 80; non Thunb. ex Retz. Obs. V. (1789) 3, nomen; nec *Augia* Lour. Fl. Cochinch. (1790) 537, nomen confusum.—T.: *A. capensis* Thunb.	*Piotes* Soland. apud Britt. in Journ. Bot. XXII. (1884) 147.
3973. **Larrea** Cav. in Anal. Hist. Nat. II. (1800) 229; Cav. Ic. VI. 39; non Ortega, Nov. Pl. Descr. Decad. (1797) 15, t.2.—T.: *L. nitida* Cav.	*Covillea* Vail in Bull. Torr. Bot. Cl. XXII. (1895) 229.
RUTACEAE	
3998. **Pentaceras** Hook. f. in Benth. et Hook. f. Gen. Pl. I. (1862) 298; non *Pentaceros* G. F. W. Meyer, Prim. Fl. Esseq. (1818) 136=*Pentaceras* Roem. et Schultes, Syst. V. (1819) 570.—T.: *P. australis* (F. Muell.) Hook. f.	

NOMINA CONSERVANDA	NOMINA REJICIENDA
RUTACEAE	
4011. **Boenninghausenia** Reichb. Consp. (1828) 197, sine descr., et apud Meissn. Gen. I. (1837), 60, II (1836–43), 44; non *Boenninghausia* Spreng. Syst. III. (1826) 153, 245.—T.: *B. albiflora* (Hook.) Meissn.	*Podostaurus* Jungh. in Nat. et Geneesk. Arch. II. (1845) 45.
4012, partim. **Haplophyllum** A. Juss. corr. Reichb. Handb. (1837) 282.—T.: *H. tuberculatum* A. Juss.	*Aplophyllum* A. Juss. in Mém. Mus. Hist. Nat. Paris, XII. (1825) 464.
4020. **Myrtopsis** Engl. in Engl. et Prantl, Nat. Pflanzenfam. III. pars 4 (1896), 137; non O. Hoffm. in Linnaea, XLIII. (1881) 133.—T.: *M. novae-caledoniae* Engl.	
4060. **Naudinia** Planch. et Lind. in Ann. Sc. Nat., Sér. 3, XIX. (1853) 79; non Rich. in Sagra, Hist. Fis. Cuba (1845), 561.—T.: *N. amabilis* Planch. et Lind.	
4065. **Chloroxylon** DC. in DC. Prodr. i. 625 (1824); non *Chloroxylum* P. Br. Nat. Hist. Jam. (1756) 187, t.7, f.1.—T.: *C. Swietenia* DC. (*Swietenia Chloroxylon* Roxb.).	
4073. **Araliopsis** Engl. in Engl. et Prantl, Nat. Pflanzenfam. III. pars 4 (1896), 175; non Kurz in Andaman Rep. (1870) 39; nec Lesq. (1878?) plant. fossil.—T.: *A. Soyauxii* Engl.	
4089. **Micromelum** Blume, Bijdr. (1825) 137.—T: *M. pubescens* Blume.	*Aulacia* Lour. Fl. Cochinch. (1790) 273.
SIMAROUBACEAE	
4118. **Castela** Turp. in Ann. Mus. Paris, VII. (1806) 78, t.5; non *Castelia* Cav. in Anal. Cienc. Nat. III. (1801) 134, t.30.—T.: *C. depressa* Turp.	
MELIACEAE	
4189. **Aglaia** Lour. Fl. Cochinch. (1790) 173; non Allemão in Nov. Act. Nat. Cur. IV. (1770) 93.—T.: *A. odorata* Lour.	*Camunium* Adans. Fam. Pl. II. (1763) 166.
MALPIGHIACEAE	
4222. **Rhyssopterys** Blume corr. Wittst. Etym. Handwörterb. ed. 2 (1856), 764.—T.: *R. timorensis* Adr. Juss.	*Ryssopterys* Blume ex Adr. Juss. in Deless. Ic. III. (1837) 21, t.35.
4226. **Heteropteris** H. B. K. Nov. Gen. V. (1822) 163.—T.: *H. purpurea* (L.) DC.	*Banisteria* L. Sp. Pl. ed. 1 (1753), 427; Gen. Pl. ed. 5 (1754), 195.
4234. **Ptilochaeta** Turcz. in Bull. Soc. Nat. Mosc. XVI. (1843) 52, et in Flora, XXVII. (1844) 120; non Nees in Mart. Fl. Bras. II. pars 1 (1842), 147, t.8.—T.: *P. bahiensis* Turcz.	
4247. **Lophanthera** Adr. Juss. in Ann. Sc. Nat., Sér. 2, XIII. (1840) 328; non Rafin. New Fl. Amer. II. (1836) 58.—T.: *L. Kunthiana* Adr. Juss.=*L. longifolia* (Kunth) Griseb.	
POLYGALACEAE	
4275. **Securidaca** L. [Gen. Pl. ed. 5 (1754) 316 pro minore parte] Syst. ed. 10 (1759) 1155; non L. Sp. Pl. ed. 1 (1753), 707.—T.: *S. diversifolia* (L.) Blake (*S. volubilis* L. 1759 non 1753).	*Elsota* Adans. Fam. Pl. II. (1763) 358.
4277. **Salomonia** Lour. Pl. Cochinch. (1790) 14; non Heist. ex Fabricius, Enum. Pl. Hort. Helmst. ed. 2 (1763), 38.—T.: *S. cantoniensis* Lour.	
EUPHORBIACEAE	
4331. **Buraeavia** Baill. in Adansonia, XI. (1873) 83; non *Bureava* Baill. in Adansonia, I. (1860) 71.—T.: *B. carunculata* (Baill.) Baill.	
4397. **Adelia** L. Syst. ed. 10, II. (1759) 1298, partim; non P. Br. Nat. Hist. Jam. (1756) 361; nec Britton et Wilson, Bot. Porto Rico and Virg. Isl. V. (1924) 487.—T.: *A. Ricinella* L.	*Ricinella* Muell.-Arg. in Linnaea, XXXIV. (1863) 153.
4415. **Acidoton** Swartz, Prodr. Veg. Ind. Occ. (1788) 83; non P. Br. Nat. Hist. Jam. (1756) 335; nomen rejic.—T.: *A. urens* Sw.	*Durandeeldea* Kuntze, Rev. Gen. II. (1891) 603.
4421, partim. **Pterococcus** Hasskarl in Flora, XXV. pars 2 (1842), Suppl. 41; non Pallas, Reise, I. (1776) App. 738; II. (1777) App. 43.—T.: *P. glaberrimus* Hassk. (*P. corniculatus* (Sm.) Pax et K. Hoffm).	*Ceratococcus* Meissn. Gen. II. (1843) 369. *Sajorium* Endl. Gen., Suppl. III. (1843) 98.

NOMINA CONSERVANDA	NOMINA REJICIENDA
EUPHORBIACEAE	
4435. **Micrandra** Benth. in Hook. Kew. Journ. Bot. VI. (1854) 371; non R. Br. in Bennett, Pl. Jav. Rar. (1844) 237.—T.: *M. siphonoides* Benth.	*Pogonophyllum* Didrichs. in Kjoebenhavn Vid. Meddel. (1857) 144.
4452. **Sagotia** Baill. in Adansonia, I. (1860–61) 53; non Walp. in Linnaea, XXIII. (1850) 737.—T.: *S. racemosa* Baill.	
4467. **Chaetocarpus** Thwaites in Hook. Journ. Bot. and Kew Gard. Misc. VI. (1854) 300, t.10A; non Schreb. in L. Gen. Pl. ed. 8 (1789), 75, nomen superfl.—T.: *C. castanocarpus* (Roxb.) Thwaites (*Adelia castanocarpa*).	*Regnaldia* Baill. in Adansonia, I. (1861) 187.
4516. **Botryophora** Hook. f. Fl. Brit. Ind. V. (1888) 476; non Bompard in Hedwigia (1867), 129; nec J. C. Ag. in Lunds Univ. Aarskr. XXIII. (1887) 139.—T: *B. Kingii* Hook. f.	
LIMNANTHACEAE	
4542. **Limnanthes** R. Br. in London and Edinb. Philos. Mag. II. (1833) 70; non Stokes, Bot. Mat. Med. I. (1812) 300; nec *Limnanthus* Neck. Elem. II.(1790) 27.—T.: *L. Douglasii* R. Br.	
CELASTRACEAE	
4623. **Denhamia** Meissn. Gen. 18, Comm. 16 (1837).—T.: *D. obscura* (A. Rich.) Meissn.	*Leucocarpum* A. Rich. Sert. Astrolab. (1834) 46, t.18.
4627. **Gymnosporia** (Wight et Arn.) Hook f. in Benth. et Hook. f. Gen. Pl. I. (1862) 365.—T.: *G. montana* (Roxb.) Benth. (*Celastrus montanus*).	[*Burglaria* Wendl. ex Steud. Nomencl. Bot. (1821) 129, nomen nudum.]
	Scytophyllum Eckl. et Zeyh. Enum. Pl. (1835) 124.
	Encentrus C. Presl in Abhandl. Böhm. Ges. Wiss., Ser. 5, III. (1844) 463.
	Polyacanthus C. Presl, loc. cit.
4637. **Plenckia** Reiss. in Mart. Fl. Bras. XI. pars 1 (1801), 30; non Rafin. Specchio Sc. I. (1814) 194; nec Moc. et Sessé ex DC. Prodr. I. (1824) 724, nomen nudum.—T.: *P. populnea* Reiss.	
ICACINACEAE	
4693. **Mappia** Jacq. Hort. Schoenbrunn. I. (1797) 22, t.47; non Heist. ex Adans. Fam. Pl. II. (1763) 193; nec. Schreb. Gen. II. (1791) 806.—T.: *M. racemosa* Jacq.	
4715. **Stachyanthus** Engl. in Engl. et Prantl, Pflanzenfam., Nachtr. 1 (1897), 227; non DC. Prodr. V. (1836), 84.—T.: *S. Zenkeri* Engl.	
SAPINDACEAE	
4730. **Bridgesia** Bert. apud Cambess. in Nouv. Ann. Mus. Paris, III. (1834) 234, t. 13; non Hook. in Hook. Bot. Misc. II. (1831) 222, t.92; nec Hook. et Arn. in Hook. Bot. Misc. III. (1833) 168, t.102.—T.: *B. incisifolia* Bert.	*Tripterocarpus* Meissn. Gen. I. (1837) 52; II. (1836–43) 37.
4733. **Thouinia** Poit. in Ann. Mus. Paris, III. (1804) 70, t.6; non L. f. Suppl. (1781) 9, 89, nomen rejic.; nec Sm. Icon. Ined. I. (1789) t.7.—T.: *T. simplicifolia* Poit.	*Thyana* Ham. Prodr. Pl. Ind. Occ. (1825) 36.
	Vargasia Bert. ex Spreng. Syst. II. (1825) 283.
4747. **Zollingeria** S. Kurz in Journ. As. Soc. Beng. XLI. (1872) 303; non Sch.-Bip. in Flora, XXXVII. (1854) 273.—T.: *Z. macrocarpa* S. Kurz.	[*Belingia* Pierre, Fl. For. Cochinch. (1895), sub t.325, in syn.]
4753. **Pancovia** Willd. Sp. Pl. II. (1799) 285; non Heist. ex Adans. Fam. Pl. II. (1763) 294.—T.: *P. bijuga* Willd.	
4820. **Mischocarpus** Blume, Bijdr. (1825) 238.—T.: *M. sundaicus* Blume.	*Pedicellia* Lour. Fl. Cochinch. (1790) 655.
RHAMNACEAE	
4899. **Colletia** Comm. ex Juss. Gen. (1789) 380; non Scop. Introd. Hist. Nat. (1777) 207.—T.: *C. spinosa* Lam.	

NOMINA CONSERVANDA	NOMINA REJICIENDA
VITACEAE	
4910. **Ampelocissus** Planch. in DC. Monogr. V. pars 2 (1887), 368.—*T.*: *A. latifolius* (Roxb.) Planch.	
4918, partim. **Cayratia** Juss. in Dict. Sc. Nat. X. (1818) 103, in obs.—T.: *C. pedata* (Lam.) Gagnep.	*Botria* Lour. Fl. Cochinch. (1790) 153.
	Columella Lour. Fl. Cochinch. (1790) 85.
	Lagenula Lour. l.c. 86.
ELAEOCARPACEAE	
4927. **Aristotelia** L'Hérit. Stirp. Nov. (1784) 31, t.16; non *Aristotela* Adans. Fam. Pl. II. (1763) 125.—T.: *A. Maqui* L.	[*Friesia* DC. in DC. Prodr. I. (1824) 520; non Spreng. Anleit. II. pars 2 (1818), 885.]
TILIACEAE	
4948. **Ancistrocarpus** Oliv. in Journ. Linn. Soc. IX. (1867) 173; non H.B.K. Nov. Gen. et Spec. II. (1817) 186.—T.: *A. brevispinosus* Oliv.	*Acrosepalum* Pierre in Bull. Soc. Linn. Paris, n.s. no. 1 (1898–99), p. 22, et no. 14, p. 119.
4957. **Sparrmannia** L. f. Suppl. Pl. (1781) 41, 265, 468; non *Sparmannia* Buc'hoz, Pl. Nouvellem. Découv. (1779) t.1. p. 3, nomen rejic.—T.: *S. africana* L. f.	*Vossianthus* Kuntze in Gaertnerisch. Centr. Bl. 653 (1900), et in Post et Kuntze, Lexic. (1903) 590.
4959. **Luehea** Willd. in Neue Schr. Ges. Nat. Freunde Berlin, III. (1801) 410, t.5; non F. W. Schmidt, Neue u. Selt. Pfl. (1793) 23, et in Usteri, Ann. VI. (1793) 118.—T.: *L. speciosa* Willd.	*Alegria* Moc. et Sessé ex DC. Prodr. I. (1824) 516.
4960. **Mollia** Mart. Nov. Gen. et Sp. I. (1824) 96; non J. F. Gmel. Syst. II. (1791) 420; nec Willd. Hort. Berol. (1806) 11, t.11.—T.: *M. speciosa* Mart.	*Schlechtendalia* Spreng. Syst. IV. Cur. Post. (1827) 295; non Willd. (1804).
TRIPLOCHITONACEAE (nunc STERCULIACEAE)	
5022A. **Triplochiton** K. Schum. in Engl. Bot. Jahrb. XXVIII. (1900) 330; non Alef. in Oesterr. Bot. Zeitschr. XIII. (1863) 13.—T.: *T. scleroxylon* K. Schum.	
BOMBACACEAE	
5035. **Bernoullia** Oliv. in Hook. Ic. Pl. XII. (1873) t.1169; non Neck. Elem. II. (1790) 97.—T.: *B. flammea* Oliv.	
5036. †**Cumingia** Vidal, Phan. Cuming. Philipp. 211 (1885); non *Cummingia* D. Don apud Sweet, Brit. Fl. Gard. III. (1828) sub t.257.—T.: *C. philippinensis* Vidal.	*Esenbeckia* Blume Bijdr. (1825) 118; non H.B.K. (1825).
5040. **Neesia** Blume in Nova Acta Acad. Nat. Cur. XVII. pars 1 (1835), 83; non Spreng. Anleit. ed. 2, II. (1818) 547.—T.: *N. altissima* Blume.	[*Blumea* Reichb. Consp. (1828) 209; non Nees (1823); nec DC. (1833).]
	Cotylephora Meissn. Gen. Comm. (1837) 28.
STERCULIACEAE	
5060. **Rulingia** R. Br. in Bot. Mag. (1820) t.2191; non *Ruelingia* Ehrh. Beitr. III. (1786) 132, nomen rejic.; nec *Rulingia* Harv. Syn. (1812) 124.—T.: *R. pannosa* R. Br.	*Achilleopsis* Turcz. in Bull. Soc. Nat. Mosc. XXII. pars 2 (1849), 9.
5062. **Byttneria** Loefl. It. Hisp. (1758) 313; non *Butneria* Duham. Arb. I. (1755) 113, t.45.—T.: *B. scabra* Loefl.	*Chaetaea* Jacq. Enum. (1760) 17.
5075. **Seringia** J. Gay in Mém. Mus. Hist. Nat. Paris, VII. (1821) 442, tt.16, 17; non Spreng. Anleit. ed. 2, II. (1818) 694.—T.: *S. platyphylla* J. Gay=*S. arborescens* (Ait.) Druce.	[*Gaya* Spreng. Syst. I. (1825) 535; non H.B.K. (1822).]
	Actinostigma Turcz. in Bull. Soc. Nat. Mosc. XXXII. pars 1 (1859), 259 [non Welw. (1858) sine descr.].
THEACEAE	
5144. **Bonnetia** Mart. et Zucc. Nov. Gen. et Sp. I. (1824) 114; non Schreb. Gen. (1789) 363; nec Neck. Elem. I. (1790) 368.—T.: *B. anceps* Mart. et Zucc.	*Kieseria* Nees in Wied-Neuwied, Reise Brasil. II. (1821) 338.
5149. **Laplacea** H.B.K. Nov. Gen. et Sp. V. (1822) 307, t.461.—T.: *L. speciosa* H.B.K.	[*Haemocharis* Salisb. Parad. Lond. I. (1806) sub t. 56, sine descr.]
	Lindleya Nees in Flora, I. (1821) 299, 328.
5155. **Anneslea** Wall. Pl. As. Rar. I. (1829) 5; non *Anneslia* Hook. in Salisb. Parad. Lond. (1807) t.64; nec *Anneslea* Roxb. apud Andr. Bot. Rep. X. (1810) t.618.—T.: *A. fragrans* Wall.	*Callosmia* C. Presl in Abh. Boehm. Ges. Wiss., Ser. 5, III. (1844) 533 (Bot. Bemerk. 103).

NOMINA CONSERVANDA	NOMINA REJICIENDA
THEACEAE	
5155. **Anneslea,** *continued.*	*Daydonia* Britten in Journ. Bot. XXVI. (1888) 11. *Mountnorrisia* Szysz. in Engl. et Prantl, Nat. Pflanzenfam. III. pars 6 (1893), 189. *Eroteum* Swartz, Prodr. (1788) 85, partim.
5157, partim. **Cleyera** Thunb. Nov. Gen. (1783) 68, partim; emend. Sieb. et Zucc. Fl. Jap. I. (1835) 151.—T.: *C. japonica* Thunb. partim; emend. Sieb. et Zucc. l.c. 153, t.81.	
5157, partim. **Freziera** Swartz, Fl. Ind. Occ. (1800) 971, partim; emend. Choisy in Mém. Soc. Phys. Genève, XIV. (1855) 122; Benth. et Hook. f. Gen. Pl. I. (1862) 183.—T.: *F. undulata* Swartz.	*Eroteum* Swartz, Prodr. (1788) 85, partim. *Lettsomia* Ruiz et Pav. Prodr. (1794), 77, t.14.
GUTTIFERAE	
5195. **Balboa** Planch. et Triana in Ann. Sc. Nat., Sér. 4, XIV. (1880) 252; non Liebm. in Kjoeb. Vidensk. Meddel. (1853) 106.—T.: *B. membranacea* Planch. et Triana.	
5205. **Platonia** Mart. Nov. Gen. et Sp. III. (1829) 168, t.289 non Rafin. in Med. Repos. N. York, V. (1808) 352; nec Kunth, Rev Gram. I. (1829) 139, 327, t.76.—T.: *P. insignis* Mart.	
DIPTEROCARPACEAE	
5221. **Pierrea** Heim in Bull. Soc. Linn. Paris (1891), 938 Recherch. Diptérocarp. (1892) 78; non Hance in Journ. Bot. XV (1877) 339.—T.: *P. pachycarpa* Heim.	
FLACOURTIACEAE	
5311. † **Byrsanthus** Guillem. in Deless. Ic. Sel. III. (1837) 30, t.52; non *Byrsanthes* C. Presl, Prodr. Monogr. Lobel. (1836) 41.—T.: *B. Brownii* Guillem.	*Anetia* Endl. Gen. (1839) 923.
5334. **Lunania** Hook. in Hook. Lond. Journ. Bot. III. (1844) 317; non Rafin. Medic. Flora, II. (1830) 106.—T.: *L. racemosa* Hook.	
5353. **Tetralix** Griseb. Cat. Pl. Cub. (1866) 8; non Hill, Veg. Syst. IV. (1762) 18; nec [Haller] Zinn, Cat. (1757) 202.—T.: *T. brachypetalus* Griseb.	
LOASACEAE	
5392. **Blumenbachia** Schrad. in Goetting. Gel. Anz. (1825) 1705; non Koeler, Gram. Gall. Germ. (1802) 28.—T.: *B. insignis* Schrad.	
ANCISTROCLADACEAE	
5400. **Ancistrocladus** Wall. Cat. (1829) n. 1052, nomen; Wight et Arn. Prodr. I. (1834), 107, in obs.; Planch. in Ann. Sc. Nat., Sér. 3, XIII. (1850) 317.—T.: *A. hamatus* (Vahl) Gilg.	*Bembix* Lour. Fl. Cochinch. (1790) 282. *Wormia* Vahl in Skrift. Nat. Selsk. Kjoeb. VI. (1810) 104; non Rottb. (1783). *Bigamea* König ex Endl. Gen. (1840) 1183.
OLINIACEAE	
5428. **Olinia** Thunb. in Roem. Arch. II. (1799) 4.—T.: *O. cymosa* Thunb.	*Plectronia* L. Mant. I. (1767) 6, 52, excl. fruct. et syn.
THYMELAEACEAE	
5457. **Ovidia** Meissn. in DC. Prodr. XIV. (1857) 524; non Rafin. Fl. Tellur. III. (1836) 68.—T.: *O. Pillo-Pillo* (Gay) Meissn. ex Domke.	
——. **Synandrodaphne** Gilg in Engl. Jahrb. LIII. (1915) 362; non Meissn. in DC. Prodr. XV. pars 1 (1864), 176.—T.: *S. paradoxa* Gilg.	
COMBRETACEAE	
5538. **Combretum** L. in Loefl. Iter. Hisp. (1758) 308; L. Syst. ed. 10 (1759), 999.—T.: *C. fruticosum* (Loefl.) Fawcett et Rendle.	*Grislea* L. Sp. Pl. ed. 1 (1753), 348.

NOMINA CONSERVANDA	NOMINA REJICIENDA
MYRTACEAE	
5585. **Piliocalyx** Brongn. et Gris in Bull. Soc. Bot. France, XII. (1865) 185 ; et in Ann. Sc. Nat., Sér. 5, III. (1865) 225 ; non *Pileocalyx* Gasparry in Rendic. Accad. Sc. Napoli, VI. (1847) 409 ; et in Ann. Sc. Nat., Sér. 3, IX. (1848) 221.—T. : *P. robustus* Brongn. et Gris.	
MELASTOMATACEAE	
5632. **Pterolepis** Miq. Comm. Phytogr. (1839) 72 ; non Schrad. in Goett. Gel. Anzeig. (1821) 2071, nom. rejic.—T. : *Osbeckia parnassiifolia* DC.=*Pterolepis parnassiifolia* (DC.) Triana.	*Brachyandra* Naud. in Ann. Sc. Nat., Sér. 3, II. (1844) 143.
5648. **Microlepis** (DC.) Miq. Comm. Phytogr. fasc. II. (1839) 71 ; non Eichwald, Casp. Cauc. (1831) 2.—T. : *Osbeckia oleifolia* DC. =*Microlepis oleifolia* (DC) Triana.	*Ancistrodesmus* Naud. in Ann. Sc. Nat., Sér. 3, XIII. (1849) 302.
5669. **Cambessedesia** DC. in DC. Prodr. III. (1828) 110 ; non *Cambessedea* Kunth in Ann. Sc. Nat. III. (1824) 336.—T. : *C. Hilariana* (Kunth) DC. (*Rhexia Hilariana*).	*Acipetalum* Turcz. in Bull. Soc. Nat. Mosc. XXI. pars 1 (1848), 577, partim.
5676. **Rhynchanthera** DC. in DC. Prodr. III. (1828) 106 ; non Blume, Tabell. Jav. Orch. (1825) 78.—T. : *R. grandiflora* (Aubl.) DC.	
5692. **Meriania** Swartz, Fl. Ind. Occ. II. (1800) 823, t.15 ; non Trew, Pl. Select. Pinx. Ehret (1754), 11, t.40, nom. rejic.—T. : *M. leucantha* Swartz.	*Davya* DC. in DC. Prodr. III. (1825) 108.
5708. **Bertolonia** Raddi in Mem. Soc. Ital. Sc. XVIII. (1820) 384, t.5, fig. 3 ; non Spin, Cat. Jard. St. Sebast. (1809) 24.—T. : *B. nymphaeifolia* Raddi.	*Triblema* R. Br. apud Spreng. Gen. I. (1830) 342.
5768. **Bellucia** Neck. Elem. II. (1790) 142 ; non *Belluccia* Adans. Fam. Pl. II. (1763) 344.—T. : *B. grossularioides* (L.) Triana.	*Apatitia* Desv. in Hamilt. Fl. Ind. Occ. (1825) 42.
UMBELLIFERAE	
5938. **Anthriscus** [Pers. Syn. I. (1805), 320, partim] Hoffm. Umbellif. I. (1814) 38 ; non Bernh. Syst. Verz. Pfl. Erfurt, 113 (1800).—T. : *A. vulgaris* Pers.=*A. Caucalis* Marsch. Bieb.	*Chaerefolium* Haller, Hist. I. (1768) 327 [forsan lapsus pro "*Cerefolium*"]. *Cerefolium* Haller, Hist. I. (1768) 328, et l.c. III. 193 ; Haller, Nomenclator (1769), 69. *Elaeosticta* Fenzl in Flora, XXVI. (1843) 458.
5964. **Scaligeria** DC. Mém. V. (1829) 70 ; non *Scaligera* Adans. Fam. Pl. II. (1763) 323.—T. : *S. microcarpa* DC.	
5977. **Tauschia** Schlecht. in Linnaea, IX. (1835) 607 ; non Preissler in Flora, XI. (1828) 44.—T. : *T. nudicaulis* Schlecht.	
5990. **Lichtensteinia** Cham. et Schlecht. in Linnaea, I. (1826) 394 ; non Willd. in Mag. Ges. Nat. Fr. Berlin, II. (1808) 19 ; nec Wendl. Coll. Pl. II. (1808) 4.—T. : *L. lacera* Cham. et Schlecht.	
6014. **Trachyspermum** Link, Enum. I. (1821) 267.—T. : *T. Ammi* (L.) Sprague (*T. copticum* Link).	*Ammios* Moench, Meth. (1794) 99.
6045. **Polemannia** Eckl. et Zeyh. Enum. (1837) 347 ; non Berg. ex Schlecht. in Linnaea, I. (1826) 250.—T. : *P. grossulariifolia* Eckl. et Zeyh.	
6058. **Schulzia** Spreng. Pl. Umbellif. Prodr. (1813) 30 ; non *Schultzia* Rafin. in Med. Repos. N. York, V. (1808) 350.—T. : *S. crinita* (Pall.) Spreng. (*Sison crinitus*).	
6099. **Bonannia** Guss. Fl. Sicul. Syn. I. (1842) 355 ; non Rafin. Specchio, I. (1814) 115 ; nec C. Presl, Fl. Sicul. I. (1826) 99.—T. : *B. resinifera* (Guss.) Guss.=*B. graeca* (L.) Haláczy.	
ERICACEAE	
6200. **Lyonia** Nutt. Gen. I. (1818) 266 ; non Rafin. in Med. Repos. N. York, V. (1808) 353 ; nec Ell. Sketch Bot. S. Carol. I. (1817) 316.—T. : *L. ferruginea* Nutt.	*Xolisma* Rafin. in Am. Monthly Mag. IV. (1819) 193.

NOMINA CONSERVANDA	NOMINA REJICIENDA
EPACRIDACEAE	
6254. **Richea** R. Br. Prodr. (1810) 555; non Labill. Voy. I. (1798) 186, t.16; nec *Richaeia* Petit-Thouars, Gen. Nov. Madag. (1806) 25 (corr. *Richea* Post et Kuntze, Lexic. 485: 1903).—T.: *R. dracophylla* R. Br.	*Cystanthe* R. Br. Prodr. (1810) 555.
6262, partim. **Leucopogon** R. Br. Prodr. (1810) 541.—T.: *L. lanceolatus* (Sm.) R. Br.	*Perojoa* Cav. Ic. IV. (1797) 29, t.349.
DIAPENSIACEAE	
6275. **Shortia** Torr. et Gray in Am. Journ. Sc., Ser. 1, XLII. (1842) 48, et l.c. Ser. 2, XLV. (1868) 402; non Rafin. Autikon Botanikon (1840), 16; Pennell in Bull. Torr. Bot. Cl. XLVIII. (1921) 92.—T.: *S. galacifolia* Torr. et Gray.	*Sherwoodia* House in Torreya, VII. (1908) 234.
6277. **Galax** L. Sp. Pl. ed. 1 (1753), 200, partim; emend. Nutt. Gen. I. (1818) 145; non L. Gen. Pl. ed. 5 (1754), 93.—T.: *G. aphylla* L.	*Erythrorhiza* Michx. Fl. Bor.-Am. II. (1803) 34, t.36. *Solenandria* Vent. Jard. Malm. (1803) t.69. *Blandfordia* Andr. Bot. Rep. (1804) t.343. *Solenandra* Pers. Syn. II. (1807) 215.
PRIMULACEAE	
6318. **Douglasia** Lindl. in Royal Institution of Great Britain, Quarterly Journ. Sc. Lit. and Arts, Oct. 1827, 385.—T.: *D. nivalis* Lindl.	*Vitaliana* Sesl. in Donati, Auszug seiner Natur-Geschichte des Adriat. Meers, 66, t.[2] fig. X. A–I (1753) (cf. Journ. Bot. LXXII. 293: 1934).
PLUMBAGINACEAE	
6350. **Armeria** Willd. Enum. Pl. Hort. Berol. (1809) 333. T.: *A. vulgaris* Willd.	*Statice* L. Sp. Pl. ed. 1 (1753), 274, partim; emend. Mill. Gard. Dict. Abridg. ed. 4 (1754).
6351. **Limonium** Mill. Gard. Dict. Abridg. ed. 4 (1754).—T. *L. vulgare* Mill.	*Statice* L. Sp. Pl. ed. 1 (1753), 274, partim; emend. Willd. Enum. Pl. Hort. Berol. (1809) 335.
SAPOTACEAE	
6365. **Labatia** Swartz, Prodr. Veg. Ind. Occ. (1788) 32; non Scop. Introd. (1777) 197.—T.: *L. sessiliflora* Swartz.	
6382. **Niemeyera** F. Muell. Fragm. VII. (1870) 114; non F. Muell. Fragm. VI. (1867) 96.—T.: *N. prunifolia* F. Muell.	
6384. **Cryptogyne** Hook. f. in Benth. et Hook. f. Gen. Pl. II. (1876) 656; non Cass. Dict. Sc. Nat. I. (1827) 491, 498.—T.: *C. Gerardiana* Hook. f.	
EBENACEAE	
6408. **Brachynema** Benth. in Trans. Linn. Soc. XXII. (1857) 125, t.22; non Griff. Notul. IV. (1854) 176.—T.: *B. ramiflorum* Benth.	
OLEACEAE	
6422. **Schrebera** Roxb. Pl. Coromand. II. (1798) 1, t.101; non L. Sp. Pl. ed. 2 (1763), 1662, nomen confusum; nec Retz. Obs. Bot. VI. (1791) 25, t.3; nec Thunb. Prodr. Pl. Cap. (1794) 28, t.2.—T.: *S. swietenioides* Roxb.	*Nathusia* Hochst. in Flora, XXIV. pars 2 (1841), 671.
LOGANIACEAE	
6468. **Peltanthera** Benth. in Benth. et Hook. f. Gen. Pl. II. (1876) 797; non Roth, Nov. Sp. Pl. (1821) 132.—T.: *P. floribunda* Benth.	
GENTIANACEAE	
6501. **Bartonia** Mühlenb. ex Willd. in Neue Schrift. Ges. Naturf. Fr. Berlin, III. (1801) 444.—T.: *B. tenella* Mühlenb. ex Willd.	*Agina* Neck. Elem. II. (1790) 153.
6526. **Schultesia** Mart. Nov. Gen. et Sp. II. (1827) 103, tt.180–2; non Spreng. Pugill. II. (1815) 17; nec Schrad. in Gött. Gel. Anz. I. (1821) 708; nec Roth, Enum. Pl. Phanerog. Germ. I. (1827) 690.—T.: *S. crenuliflora* Mart.	*Floyeria* Neck. Elem. I. (1790) 388.

NOMINA CONSERVANDA	NOMINA REJICIENDA
APOCYNACEAE	
6564. **Willughbeia** Roxb. Pl. Coromandel, III. (1819) 77, t.280 ; non Scop. in Schreb. Gen. I. (1789) 162 ; nec *Willughbaeya* Neck. Elem. I. (1790) 82, nomen rejic.—T. : *W. edulis* Roxb.	*Ancylocladus* [Wall. Pl. As. Rar. III. (1832) 45, nomen provisorium ;] Kuntze, Rev. Gen. II. (1891) 412 ; Pierre in Bull. Soc. Linn. Par. n. s. I. (1898–1899) 94.
	Pala Juss. in Ann. Mus. Paris, XV (1810) 346.
6583. **Alstonia** R. Br. in Mem. Werner. Soc. I. (1809) 75 ; non Scop. Introd. (1777) 198 ; nec Mutis apud L. f. Suppl. (1781) 39.—T. : *A. scholaris* (L.) R. Br. (*Echites scholaris*).	
6639. **Urceola** Roxb. in Asiat. Research. V. (1798) 169 ; non Vand. Fl. Lusit. et Bras. Sp. (1788) 8, t.1, fig. 4 ; Roem. et Schult. Syst. III. (1818) 99 ; nec Quelet, Ench. Fung. (1886) 320.—T. : *U. elastica* Roxb.	*Chavannesia* A. DC. in DC. Prodr. VIII. (1844) 444.
6670. **Spirolobium** Baill. in Bull. Soc. Linn. Paris (1889), 773 ; non Orb. Voy. Amér. Merid. VII. pars 1, Sert. Patag. (1839) t.13.—T : *S. cambodianum* Baill.	
6691. **Parsonsia** R. Br. in Mem. Werner. Soc. I. (1809) 64 ; non P. Br. Nat. Hist. Jam. (1756) 199.—T. : *Periploca capsularis* Forst.	*Helygia* Blume, Bijdr. XVI. (1826) 1043.
6702. **Prestonia** R. Br. in Mem. Werner. Soc. I. (1809) 69 ; non Scop. Introd. (1777) 281.—T. : *P. tomentosa* R. Br.	*Exothostemon* G. Don, Gen. Syst. IV. (1838) 82.
	Haemadictyon Lindl. in Trans. Hortic. Soc. VI. (1825) 70.
ASCLEPIADACEAE	
6726. **Camptocarpus** Decne. in DC. Prodr. VIII. (1844) 493 ; non Koch in Linnaea, XVII. (1843) 304.—T. : *C. mauritiana* (Poir.) Decne. (*Periploca mauritiana*).	
6772. **Schubertia** Mart. et Zucc. Nov. Gen. et Sp. Pl. I. (1824) 55, t.33 ; non Mirbel in Nouv. Bull. Soc. Philom. III. (1812) 123.—T. : *S. multiflora* Mart. et Zucc.	

6889. **Pectinaria** Haw. Suppl. Pl. Succul. (1819) 14 ; non Bernh. Syst. Verz. Pfl. Erfurt (1800), 113.—T. : *P. articulata* Haw.	
CONVOLVULACEAE	
6979, partim. **Bonamia** Thouars in Dict. Sc. Nat. V. (1804) 145 ; Hist. Vég. Isl. Afr. (1805) 17, t.8 ; non *Bonamya* Neck. Elem. I. (1790) 316.—T. : *B. madagascariensis* Poir.	
HYDROPHYLLACEAE	
7022. **Nemophila** Nutt. in Barton, Fl. N. Am. II. (1822) 71.—T. : *N. phacelioides* Nutt.	*Galax* L. Sp. Pl. ed. 1 (1753), 200, partim ; Gen. Pl. ed. 5 (1754), 93.
	Viticella Mitchell, Diss. Brevis Bot. et Zool. (1769) 42.
7033. **Nama** L. Syst. ed. 10 (1759), 950, partim, emend. Choisy in DC. Prodr. X. (1846) 182 ; non L. Sp. Pl. ed. 1 (1753), 226.—T. : *N. jamaicensis* L.	*Conanthus* S. Wats. Bot. King's Exped. (1871) 256.
	Marilaunidium Kuntze, Rev .Gen. II. (1891) 434.
7035. **Wigandia** H.B.K. Nov. Gen. et Sp. III. (1818) 126 ; non Neck. Elem. I. (1790) 95.—T. : *W. caracasana* H.B.K.	*Cohiba* Rafin. Fl. Tellur. III. (1836) 75.
BORAGINACEAE	
7042. **Bourreria** P. Br. Nat. Hist. Jam. (1756) 168 ; Jacq. Enum. Pl. Carib. II. (1760) 14 ; non *Beureria* Ehret, Pl. et Papil. Rar. (1755) t.13.—T. : *B. succulenta* Jacq. (*Cordia Bourreria* L.)	*Morelosia* La Llave et Lex. Nov. Veg. Descr. I. (1824) 1.
7124. **Rochelia** Reichb. in Flora, VII. (1834) 243 ; non Roem. et Schult. Syst. IV. pars 11 (1819), 108.—T. : *R. saccharata* Reichb. =*R. disperma* (L.) Wettst.	*Raclathris* Rafin. Sylva Tellur. (1838) 167.
——. †**Vaupelia** Brand in Fedde, Repert. XIII. (1914) 82 ; non *Vaupellia* Griseb. Fl. Brit. W. Ind. (1861) 460.—T. : *V. barbata* (Vaupel) Brand.	*Maccoya* F. Muell. Fragm. I. (1859) 127.

NOMINA CONSERVANDA	NOMINA REJICIENDA
VERBENACEAE	
7139. **Urbania** Philippi, Verz. Pfl. Antofagasta u. Tarap. (1891) 60; non Vatke in Oesterr. Bot. Zeitschr. XXV. (1875) 10.—T.: *U. pappigera* Philippi.	
7157. **Casselia** Nees et Mart. in Nov. Act. Acad. Leop.-Carol. XI. (1823) 73, t.6; non Dumort. Comm. Bot. (1822) 21.—T.: *C. serrata* Nees et Mart.	
——. **Xerocarpa** H. J. Lam, Verbenac. Mal. Arch. (1919) 98; non Spach, Hist. Veg. Phan. IX. (1840) 583.—T.: *X. avicenniifoliola* H. J. Lam.	
LABIATAE	
7227. **Stenogyne** Benth. in Bot. Reg. XV. (1830) sub t. 1292; non Cass. in Dict. Sc. Nat. L. (1827) 491, 493.—T.: *S. rugosa* Benth.	
7306. **Saccocalyx** Coss. et Dur. in Ann. Sc. Nat., Sér. 3, XX. (1853) 80; non Stev. in Bull. Soc. Nat. Mosc. IV. (1832) 269.—T.: *S. satureioides* Coss. et Dur.	
7346. **Alvesia** Welw. in Trans. Linn. Soc. XXVII. (1869) 55; non Welw. Apont. (1859) 587, no. 47.—T.: *A. rosmarinifolia* Welw.	
SOLANACEAE	
7392. **Triguera** Cav. Diss. II. (1786) App., p. 1, t. A.; non Cav. Diss. I. (1785) 41, t.11.—T.: *T. ambrosiaca* Cav.	
7414. **Solandra** Swartz in Vet. Akad. Handl. Stockh. VIII. (1787) 300, t.11; non L. Syst. ed. 10 (1759), 1269; nec Murr. in Comm. Goett. 1783–4, VI. (1785) 21, t.1.—T.: *S. grandiflora* Swartz.	[*Swartzia* J. F. Gmel. Syst. II. (1791) 360; non Schreb. (1791), nom. conserv.]
SCROPHULARIACEAE	
7510. **Tetranema** Benth. in Bot. Reg. [XXIX.] (1843) t.52; non Sweet, Hort. Brit. ed. 2 (1830), 149.—T.: *T. mexicanum* Benth.	
BIGNONIACEAE	
7668. **Cuspidaria** DC. in Bibl. Univ. Genève, XVII. (1838) 125 (seors. 9); non Link, Handb. Gewächse, II. (1831) 315.—T.: *C. pterocarpa* (Cham.) DC. (*Bignonia pterocarpa*).	*Nouletia* Endl. Gen. (1841) 1407. [*Lochmocydia* Mart. ex DC. in DC. Prodr. IX. (1845) 177, pro. syn.]
7673. **Haplolophium** Cham. corr. Endl. Gen. (1839) 712.—T.: *H. bracteatum* Cham.	*Aplolophium* Cham. in Linnaea, VII. (1832) 556.
7697. **Lundia** DC. in Bibl. Univ. Genève, XVII. (1838) 127; et in Ann. Sc. Nat., Sér. 2, Bot. XI. (1839) 289; non Schum. et Thonn. Beskr. Guineiske Pl. II. (1828) 5.—T.: *L. glabra* DC.	*Craterotecoma* Mart. ex DC. in DC. Prodr. IX. (1845) 215.
GESNERIACEAE	
7808. **Oreocharis** Benth. in Benth. et Hook. f. Gen. Pl. II. (1876) 1021; non "Decaisne" Lindl. Veg. Kingd. ed. 1 (1846), 656.—T.: *Didymocarpus Oreocharis* Hance=*Oreocharis Benthami* C. B. Clarke.	
7824. **Aeschynanthus** Jack in Trans. Linn. Soc. XIV. (1823) 42, t.2, fig. 3.—T.: *A. volubilis* Jack.	*Trichosporum* D. Don in Edinb. Phil. Journ. VII. (1822) 84.
7835. **Acanthonema** Hook. f. in Bot. Mag. LXXXVIII. (1862) t.5339; non J. G. Agardh in Svensk. Vet. Akad. Handl. (1846) 13.—T.: *A. strigosum* Hook. f.	
7853. **Mitraria** Cav. in Ann. Cienc. Nat. III. (1801) 230, t.31; non J. F. Gmel. Syst. II. (1791) 799.—T.: *M. coccinea* Cav.	*Diplocalyx* C. Presl, Bot. Bemerk. (1844) 146.
7866. †**Codonanthe** (Mart.) Hanst. in Linnaea, XXVI. (1854) 209; non *Codonanthus* G. Don, Gen. Syst. IV. (1837) 166, genus dubium; nec *Codonanthus* Hassk. in Flora, XXV. Beibl. II. (1842) 24, nomen nudum.—T.: *C. aggregata* (Mart.) Hanst. (*Hypocyrta aggregata*).	*Coccanthera* C. Koch ex Hanst. in Ind. Sem. Hort. Berol. (1855) 17.
7878. †**Seemannia** Regel in Gartenfl. IV. (1855) 183, t.126 [non Hook. Lond. Journ. Bot. VII. (1848) 567, nomen provisorium.]—T.: *S. ternifolia* Regel=*S. sylvatica* (H.B.K.) Hanst.	*Fritschiantha* Kuntze, Rev. Gen. III. pars 2 (1898), 241.

NOMINA CONSERVANDA	NOMINA REJICIENDA
ACANTHACEAE	
7914. **Thunbergia** Retz. in Phys. Saellsk. Handl. I. (1776) 163; non Montin in Vet. Akad. Handl. Stockholm (1773), 288, t.11.—T.: *T. capensis* Retz.	*Flemingia* Roxb. ex Rottl. in Neue Schrift. Ges. Naturf. Fr. IV. (1803) 202; non Roxb. ex Ait. (1812). *Diplocalymma* Spreng. Neue Entdeck. III. (1822) 30.
7972. **Crabbea** Harv. in Hook. Lond. Journ. Bot. I. (1842) 26; non Harv. Gen. S. Afr. Pl. (1838) 276.—T.: *C. hirsuta* Harv.	
8028. **Tetramerium** Nees in Benth. Bot. Voy. Sulphur (1844), 147, t.48; non Gaertn. f. Fruct. III. (1805) 90, t.196.—T.: *T. polystachyum* Nees.	*Henrya* Nees in Benth. Bot. Voy. Sulphur (1844), 148, t.49.
8039. **Mackaya** Harv. Thes. Cap. I. (1859) 8, t.13; non Arn. in Mag. Zool. and Bot. II. (1838) 550.—T.: *M. bella* Harv.	
8100. **Trichocalyx** I. B. Balf. in Proc. Roy. Soc. Edinb. XII. (1884) 87; non Schau. in Nov. Act. Acad. Nat. Cur. XIX. Suppl. II. (1841) 238, nomen superfl.—T.: *T. obovatus* I. B. Balf.	
RUBIACEAE	
8130. **Lerchea** L. Mant. II. (1771) 155; non *Lerchia* Zinn, Catal. Pl. Goett. (1757) 30.—T.: *L. longicauda* L.	*Codaria* L. ex Benn. Pl. Jav. Rar. (1838) 99; Kuntze, Rev. Gen. I. (1891) 279. *Rotheria* Meyen, Reise, I. (1834) 402.
8158. **Cruckshanksia** Hook. et Arn. in Hook. Bot. Misc. III. (1833) 361; non Hook. et Arn. l.c. II. (1831) 211, t.90.—T.: *C. hymenodon* Hook. et Arn.	
8162. **Payera** Baill. in Bull. Soc. Linn. Paris, I. (1878) 178; non *Payeria* Baill. in Adansonia, I. (1860–61) 50, t.3.—T.: *P. conspicua* Baill.	
8181. **Wendlandia** Bartl. Ordin. (1830) 211; et ex DC. Prodr. IV. (1830) 411; non Willd. Sp. Pl. II. (1799) 275, nomen rejic.—T.: *W. paniculata* DC.	
8183. **Augusta** Pohl in Flora, XII. (Feb. 1829) 118; non Leandro in Denkschr. Akad. Muench. VII. (1819) 235, nomen rejic.; nec *Augustia* Klotzsch in Monatsb. Berlin Akad. (Martio 1854) 124; Abh. Akad. Berlin (1854) 80.—T.: *A. lanceolata* Pohl=*A. longifolia* (Spreng.) Rehder (*Ucriana longifolia*).	[*Ucriana* Spreng. Syst. I. (1825) 516, 761, partim; non Willd. Sp. Pl. I. (1797) 961.] *Schreibersia* Pohl in Endl. Gen. (1838) 553.
8215. **Schizocalyx** Wedd. in Ann. Sc. Nat., Sér. 4, I. (1854) 73; non Scheele in Flora, XX. pars 1 (1843) 575; nec Hochst. in Flora, XXVII. Beil. I. (1844).—T.: *S. bracteosa* Wedd.	
8244. **Coptophyllum** Korth. in Ned. Kruidk. Arch. II. (1851) 161; non Gardn. in Hook. Lond. Journ. Bot. I. (1842) 133.—T.: *C. bracteatum* Korth.	
8265. **Pentagonia** Benth. Bot. Voy. Sulphur (1844), 105; non Heist. ex Fabricius, Enum. Pl. Helmstad. (1759) 184, nom. rejic.; nec *Pentagonium* Schau. in Nova Acta Nat. Cur. XIX. Suppl. 1 (1843), 364.—T.: *P. macrophylla* Benth.	*Watsonamra* Kuntze, Rev. Gen. I. (1891) 302.
8285. **Gardenia** Ellis in Phil. Trans. LI. (1761) 935, t.23, Soland. l.c. LII. (1762) 654, t.20; Phil. Trans. Abridg. XI. (1809) 508, 669, t.15, fig. A–E; non Colden, Essays Edinb. II. (1756) 1; Boehm. in Ludw. Def. ed. 3 (1760), 292.—T.: *G. jasminoides* Ellis.	*Warneria* L. Amoen. Acad. IV. (1759) 138. *Varneria* L. l.c. 136.
8296. **Villaria** Rolfe in Journ. Linn. Soc., Bot. XXI. (1884) 311; non Schreb. Gen. II. (1791) 685; nec Batty, Notice Hist. sur Villar (1858), cf. Bull. Soc. Bot. France, V. (1858) 309; nec *Vilaria* Guett. Mém. Minéral Dauphiné, I. Préf. p. clxx. et II. (1779) t.19; nec *Villaria* Guett. ex DC. Prodr. VI. (1837) 542, pro syn.—T.: *V. philippinensis* Rolfe.	
8312. **Zuccarinia** Blume, Bijdr. (1826) 1006; non Maerklin in Ann. Ges. Wetterau, II. (1811) 252; nec Spreng. Syst. IV. Cur. Post. (1827) 50; Spreng. Gen. I. (1830) 169.—T.: *Z. macrophylla* Blume.	
8353. **Mesoptera** Hook. f. in Benth. et Hook. f. Gen. Pl. II. (1873) 130; non Rafin. Fl. Tellur. IV. (1836) 49.—T.: *M. Maingayi* Hook. f.	

NOMINA CONSERVANDA	NOMINA REJICIENDA
RUBIACEAE	
8357. **Cuviera** DC. in Ann. Mus. Paris, IX. (1807) 222, t.15; non Koeler, Descr. Gram. Gall. et Germ. (1802) 328.—T.: *C. acutiflora* DC.	
8388. **Psilanthus** Hook. f. in Hook. Ic. Pl. (1873) t.1129; non Juss. in Ann. Mus. Paris, IV. (1805) 396, nomen; nec Roem. Syn. Pepon. (1846) 198; nec *Psilosanthus* Neck. Elem. I. (1790) 69, nom. rejic.—T.: *P. Mannii* Hook. f.	
8397. **Trichostachys** Hook. f. in Benth. et Hook. f. Gen. Pl. II. (1873) 128; non Welw. Synops. (1862) 19.—T.: *T. longifolia* Hiern.	
8412. **Lasianthus** Jack in Trans. Linn. Soc. XIV. (1823) 125; non Adans. Fam. Pl. II. (1763) 398.—T.: *L. cyanocarpus* Jack.	*Dasus* Lour. Fl. Cochinch. (1790) 141.
——. **Robynsia** Hutchinson in Hutchinson et Dalziel, Fl. W. Trop. Afr. II. (1931) 108; non Drapiez in Lem. Hort. Univ. II. (1841) 127, 231; nec Mart. et Gal. in Bull. Acad. Brux. X. pars 2 (1843), 193.—T.: *R. glabrata* Hutch.	
DIPSACACEAE	
8541. **Cephalaria** Schrad [Ind. Sem. Hort. Gotting. 1814, 2, sine descr.] ex Roem. et Schult. Syst. Veg. III. (1818) 1, 43.—T.: *C. alpina* (L.) Roem. et Schult.	*Lepicephalus* Lag. Gen. et Sp. Nov. (1816) 7.
STYLIDIACEAE	
8724. **Stylidium** Swartz in Willd. Sp. Pl. IV. (1805) 7, 146; et in Mag. Ges. Naturf. Fr. Berlin, I. (1807), 48, tt.1, 2; et l.c. V. (1811) 89; non Lour. Fl. Cochinch. (1790) 220.—T.: *S. graminifolium* Swartz.	*Candollea* Labill. in Ann. Mus. Paris, VI. (1805) 453. [*Ventenatia* Sm. Exot. Bot. II. (1806) 13, tt.66, 67; non Cav. (1797); nec Koel. (1802), nom. utique conserv.] *Forsteropsis* Sond. in Lehm. Pl. Preiss. I. (1845) 393.
COMPOSITAE	
8761. **Piptolepis** Sch. Bip. in Pollichia, XX.-XXI. (1863) 380; non Benth. Pl. Hartweg. (1840) 29.—T.: *P. ericoides* Sch. Bip.	
8772. **Soaresia** Sch. Bip. in Pollichia, XX-XXI. (1863) 376; non Fr. Allem. in Rev. Bras. I. (1857) 210; et in Arch. Palestra Sc. Rio de Janeiro (1858), 142.—T.: *S. velutina* Sch. Bip.	
8808. **Brachyandra** Philippi [in Bot. Zeit. XV. (1857) 681, nomen;] Fl. Atac. (1860) 34, t.4; non Naud. in Ann. Sc. Nat., Sér. 3, II. (1841) 143.—T.: *B. macrogyne* Philippi.	*Leto* Philippi in Ann. Mus. Nac. Chile (1891), 33.
8840. **Bradburia** Torr. et Gray, Fl. N. Am. II. (1841) 250; non *Bradburya* Rafin. Fl. Ludovic. (1817) 104.—T.: *B. hirtella* Torr. et Gray.	*Mauchia* Kuntze, Rev. Gen. I. (1891) 352.
8843. **Chiliophyllum** Philippi in Linnaea, XXXIII. (1864) 132; non DC. in DC. Prodr. V. (1836) 554.—T.: *C. densifolium* Phil.	
8852. **Haplopappus** Cass. corr. Endl. Gen. (1837) 385.—T.: *H. glutinosus* Cass.	*Aplopappus* Cass. in Dict. Sc. Nat. LVI. (1826) 168. *Hoorebeckia* Cornelissen in Mussch. Hort. Gand. (1817) 120.
8855. **Bigelowia** DC. in DC. Prodr. V. (1836) 329; non Rafin. in Journ. Phys. Chim. Hist. Nat. LXXXIX. (1819) 289, sphalmate "*Bigelonia*"; nec *Bigelovia* Sm. in Rees, Cyclop. XXXIX. (1819); nec Spreng. Neue Entdeck. II. (1821) 150; nec Spreng. Syst. I. (1825) 366, 404; nec *Bigelowia* DC. ex Gingins in DC. Prodr. I. (1824) 290, pro syn.—T.: *B. nudata* (Michx.) DC.	*Chondrophora* Rafin. New Fl. N. Am. IV. (1836) 79.
8887. **Amellus** L. Syst. Nat. ed. 10, II. (1759) 1225; non P. Br. Nat. Hist. Jam. (1756) 317; T.: *A. lychnites* L.	*Haenelia* Walp. Repert. Bot. Syst. II. (1843) 974.
8909. **Celmisia** Cass. [in Dict. Sc. Nat. XXXVII. (1825) 259, partim] ex DC. in DC. Prodr. V. (1836) 210; non Cass. in Bull. Soc Philom. (1817) 32.—T.: *C. longifolia* Cass.	*Elcismia* B. L. Robinson in Proc. Amer. Acad. XLIX. (1913) 511.

NOMINA CONSERVANDA	NOMINA REJICIENDA
COMPOSITAE	
8916. **Olearia** Moench, Meth. Suppl. (1802) 254.—T.: *O. tomentosa* (Wendl.) DC.	*Shawia* J. R. et G. Forst. Char. Gen. (1776) 95, t.48.
8918. **Sommerfeltia** Less. Syn. Compos. (1832) 189; non *Sommerfeldtia* Schumach. et Thonn. Beskr. Guin. Pl. (1827) 331; nec *Sommerfeltia* Flörke apud Sommerfeldt in K. Norske Vidensk. Skrift. II. pars 2 (1827), 60.—T.: *S. spinulosa* (Spreng.) Less.	
8994. **Cassinia** R. Br. in Trans. Linn. Soc. XII. (1817) 126; non R. Br. ex Ait. Hort. Kew. ed. 2, V. (1813) 184.—T.: *C. aculeata* (Labill.) R. Br.	*Chromochiton* Cass. in Dict. Sc. Nat. LVI. (1828) 220. *Achromolaena* Cass. l.c. 222. *Apalochlamys* Cass. l.c.223. *Rhynea* DC. in DC. Prodr. VI. (1837) 154.
9006. **Helichrysum** Mill. corr. Pers. Syn. II. (1807) 414.—T.: *H. orientale* Gaertn.	*Elichrysum* Mill. Gard. Dict. Abridg. ed. 4 (1754). *Siloxerus* Labill. Nov. Holl. Pl. Sp. II. (1806) 57, t.209.
9028. **Angianthus** Wendl. Coll. II. (1809) 31, t.48.—T.: *A. tomentosus* Wendl.	
9150. †**Podanthus** Lag. Gen. et Sp. (1816) 24; non *Podanthes* Haw. Syn. Pl. Succ. (1812) 32.—T.: *P. ovatifolius* Lag.	*Euxenia* Cham. in Nees, Hor. Phys. Berol. (1820) 75.
9168. **Selloa** H.B.K. Nov. Gen. et Sp. IV. (1820) 265, t. 395; non Spreng. Nov. Prov. Hort. Halens. et Berol. (1819) 36.—T.: *S. plantaginea* H.B.K.	*Feaea* Spreng. Syst. III. 362 (1826); non *Feea* Borg. (1824).
9192. **Wedelia** Jacq. Enum. Pl. Carib. (1760) 8, 28; non Loefl. Iter. Hisp. (1756) 180, nomen rejic.—T.: *W. fruticosa* Jacq.	*Pascalia* Ortega, Nov. Pl. Matrit. Descr. Dec. (1797) 39.
9208. **Salmea** DC. Cat. Hort. Monspel. (1813) 140; non *Salmia* Cav. Icon. III. (1794) 24, t.246; nec Willd. in Mag. Ges. Nat. Fr. Berlin, V. (1811) 399.—T.: *S. scandens* (L.) DC.	*Hopkirkia* Spreng. Nov. Prov. (1819) 23; Syst. III. (1826) 443. *Fornicaria* Rafin. Sylva Tellur. (1838) 116.
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XIII—NOTES ON CAREX: XII.* E. NELMES.

A NEW MEXICAN SPECIES.

A rather large proportion of the *Carices* collected in Mexico by Mr. & Mrs. E. K. Balls and Mr. W. B. Gourlay are unfortunately not much beyond the flowering stage. This makes identification difficult, especially as herbarium material of Mexican *Carices* is scanty. A further unfortunate result is that several species which are probably new to science are not sufficiently mature for description. One of them, however, is quite well advanced in fruit and is described below.

Carex Ballsii *Nelmes*, sp. nov. ; affinis *C. consorti* C. B. Clarke, sed spicis magis densifloris, squamis marginibus *non* albo-hyalinis, utriculis leviter obliquis inferne compresso-trigonis differt.

Rhizoma caespitosum, validum. *Culmi* validi, erecti, circiter 120 cm. alti, triquetri, faciebus concavi, superne scabri, inferne foliati, basi vaginis aphyllis fuscis circumdati. *Folia* culmis aequilonga, 7–10 mm. lata, rigida, coriacea, marginibus revoluta, glauco-viridia, carinata ; vaginae tenuiter membranaceae, rubido-brunneae, demum parce reticulatim fissae. *Spicae* circiter 20, superioribus 2–3 exceptis binae, androgynaeceae (parte mascula brevi), cylindricae, plerumque 3·5–8 cm. longae, circiter 5 mm. latae, densiflorae, plerumque nutantes, inferiores subapproximatae, aequaliter longipedunculatae, interdum basi breviter ramosae, superiores approximatae, inaequaliter pedunculatae, pedunculis scabriusculis. *Bracteae inferiores* foliaceae, inflorescentiam superantes, brevissime vaginantes, superiores minores vel squamiformes. *Squamae* ovato-ellipticae, atro-castaneae, stramineo-carinatae, plerumque apice muticae. *Utriculi* squamas paullo superantes vel raro eas aequantes, 3·5 mm. longi, superne subinflato-trigoni, inferne compresso-trigoni, oblongo-elliptici, glabri, membranacei, leviter obliqui, demum subpatentes, marginati, enerves, valde stipitati, in rostrum breve ore oblique sectum bidentulum subabrupte contracti. *Nux* oblonga vel oblongo-obovoidea, medio constricta, obliqua. *Stigmata* 3.

MEXICO: Vera Cruz ; Loma-Grande, Mt. Orizaba, 2910 m., 27 April 1938, *Balls & Gourlay* B. 4371.

*Continued from K.B. 1939, 659.

XIV—NOTES ON CAREX: XIII.* E. NELMES.

AFRICAN ALLIES OF C. PENDULA HUDS.

Carex pendula Huds. is one of the better known British *Carices*. It is by no means one of the commonest of our sedges, but its large size and the pendulous habit of its spikes, combined with its gregariousness, make it very conspicuous in late spring.

This species is one of a large number of common European plants which have an almost exclusively European distribution, just extending into west Asia and north Africa. It has, however, spread southwards, like some other *Carices*, and changed its characters on the journey. A species which has hitherto been known as *C. Petitiana* A. Rich. represents it in north-east tropical Africa, *C. Bequaerti* De Wild. replaces this on the more southern mountains of tropical Africa, and, lastly, *C. Mossii* Nelmes completes the long journey to the Cape.

There are no near relatives of *C. pendula* in North America, nor in Asia, and, as we might expect, none either in South America or in Australasia.

It is interesting to note that some of the characters which distinguish these tropical African species from the European *C. pendula* bear a close resemblance to those which differentiate many of the African *Elatae* (see Note IV in this series) from their relatives in south-western Europe. The terminal male spike of Europe tends to become gynaecandrous in tropical Africa, the female spikes are thicker and the whole plant stouter.

I.

When the type material of *Carex Petitiana* A. Rich was recently examined it was found to consist of two very distinct species.

Only one specimen of the some half dozen on the type sheet represents the plant which has been known as *Carex Petitiana* by every authority on the *Cyperaceae* since the publication of the name in 1851 (A. Rich. Tent. Fl. Abyss. **2**, 513). This specimen consists of but a single flowering culm without its basal portion. An analysis of the description of *Carex Petitiana* shows that this insignificant portion of the plant material is clearly referred to by only about one tenth part of the essential points.

The overwhelming part, therefore, of both the material and its description, including the key portion, belongs to another species. This, therefore, I submit, is the true *C. Petitiana* A. Rich. It is intermediate between *C. longipedunculata* K. Schum. and *C. cuprea* (Kükenth.) Nelmes (*C. longipedunculata* K. Schum. subsp. *cuprea* Kükenth.), members of Kükenthal's Section 62 : *Elatae*. Incidentally, when I raised this second plant to specific rank, in 1938, I had no occasion to borrow the type of *C. Petitiana* A. Rich., because this species, as mentioned above, was generally regarded as belonging to a wholly unrelated Section of the genus (Section 46 : *Maximae* Aschers.).

The question of the name of the plant eliminated from the above mentioned material now arises.

The only name cited in synonymy by Kükenthal in Engler's Pflanzenreich under the name *C. Petitiana*, apart from C. B. Clarke's misidentification as *C. pendula* Huds., is *C. anomala* Steud. (Synops. Cyper. 230 : 1855), a later homonym of *C. anomala* Pall. (1808). Boeckeler (Flora, **40**, 411 : 1876) and Clarke (Durand & Schinz, Consp. Fl. Trop. Afr. **5**, 689 : 1894), however, cite *C. robusta* Hochst. mss. as a synonym.

De Wildeman (Pl. *Bequaert.* **4**, 246 : 1927) described a similar plant from the Belgian Congo under the name *C. Bequaerti*. Incidentally, he states that he considers his species belongs to the Section *Elatae* (Pflanzenreich IV.**20**, 645–657), with *C. longipedunculata* K. Schum. as its nearest relative. Actually the *Maximae*, to which *C. Bequaerti* belongs, is a Section far removed from the *Elatae*. This species may be specifically distinct from the Abyssinian plant eliminated from *C. Petitiana*. Its stems are taller ; its spikes are longer, with longer peduncles ; and its glumes darker and more acuminate. There is, however, scarcely any difference between the utricles of these two plants. They are strikingly similar in colour and shape, they are both subinflated and equally short-beaked, and they both contain similar nuts.

Incidentally, this utricle-similarity is also noteworthy between the Abyssinian plant and the European *C. pendula* Huds., and between *C. Bequaerti* De Wild. and a South African relative described below. This group, then, shows a striking constancy in the important utricle character throughout its entire range from Europe to the Cape.

Intermediates of various kinds between the Abyssinian and the Belgian Congo plants have been collected in Abyssinia itself, in Uganda, and in other parts of Tropical Africa.

This material, therefore, needs careful and prolonged study before its constituents can be accurately delimited. If the Abyssinian plant proves to be specifically distinct, I suggest that the epithet " robusta," written by Hochstetter on a sheet of it in the Paris herbarium, would be very appropriate for this giant among sedges.

II.

Specimens collected in Natal, the Transvaal, and neighbouring regions, appear scarcely specifically distinct from *C. Bequaerti*.

There are, however, plants among this southern material which can be considered as a separate species. This has a distinctly smaller, non-inflated utricle, and a differently shaped nut.

The nut character is noteworthy because its variation in the genus is small compared with that of the utricle, in which it is enclosed, and consequently it has little taxonomic value. This is, of course, in striking contrast to the more exposed nut of most other genera of *Cyperaceae*, where it takes on the more important distinguishing rôle of the *Carex* utricle.

Carex Mossii *Nelmes*, sp. nov. ; affinis *C. Bequaerti* De Wild. sed utriculis minoribus non inflatis, nucibus obovoideis praecipue differt.

Folia superiora usque 15 mm. lata, inflorescentiam superantia, supra viridia infra glaucescentia, marginibus scabrida, plana, apicem versus longe acuminata, subcoriacea. *Spicae* 7–9, plerumque 12–15 cm. longae, 5–6 mm. diametro, densiflorae, basi interdum laxiores, terminalis fere apice et basi mascula medio feminea, ceterae femineae (apice breviter masculae), superiores subapproximatae, sessiles vel subsessiles, inferiores remotae, longe exserte pedunculatae. *Bracteae* inferiores foliaceae, inflorescentiam superantes, longe vaginantes, superiores minores, haud vel breviter vaginantes. *Squamae femineae* oblongo-lanceolatae vel ellipticolanceolatae, tenues, pallide brunneae, marginibus anguste albohyalinae, apice saepe excisae, carinatae, mucronulatae. *Utriculi* 2·25–2·5 mm. longi, squamis breviores et latiores, ellipsoidei vel ellipsoideo-obovoidei, haud inflati, indistincte trigoni, membranacei, virides, punctati, glabri, utrinque tenuiter paucinerves, vix stipitati, in rostrum breve teres ore truncatum pallide brunneum leviter excisum subabrupte contracti. *Nux* 1·5 mm. longa, obovoidea, arcte inclusa, puncticulata. *Stigmata* 3.

SOUTH AFRICA : Eastern Cape Province ; Hogsback, 1 January 1927, *C. E. Moss* 999 (Kew, type) ; *Miss E. M. Young* 15, 336.

XV—MISCELLANEOUS NOTES.

The Flora of Madagascar.*—The French are very fortunate, from a biological point of view, in possessing two of the most interesting oceanic islands in the world, namely Madagascar and New Caledonia. Although Madagascar does not appear to loom very large by the side of the African continent, it is nearly as big as France itself, being a thousand miles long and up to three hundred and sixty miles wide. Like most other oceanic islands its fauna and flora are of very great interest, and in this rapidly changing world it is imperative that all possible material and information should be gathered together into museums and herbaria with the least possible delay.

Madagascar was given a wide berth by most of the early voyagers. They were more interested in the riches of the East Indies, and it was not until nearly the end of the nineteenth century that comprehensive collections were made in the more interesting interior parts of

* " Flore de Madagascar (Plantes vasculaires)," Publiée sous les auspices du gouvernement général de Madagascar et sous la direction de H. Humbert, Professeur au Museum Nationale d'Histoire Naturelle. Tananarive, Imprimerie Officielle, 1936.

the island by members of the London Missionary Society. The Rev. R. Baron and others sent a wealth of specimens to Kew from about 1880 onwards, and they were worked out by the late J. G. Baker in numerous papers in various botanical journals.

From the beginning of this century the French have made large collections of plants, those of M. Perrier de la Bathie, and of Professor Humbert, the present director of the Paris Herbarium, who has made several expeditions and discovered many interesting new species, being of great importance. But so far information as to the flora as a whole has only been available in numerous scattered journals and pamphlets, and the need for a " Flora " has been felt for a considerable time. Such a work was commenced in 1936 and has made steady progress under the editorship of Professor Humbert. A departure has been made from the De Candolle system, which has so far usually been followed at the Paris Museum, and the families will eventually fall into their places in the Engler and Prantl system. Each family is published independently and with a separate pagination which may render citation somewhat difficult. There are keys and short descriptions for each species and black and white illustrations here and there. When finished we shall have at last a long-desired complete flora of one of the most interesting islands in the world, rich in endemics and teeming with phytogeographical problems,* and it would be a great pity if the war should be the means of curtailing the progress of so important a work. We earnestly trust that Professor Humbert and his colleagues will be able to bring the work to a successful conclusion.

Magic Gardens.†—Mrs. Rosetta E. Clarkson, Editor of the Herb Journal and the Herb Lovers' Book Club, has provided us with a book about herbs and gardens which possibly no one on this side of the Atlantic could have written with equal charm and enthusiasm. Mrs. Clarkson has long been eminent as a herbalist. Her monthly Herb Journal circulates in every American State, and her library of herbals and old still-room and garden books is one of the finest collections of its kind in the world.

Chapter II deals with herbs in the flower garden, and a useful selection of fragrant kinds may be noted in these well written pages. Chapter III is entitled " Walls and Wattles." Although there is much about these, there is interwoven an equal amount of English history and the progress of gardening is traced during the centuries. When enclosing walls were abandoned for a time, sunk fences became the vogue, just plain ditches dug around the garden area. So instead of being able to see the end of a path ahead, the visitor would suddenly be brought up short with a ditch in front of him :—

* See Hutchinson, Nature, **145**, 448 (1940).

† By Rosetta E. Clarkson. New York : Macmillan & Company, 1939. Pp. xviii + 370, with numerous illustrations from the old herbals and ancient gardening books. Price 15*s*. net.

" The common people called this innovation a *Ha-Ha*, from the expression automatically uttered as the stroller almost pitched into the *fence* below him."

America was a new country when Elizabethans were enjoying their espaliers, pleached alleys, orchards, pleasure and kitchen gardens. New Englanders struggling through the first precarious years were too busy obtaining food, shelter and clothing to give much attention to the refinements of garden construction. But when gardens were established they were naturally modelled on those left behind in Old England. In Virginia gardens developed in true English style with box planted in patterns on lawns. Box hedges were employed because they were so useful to spread out the laundry to dry !

The section of the book devoted to " Mazes and Labyrinths " will be of particular interest to those who have failed to liberate themselves from the famous puzzle at Hampton Court. An illustration of this is given, dating from 1690.

As our space is limited an account of the remainder of this charming book cannot be given, but it will be sufficient to say that there are several more equally interesting chapters, closing with a list of noteworthy herbs and a skilfully set out historical table showing their importance from as far back as 5000 B.C.

Cultivation of Plants in Nutrient Solutions.*—The cultivation of plants in solutions of mineral salts, or in a substratum of sand, cinders or gravel impregnated with nutrient solutions, seems to have become very popular in recent years, judging from the new books on the subject which have been published. The fundamental principles of these methods of cultivation have been known to plant physiologists for a long time, but it is a comparatively new development to cultivate plants by these methods either to produce a decorative effect or for the commercial production of flowers, fruits and vegetables. Those who are interested in this subject will find the recent book on the subject by Turner and Henry very helpful, as the authors have not only outlined the theory of growing plants by these methods, but have also included practical directions for putting them into effect, both on a comparatively small as well as on a commercial scale. Whether the authors' claim that it is possible to produce bigger crops at lower cost than by ordinary cultivation in soil will be substantiated under English conditions remains to be tested. There can be no doubt that culture in nutrient solutions gives very good results when carried out in suitable localities by those who are well versed in the necessary technique, but when one sees the magnificent results obtained in large-scale commercial greenhouses in this country by well established and more

* " Growing Plants in Nutrient Solutions or Scientifically Controlled Growth," by W. I. Turner and V. M. Henry. New York : John Wiley and Sons, Inc. London : Chapman and Hall, Ltd. 1939. Price 18*s*.

orthodox methods of cultivation, the alleged superiority of these newer methods will have to be very clearly demonstrated before large-scale commercial growers will be prepared to adopt them.

C. R. METCALFE.

The Liverworts of West Virginia.*—Local Floras on the *Hepaticae* are not numerous and we therefore welcome the appearance of this small volume on the liverworts of Western Virginia by N. Ammons, a copy of which has been presented to the Library. The flora of the State is relatively rich, since it is traversed by part of the Appalachian Range. The volume follows the customary arrangement of Floras and is provided with keys both to genera and species. It concludes with an extensive bibliography and 26 plates illustrating general habit and microscopical structure of the principal genera. There are some paragraphs on the natural features of the area which lead us to hope that at a later date the author may supplement his treatise by an ecological account.

A Field Key to the Trees and Shrubs of Tanganyika.†—This little "pocket book," will prove indispensable to the field botanist. B. D. Burtt was an enthusiastic collector, and his knowledge and experience over a period of twelve years has gone to the preparation of this booklet. Part I, which has now been issued, though primarily dealing only with genera, includes a certain number of species. It is clearly and compactly arranged and easy to use. The author has taken great pains to make the Key workable, and a warning is given as to possible sources of error, e.g., in the examination of immature leaves or coppiced forms. It is also emphasized that it is purely a "field-key" and not applicable to herbarium work. Part II of the work, which will provide keys for species, will be eagerly awaited by field-workers.

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* "A Manual of the Liverworts of West Virginia," by Nelle Ammons, West Virginia University. Reprinted from "The American Midland Naturalist," vol. 23, no. 1, pp. 3–164, January, 1940, at the University Press, Notre Dame, Indiana.

† "A Field Key to the Savanna Genera and Species of Trees, Shrubs and Climbing Plants of Tanganyika Territory. Part I: Genera and some Species," by B. D. Burtt. Government Printer, Dar es Salaam, 1939. Pp. xvi+53. Price 2*s*.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1940
ROYAL BOTANIC GARDENS, KEW

XVI—NOTES ON SOME GRECIAN SEMPERVIVA.

R. S. Wale

Apart from the account in Halácsy's "Conspectus Florae Graecae," there exists practically no reliable, and certainly no detailed, published information on the Grecian and Albanian *Semperviva*. Praeger, in his "Account of the genus *Sempervivum*" (London: 1932), completely ignored these two countries and submerged *S. marmoreum* Grisebach and *S. Reginae-Amaliae* Held. & Guic., both Grecian in origin, under *S. Schlehani* Schott without comment and contrary to the International Rules of Nomenclature. Older writers give only scanty, or even inaccurate, information thereon, although it was quite clear from these references that there were many *Semperviva* to be found throughout Greece, their specific nature, however, remaining in doubt. No reference was made to Albanian plants, except the mere record of the occurrence of *S. marmoreum* Griseb. and *S. Heuffelii* Schott without further details, but this was to be expected as the difficulties in the way of botanical expeditions to this country were immense.*

In 1937 E. K. Balls visited Greece and spent most of his time in the Epirus and Grammos mountains (see fig. 1). At my request he paid special attention to the *Semperviva* and made a representative collection of specimens. With reference to their distribution he noted (in litt.):

"In answer to your question as to whether *Semperviva* were absent from any area I think that on every high mountain we found some. The central Pindus, about Agrafa, appears to have provided only *S. Heuffelii* and I think that in the Epirean Peristeria there was very little else, the other species we found there was only in very small quantity. Below about 7000 ft. I do not think we found *Semperviva* at all; they were usually pretty high on all the mountains and not nearly so free growing on the southern mountains as on the northern ranges. The Grammos mountains were much more prolific than any others which we visited."

These plants could quite readily be divided into three groups:—*S. Heuffelii* Schott, a number of pubescent plants, and four glabrous specimens.

The four glabrous plants were collected from Mt. Tschumba Petzi, Mt. Kambeecho, and Mt. Skrutsch (three adjoining peaks, between the mountains of Grammos and Mavri Petri, of the Grammos

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* I have now a number of Albanian *Semperviva* in cultivation but as they have not yet flowered description would be premature.

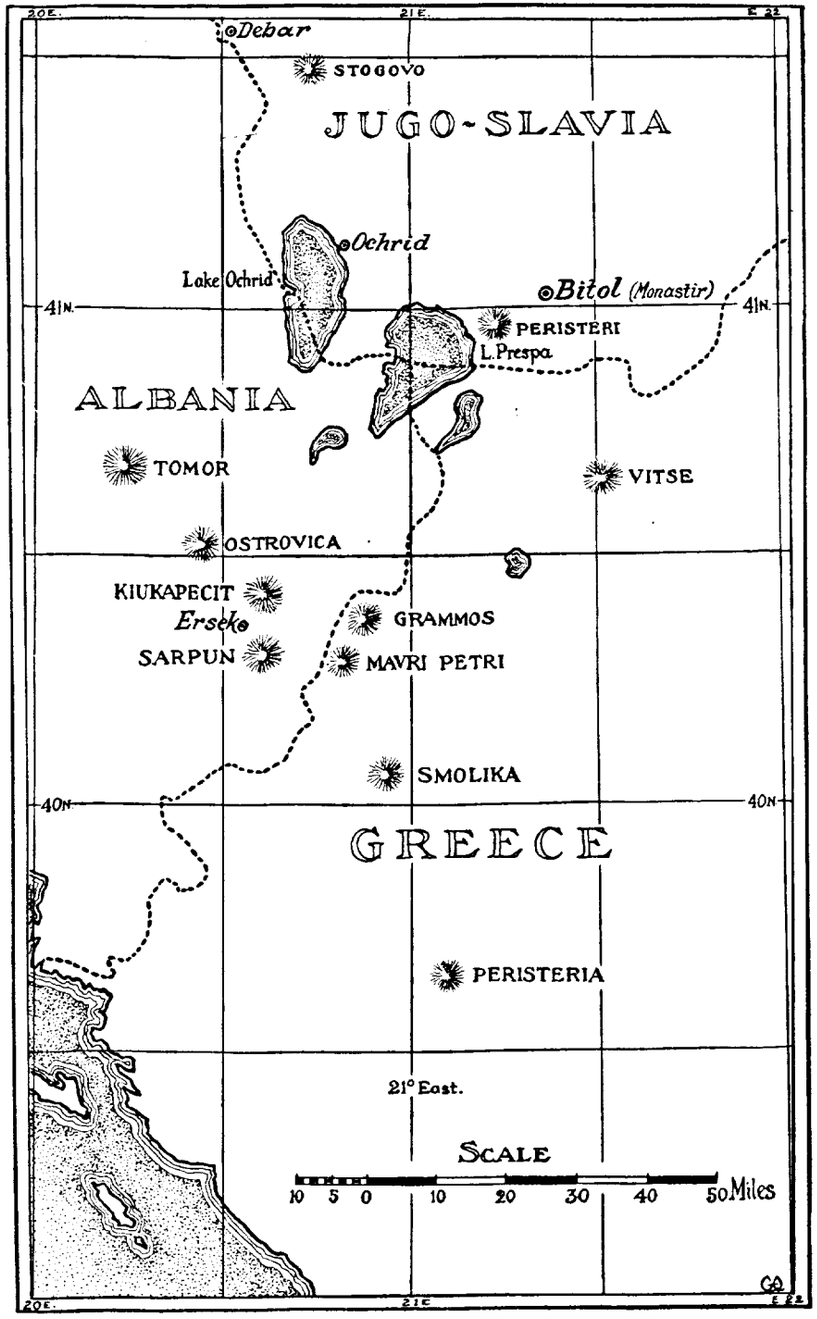


Fig. 1. Sketch map showing mountains referred to in the text.

range on the Albanian-Greek frontier), and from Smolika, which is about twenty-five miles to the south of these. Although these plants showed small individual variations they appeared to belong to a single species which could not be matched with any existing description or material. The Tschumba Petzi plant flowered for the first time in 1939 and is described below as a new species. The Kambeecho and Skrutsch plants have also flowered, though not quite normally, and the one from Smolika has not yet flowered. On continued observation these three plants are sufficiently near to the type to warrant their inclusion, at least for the time being, in this species.

The field note for the Tschumba Petzi plant is as follows :— " B 3961a, Tschumba Petzi near Grammos, 8500 ft., 4.9.37.

This is probably the same as 3961, though growing in very different conditions it appears completely different. Leaves a bright glossy green and apt to stiffen outwards making a rather flattened rosette to 2 ins. across. Growing on steep grass banks in shade of tufts of long grass. A grey claylike soil, rather wet. (These rosettes are all that were collected and the plant does not seem very profuse in this situation.) "

In cultivation the above notes apply to plants in the spring or when grown in the shade, but given full exposure the rosette becomes more globular, the leaves shorter, thicker and more erect or even incurled, and the whole rosette more dense. The central leaves remain bright green while the outermost leaves develop pink shades. When viewed either from above or from the side the absence of marginal cilia is very striking, the leaf appearing to have a rounded edge not shown by any other species. The plant does not increase very rapidly, giving off only a few stolons each year, but grows well, slowly forming a close clump in which the rosettes are decidedly below more isolated ones in size. When established it flowers readily in late July and early August and may go on into September. It stands the winter satisfactorily.

Sempervivum Ballsii *Wale*, sp. nov.; a *S. marmoreo* Griseb. planta minore, rosularum foliis erectioribus apicibus haud purpureis parte superiore marginibus eciliatis, inflorescentia minore compactiore languidiore differt; a *S. Reginae-Amaliae* Held. et Guic. rosularum foliis glabris, caulibus floriferis minus puberulis, foliis paucioribus, floribus languidioribus distinguitur.

Rosettes about 3 cm. across (2·5 to 3·5 cm.) sub-globular, inner leaves closed, outer more open and erect, but the short thick leaves give the rosette a dense appearance. In the spring the outer leaves longer and thinner and the rosette as a whole more open. *Rosette leaves* about 18 mm. × 6·5 mm. × 1·7 mm., obovate, abruptly mucronate, slightly convex on face, convex on back, glabrous, sparingly ciliate on lower two-thirds, no cilia on upper third, bright green with olive to yellow tinge, outermost leaves tinged yellow to light red. Leaves of young rosettes lightly hairy on midrib and ciliate almost

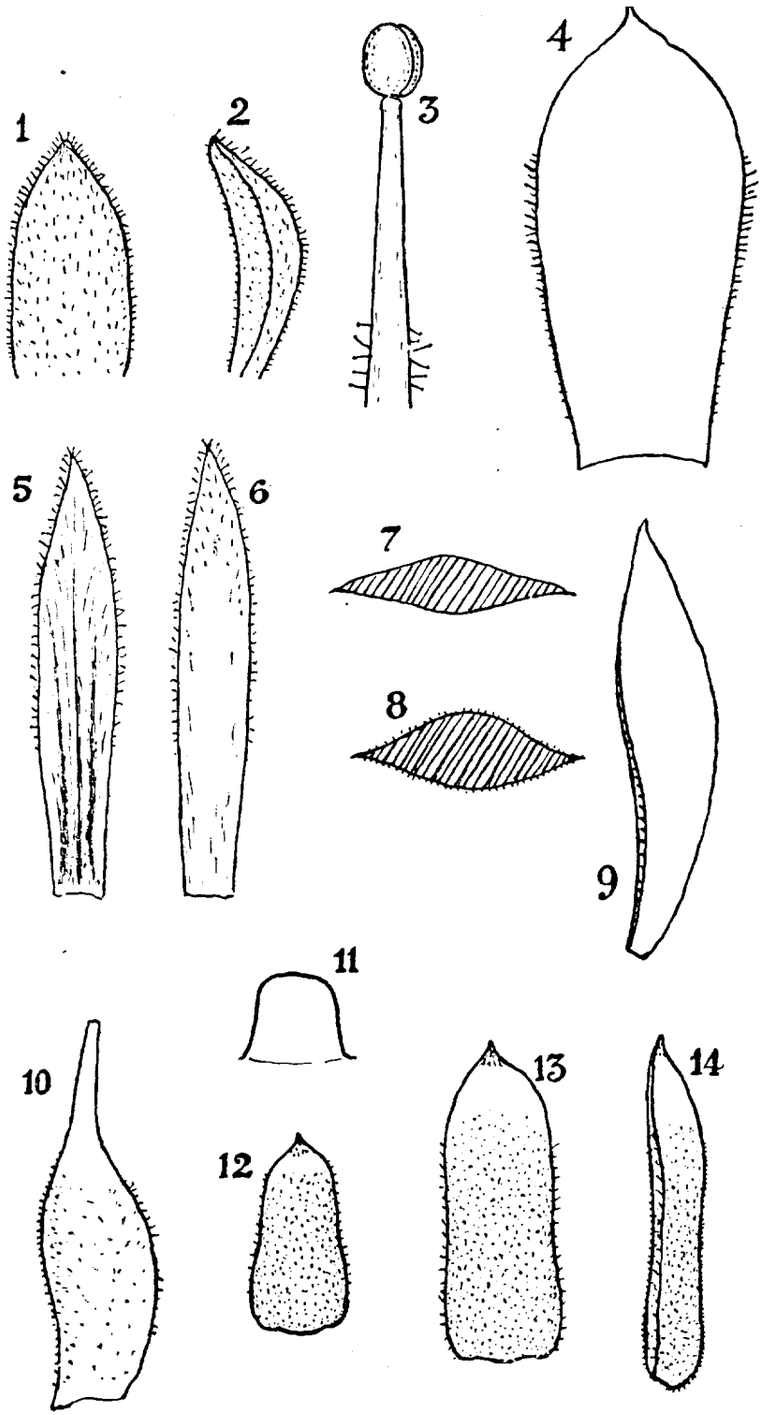


Fig. 2. *Sempervivum Ballsii*.—1, Sepal, abaxial surface; 2, Sepal, lateral view; 3, Stamen; 4, Rosette leaf, abaxial surface; 5, Petal, adaxial surface; 6, Petal, abaxial surface; 7, Rosette leaf, transverse section; 8, Cauline leaf, transverse section; 9, Rosette leaf, laterai view; 10, Carpel; 11, Scale; 12, Upper cauline leaf, abaxial surface; 13, Lower cauline leaf, abaxial surface; 14, Lower cauline leaf, lateral view.

to tip. *Offsets* three to four in May. *Stolons* basal, horizontal, thick even when young, 1–1·5 cm. long, up to 2 mm. thick with a few ovate leaves hairy on both faces. *Flowering stem* 10 cm. high, broad at base narrowing abruptly, rest of stem hardly tapering at all, sparingly clothed with erect only slightly overlapping leaves, lower ones linguiform upper oblong to ovate-lanceolate, 17 mm.×5·5 mm. ×1·6 mm. to 9·5 mm.×5 mm.×1·5 mm., lower sparingly ciliate and puberulous on proximal two thirds, upper puberulous sparingly ciliate on proximal two thirds, stem sparingly hairy with short hairs. *Inflorescence* small, compact, spheroidal, flattened from above to below, about 4 cm. across, of two simple and two dichotomous branches with central bud and about twenty-five flowers sparingly covered with short hairs, bracts small and few. *Bud* ovoid, flattened at tip. *Flower* 12-parted, 1·8–2 cm. in diameter when fully open, dull rose colour, on very short pedicels. *Calyx* cup-shaped, puberulous, green with varying amount of red at tip, 5 mm. long, the segments oblong-lanceolate 3 mm.×1·2 mm.×0·7 mm. *Petals* lanceolate, acuminate, 9 mm.×1·4 mm., margins pink with broken central dull crimson band, unbroken deeper in colour and brighter at base, greenish in centre and more so on back where only the edges are pink, sparingly pubescent on back, ciliate on distal two thirds of edges hairs longest at tip. *Stamens* 4 to 4·5 mm. long, filaments crimson except for small white zone at each end, a few hairs near base; anthers ovoid, buff to pinkish-buff, pollen yellow. *Scales* about 0·5 mm.×0·5 mm., rounded quadrate, greenish. *Ovaries* slender, pale green, finely hairy on inner surface and a few hairs on outer surface, 2·5 mm. long, styles slightly divergent, pinkish, 1·5 mm. long.

Flowers July to August (in S. England).

GREEK EPIRUS: on Mt. Tschumba Petzi, Grammos range, on steep grass banks, *E. K. Balls* 1937 (typus in Herb. Kew.).

The Grammos range is the centre of a mountainous area rich in *Semperviva*, but the only known species at all similar to *S. Ballsii* are *S. marmoreum* Griseb. and *S. Reginae-Amaliae* Held. et Guic. With regard to *S. marmoreum* I have not yet obtained living plants from Mt. Athos but after examining some good flowering material in the Kew Herbarium I agree with Dr. Turrill (Bull. Soc. Bot. Bulgaria, **7**, 126 : 1936), in accepting this as the same as *S. Schlehani* Schott which it then supersedes, being described ten years earlier. In rosette the distinction of *S. Ballsii* from *S. Reginae-Amaliae* is easy as the latter plant has puberulous rosette leaves. When in flower the plants are readily distinguished as *S. Reginae-Amaliae* has flower stems with crowded, thick, ovate leaves and brightly coloured flowers, while *S. Ballsii* has much less well clothed and less hairy stems and dull coloured flowers. From *S. marmoreum* it is distinguished by its smaller size, more upright habit of the rosette leaves, which are never purple tipped and have no cilia on the distal third of the leaf margins, and the smaller, more compact

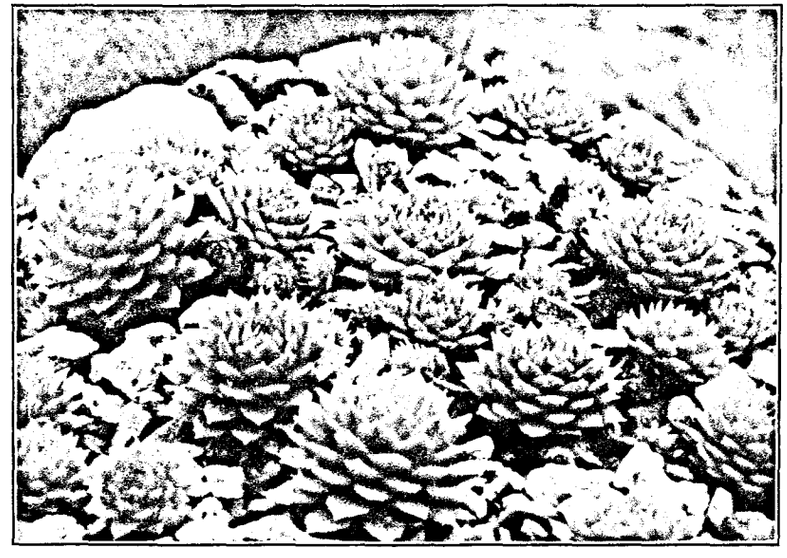
and duller inflorescence. *S. octopodes* Turrill from Mt. Peristeri, N. Macedonia, and *S. ciliosum* Craib from Mt. Mali Hat, Galicića range, between lakes Ochrid and Presba, are the next nearest species geographically, but both are readily distinguished by their hairy rosette leaves, yellow flowers and many other details. *S. macedonicum* Praeger has not been recorded farther south than Mt. Krcin above Debar on the Serbian-Albanian frontier and this also has pubescent rosette leaves. The rosette of *S. Ballsii* is similar to *S. minor* Turrill (mss.) but the rosette leaf of the latter is quite different in shape with marginal cilia almost to the tip, and the flower is yellow.

The comparison of the new species given in the table below is made on the basis of eighteen specimens of *S. marmoreum* collected in Bulgaria, Jugoslavia, and Albania and on a plant from Mt. Vardusa, Greece, collected some years ago by Miss D. Lowe and on additional material from the same locality collected in 1937 by E. K. Balls, which I regard as typical *S. Reginae-Amaliae*. Contrary to Praeger (op. cit. 59, " green with rarely a red-purple tip, or flushed red over face and back—mostly excepting the margin ") all my collected forms of *S. marmoreum* are red-brown tipped, commonly very deeply so.

	S. marmoreum.	*S. Ballsii.*	*S. Reginae-Amaliae.*
Rosette	Very variable in size, medium to large, half open sub-dense. Leaves fairly numerous.	Small to medium, compact, dense, few leaves.	Small to medium, compact, dense, not many leaves.
Rosette leaf ...	Spathulate. Deep green, strong brown-purple tip or distal half. Margins strongly ciliate to tip. Glabrous.	Obovate. Bright green, outer leaves colouring pink. No cilia distal quarter or third. Glabrous.	Spathulate-obovate. Dull green, outer leaves colouring light red. Ciliate to tip. Puberulous.
Rosette leaves of young offset.	Hairy.	Few hairs on mid-rib.	Puberulous.
Stolons	Medium to long.	Short.	Short.
Flower stem ...	Narrows abruptly at base, rest of stem same width. Densely hairy, long and short hairs.	Narrows abruptly at base, rest of stem same width. Sparingly hairy, short hairs.	Narrowing gradually from below up. Hairy, long and short hairs.
Inflorescence ...	Large, open, flattish.	Small, compact, spheroidal.	Small to medium, flattish.
Stem leaf	Deltoid-ovate to linguiform. Strongly ciliate to tip. Pubescent.	Linguiform to deltoid-ovate. Ciliate proximal three quarters. Sparingly pubescent proximal three quarters.	Ovate to oblong-ovate. Ciliate to tip. Puberulous.

PLATE V

1. *Sempervivum Ballsii* (no. B.3961), flowering rosettes.



2. *Sempervivum Ballsii* (no. B.3961), vegetative rosettes.

[*To face page* 146.

	S. marmoreum.	*S. Ballsii.*	*S. Reginas-Amaliae.*
Stem leaf	Strong brown-purple tip.	Pinkish tip at the most.	Outer leaves may be pink tipped.
Petals	Central bright crimson band with white margins.	Dull pink broken central band with pink margins.	Central solid crimson band.
Anthers	Pink to red.	Buff to pink-buff.	Buff.
Scales	Rounded, small.	Rounded quadrate.	Semicircular tip, twice as long as broad.

Apart from S. *marmoreum* Griseb., no reliable reference has been found in the literature to any glabrous Grecian *Semperviva*. Boissier records *S. tectorum* (Fl. Or. **2,** 796 : 1872) as " glabris vel minute glandulosis " from Mts. Olenus and Parnassus, but gives it as equal to *S. Reginae-Amaliae* Held. et Sart. (mss.) and *S. montanum* Smith ex Prod. Fl. Graec., both pubescent plants. I have a plant from Mt. Parnassus which is hairy but none from Mt. Olenus. He also describes the variety " *marmoreum* " from Mt. Athos only, with the criterion that the scales are almost absent, giving as synonyms *S. marmoreum* Griseb. and *S. purpurascens* Schott, both of which are glabrous. Halácsy records many stations for *S. Reginae-Amaliae* Held. et Guic., again without reference to any glabrous plant. It would thus appear that the plant now described as *S. Ballsii* was unknown to these authors.

The pubescent plants collected by E. K. Balls and mentioned at the beginning of this article have, with the exception of the Vardusa plant, failed to produce satisfactory flowers. They present a number of minor differences in rosette, of which colour is the most striking, but provisionally I have placed them all together as forms of *S. Reginae-Amaliae* Heldreich et Guiccardii ex Halácsy.

There is some confusion in the literature regarding the authors responsible for the name *S. Reginae-Amaliae*. The reference from Halácsy must be regarded as correct but the source from which the description was obtained is not given. The specimen referred to by him (Fl. Gr. Exs. no. 2982, dated 1855), now in the Kew Herbarium, bears only the name. Boissier (Fl. Or. **2,** 796 : 1872) records, from manuscript, *S. Reginae-Amaliae* Held. et Sart., presumably after Sartori who was working with Heldreich at the time. Praeger (op. cit. 59) gives *S. Reginae-Amaliae* Heldreich et Sarnthein ex Boissier, probably by the erroneous expansion of Boissier's " Sart." It is quite clear that the same plant was intended by all these authors.

I am indebted to Mrs. H. P. Thompson and Mr. W. E. Th. Ingwersen for the many Balkan *Semperviva* with which they have so generously provided me, the results of many years skilful and accurate collecting.

I wish to thank Dr. Turrill for the help which he has so freely given me on all matters connected with the preparation of this paper.

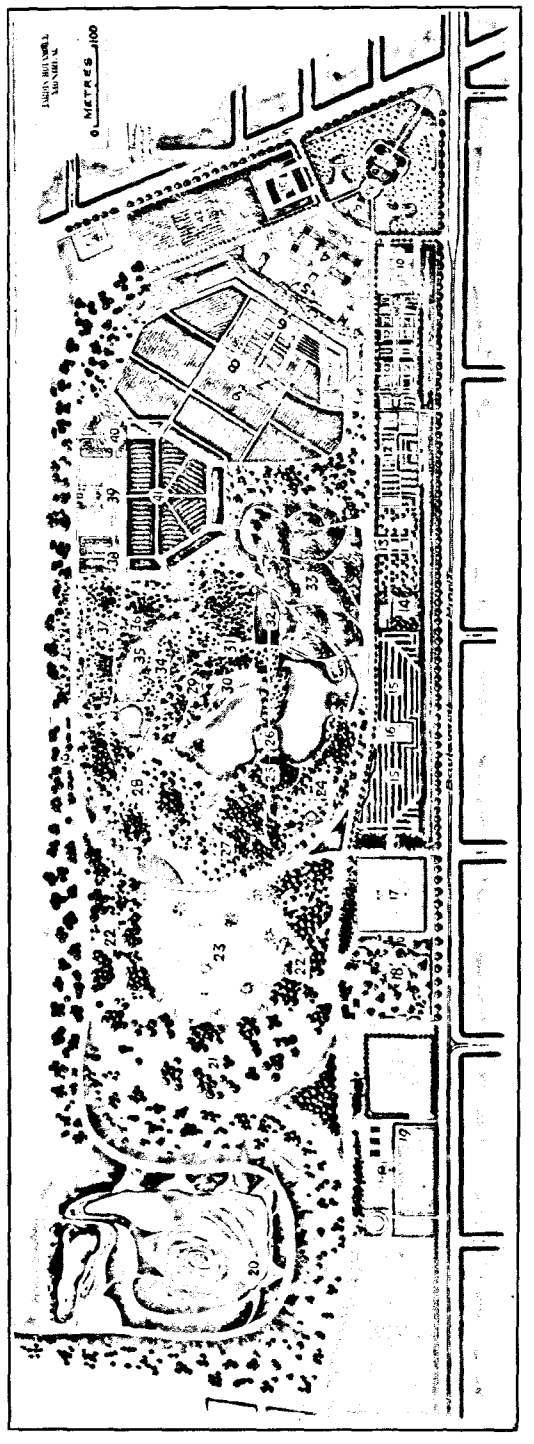
XVII—THE MONTREAL BOTANICAL GARDEN.

P. A. CHANDLER (Montreal Botanical Garden).

The Province of Quebec is well known for its rich forests of spruce and fir, for the high standard of its agricultural crops, and for the maple sugar and maple syrup extracted from *Acer saccharum*, known to all visitors to the Province. The gardens throughout the world have been enriched with many beautiful plants native to this region, notably *Pinus Strobus*, *Tsuga canadensis*, *Cornus canadensis*, *Sarracenia purpurea*, *Primula laurentiana*, and further gems are to be expected from the Gaspé peninsula. However, with the exception of some small gardens connected with agricultural institutes, and two feeble, unsuccessful attempts to establish a botanical garden within the Province in the latter part of the last century, there was until recently no garden of any botanical importance. The necessity for such a garden had long been felt by botanists and horticulturists throughout the Province, and due to their persistent efforts, notably those of Dr. Marie-Victorin, another attempt was made in 1933 to establish such a garden.

At this time the city of Montreal presented an area of 250 acres at the east end of the city which had been at one time set aside for a public park, but was never developed and had become more or less waste land. A Botanical Garden Commission was set up to formulate and direct the policy of the gardens under the chairmanship of Dr. Marie-Victorin, the present Director of the gardens. For the first three years little progress was made except for the building of two small greenhouses. However, in the summer of 1936 a plan was designed for the whole garden as it will be eventually (see Plate VI), and this design was carefully followed in the construction work which commenced shortly afterwards and which will be outlined later. Particularly interesting and noteworthy in considering the design of this garden is the fact that the available grounds were almost entirely bare of natural growth and nearly perfectly flat. Everything had to be created from the beginning. This had the advantage that no compromises had to be made with the existing features, as is usually the case with gardens of this type, while on the other hand it has the disadvantage that it is sure to take many years before the garden can be expected to assume anything like a mature aspect. In the plan of the garden as it was conceived, the knowledge available to-day of how a modern botanic garden may best serve the cultural interests of a community—in this case in particular the city of Montreal, the Province of Quebec and the whole of Canada—was fully utilized and the greatest advantage was taken of what were considered the finest ideas that have so far evolved from existing gardens. If the achievements to date are any indication of the final result, this method will be fully justified. In the planning of any garden of this type the climatic conditions have of course to be carefully considered; here the long winters with sub-zero temperatures followed by hot summers would seem to place rather severe

PLATE VI



MAP OF THE MONTREAL BOTANICAL GARDEN

1. Flower garden of annuals
2. Fountain
3. Cascade
4. Administration building
5. Display greenhouses
6. Service greenhouses
7. Garage and workshops
8. Heating plant
9. Nursery
10. Parking places
11. Display garden of perennials
12. Garden of economic plants
13. Fruit garden
14. Gardens of medicinal plants
15. Fruticetum
16. Formal rock garden
17. Cricket field
18. Picnic grounds
19. Playgrounds
20. Ornamental planting in an old quarry.
21. Arboretum
22-37. Natural groups representing Canadian flora
22. Western Canadian flora
23. Mid-Western plains
24. Sugar Maple formation
25. Beech formation
26. Damp shore formation
27. Black Maple formation
28. Northern deciduous forest
29. Mixed forest
30. Rich damp meadow
31. Coniferous forest
32. Bog
33. Alpinum
34. Red Pine association
35. Sand dune
36. Banks Pine formation
37. White Pine formation
38. Biological-morphological groups
39. Water and bog plants
40. Genetic groups
41. Taxonomic garden
42. Breeding and testing field

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limitations on the kinds of plants that can be grown. But fortunately it has been found possible to grow a far wider range than might have been expected due to the heavy snow covering in the winter and the cooling effect of the numerous lakes and rivers in the vicinity during the summer.

After October 1936, when the garden received the benefit from a Provincial Government Relief Scheme for the Unemployed, construction work went ahead at a rapid pace, and during the three following years until the outbreak of the war, great progress was made, although there is still a great deal to be done. The following account will give some idea of the work accomplished to date and that which remains to be carried out.

The administration building is completed, and, apart from the various garden offices which are spread over two floors, the Botany Department of the University of Montreal occupies one floor of the building. The building itself, from the exterior, has its own attraction, with a well-balanced water cascade leading up to the front entrance. To capture the botanical spirit, two inscriptions to Linnaeus and Mendel are to be found on either side of the entrance. The projecting entrance hall and winter gardens are built of a white stone, while the main body of the building is of a yellow brick. On entering, one's attention is attracted to the winter gardens, one on each side, where seasonal displays of flowering plants are maintained. Here of great fascination to the visitors are the four small aquaria, set into the wall at eye level, filled with tropical water plants and tropical fishes. The main body of the building consists of four wings with the central section devoted to a large air-conditioned auditorium for conferences, meetings, and lectures. This hall has a seating capacity for 600 people and is equipped with all the modern apparatus for the projection of moving pictures and lantern slides. Decorated in a pastel shade of green and equipped with indirect lighting, it creates a feeling of beauty and peace such as we all associate with plants, while a scientific atmosphere is provided through the names of famous botanists inscribed along the walls. Throughout the whole building with its offices, library, herbarium, and laboratories, simplicity with efficiency has been the keynote of the design. Little has been left out of what one might expect to find in such a building, and a special photographic department, a student gardeners' lecture room and laboratory, a lunch room and rest room for the staff, a well equipped seed room, where the seeds are cleaned and prepared for distribution, a labelling room and a lantern slide room are a few of its component parts. Facilities for research in plant breeding have also been provided and the large laboratory reserved for this purpose includes an air-conditioned greenhouse where light, humidity and temperature can be accurately controlled.

Directly behind the administration building will be located the display greenhouses extending in a wide V formation to a length of

1200 feet, although at the present time only the concrete foundations of these greenhouses have been built. Provision has been made for the display, all under one roof, of tropical and temperate region plants, and collections of succulents, cacti, ferns, orchids, aquatics, and alpines. It is the intention to plant these houses in a naturalistic arrangement so as to give an indoor garden effect depicting the plant life in other regions of the world. Among the many interesting and novel features of this complex of display greenhouses the aquarium room located in the basement of the *Victoria regia* house is of special note. From the centre of this room one may view the *Victoria regia* from beneath through the glass bottom of its tank. Around the sides of the aquarium room aquaria are to be built into the walls which will be lit artificially and will contain a large collection of submerged water plants. In keeping with the modern ideas of economy the service greenhouses for the propagation of plants for the display houses and the outside gardens are located in close proximity to the display houses and are connected with them by a covered passage. Altogether there are 18 of these thermostatically controlled service greenhouses each equipped to serve some special type of culture. Two of these houses located at the end of the group have been fitted out with work tables in the centre and will be used for popular courses in horticulture, both for adults and for school children. One other house is reserved for plant breeding and one for experiments in plant physiology. The large centrally located workroom from which all the houses branch off laterally is an essential feature here because of the severe winter temperatures. Apart from propagating houses and electrically heated hot-beds, modern greenhouse equipment is not complete without a refrigerated room for the chilling and after-ripening of seeds of northern temperate zone plants to facilitate germination. This latter has been installed here in one of the greenhouse cellars. Equipment for soil sterilization has also been provided. Surrounding the houses an extensive range of heated and unheated frames, together with four cool sunken pits, furnish a complete and economic set up. The central heating plant, along with the garages, engineer's and carpenter's shops adjoining the frame yard, bring all the buildings into a very compact unit.

The principle followed in many gardens to relegate the nursery to any odd corner which may be available, no matter whether the situation or soil may be suitable, has not been followed here. Realising that the nursery is one of the most important units of the garden a large area surrounding the frame yard has been reserved for this purpose. Special sections are devoted to trees and shrubs, herbaceous plants, alpines, and woodland plants, the latter accommodated under a well-constructed lattice shelter. This nursery area will have an aesthetic value of its own, with hedges of *Thuja occidentalis* creating vistas and giving a neat and trim appearance. Without special permission the public will not be admitted

to this enclosed area which includes not only the service houses, frames and nursery, but also a taxonomic garden which is not yet planted. Inside the fence of the nursery a wide border will be planted to provide plant material for distribution to the educational institutes and schools throughout the city for practical demonstrations. A meteorological station has also been established within this area.

Of the ornamental features which have been finished to date, the area in front of the administration building claims our first attention. Here a series of formal beds and borders, devoted especially to a display of bulbs in the spring and annuals and other bedding plants in the summer and surrounded by a broad expanse of lawn planted with conifers, forms a quiet yet imposing entrance and immediately creates a desire to seek more. The attention of passing motorists is also attracted by these displays as they pass along the main highway, and many are induced to stop and enter the gardens. Not forgetting modern modes of travel by automobile which call for adequate parking space, two comparatively large areas on either side of the entrance garden are available for the influx of visitors travelling by car who may be expected from all parts of Canada and the States. High winds play havoc in any garden and particularly here where the prevailing N.W. wind blows down from the Arctic. To afford some protection a high bank of soil was placed along this side of the garden and has been planted with trees and shrubs. A glance at the map will show a series of special gardens running parallel with the boulevard on one side of the grounds.

The first garden to be noticed is the perennial flower garden for the display of herbaceous plants. A formal arrangement with broad paths, a stone pergola at each end connected by a raised promenade, and a wide central strip of grass terminating in two small pools form the predominating features of the design. The idea, besides providing a colourful display during the whole season, is to show the best varieties of herbaceous plants in separate beds so that visitors can form their own opinion as to which they might like to grow in their own gardens. There are large beds of delphiniums, paeonies, asters, lupins, *Hemerocallis*, and dahlias, while in separate sections irises, lillies, and astilbes are displayed; with this arrangement the individual requirements of the plants can be taken into consideration much better than if all were mixed, and such plants as the gentians, for instance, which were all brought together on a specially constructed bed, have been provided with a special underground watering system. Visitors who wish to see a floral display at a certain period of the season will find something of interest in the four large seasonal sections for the months of May, June, July, August and September. The rose garden, which is such a prominent feature in many European and American gardens, is not of equal importance here owing to the uncertainty of being

able to grow roses satisfactorily under the severe climatic conditions of Montreal, but it is hoped that by judicious attention to winter protection some of the hardier varieties will succeed, notably the polyantha section. Therefore a small area in the centre of this garden has been planted with roses of this type. In contrast to the roses, tropical water-lilies are a great success in the summer in the formal pool opposite the rose beds.

Without doubt, the greatest public interest up to the present has been aroused by the economic garden, which has for its main purpose to bring about a better understanding of the commoner plants of everyday use. Directed by notices the visitors follow a definite route which has been so planned that all groups are passed in their order. First comes the collection of fruits, where tomatoes of all shapes, sizes, and colours, melons (for which the Island of Montreal is famous), cucumbers and gourds, as well as egg plants and peppers may be seen. The next notice reads: "Curious Plants." Here are to be found amongst others, the squirting cucumber (*Ecballium elaterium*), the gas plant (*Dictamnus albus*), and the pitcher plant (*Sarracenia purpurea*). Root crops follow, giving a kitchen garden aspect with neat rows of potatoes, turnips, parsnips, beetroots, and carrots in many varieties; these have attracted the public's attention to a marked degree. The next section may be of special interest to the French who are well known as connoisseurs of salads and the closely allied "epinards" (spinach). Amongst a fine collection of these plants are to be found numerous varieties of lettuce, sorrel, dandelion, rocket salad, orache, and the little used baselle. Although the brassicas do not hold such a place of importance here as they do in more temperate regions, many can be grown in the summer as can be seen in the next section which contains varieties of cabbage, cauliflower, Brussels sprouts, kales, etc. Under the notice "Plantes condimentaires" come the vegetables such as the leeks, onions, and other edible species of *Allium*, followed by an extensive collection of herbs. Foreign visitors are usually much interested in the plants used for food by the American Indians, and it is only appropriate that a special section should be devoted here to a display of these plants since many of the Indian tribes are still native to the country. Indian rice (*Zizania aquatica*), Indian cucumber root (*Medeola virginiana*), and Indian breadroot (*Psoralea esculenta*), along with many others, form an interesting collection. The economic importance of the seeds of legumes is ever increasing and the wide selection of peas and beans grown illustrates this fact. The universally important soybean (*Glycine max*) is not only found in this group, but also in the oil-producing plants which follow and the forage plants, which adequately illustrates its great importance amongst the commercial crops of the world to-day. Plant dyes and then textiles follow, where cotton (*Gossypium herbaceum*), flax (*Linum usitatissimum*), and jute (*Corchorus olitorius*) are to be found amongst others. The

general public as a rule has a very limited knowledge of the culture of cereals and in many cases only a vague idea of what the different kinds look like. Hence the large group of many varieties of wheat, barley, oats, rye, corn, sorghum, and buckwheat, is of great interest and educational value. The growth of the tobacco industry in Canada is increasing from year to year, hence a selection of 12 varieties is appropriate. The perfume and scented plants follow and finally the group of forage plants to finish the tour. Altogether some 490 kinds and varieties of economically important plants are grown in this garden. Each variety bears a label giving the botanical name and the common name in both French and English. Since French is the spoken language of 73 per cent. of the population, the description of the plant's history and uses is given in French. It is evident even from the short time this garden has been in operation that it has been most enlightening to the visitors from many points of view. There are countless ways by which the public benefits from a visit to this garden; to cite only one, it gives a broader idea of the wide range of plant foods that can be grown here, and hence indirectly encourages the public to seek new varieties of food for the benefit of all concerned. Numerous parties of school children are shown round daily by a competent guide attached to the garden staff.

From the Economic Garden we pass to the Fruit Garden through a fine wooden pergola for the growing of grapes, which do exceedingly well in this Province. Besides the usual collection of apples, pears, plums, cherries, and other small fruits, nuts are also being grown, and include the pecan (*Carya Pecan*), butternut (*Juglans cinerea*), and walnut (*Juglans nigra*). The various methods of training fruit trees is also exhibited in a row of espalier pears. A medicinal garden, which at the present is still unfinished, completes a series of gardens where plants are grown that are of importance to man from an economic point of view.

Climatic conditions seem to favour the growth of alpines, and the large alpine garden, which is still in the course of construction, promises to give a good representation of the alpine flora of the world. This will be accomplished by grouping the plants on a series of mounds, each mound representing a different mountain range such as the Alps, the Pyrenees, the Balkans, the Himalayas, the mountains of Japan, the mountains of Eastern North America, the Rocky Mountains, etc. Only botanical species and varieties will be planted here, while improved horticultural forms and garden hybrids will be grown on a series of formal stone beds and dry walls in another part of the grounds. Through the Alpine Garden several streamlets will meander down to two large lakes which have been constructed. Around these lakes much natural planting will be done representing the bog and aquatic flora of the Province, which is particularly rich. A large area in this part of the gardens will be developed to illustrate the most important native

plant associations of Eastern Canada. Sugar maple, black maple, white pine, and mixed coniferous forest, with all the shrubs and herbs that usually accompany them in nature, will be the most important components of this native section, which will enable visitors to study Canadian plants in their natural habitat without having to travel thousands of miles.

So far the only progress made with the Arboretum is the gathering together in the nursery of young plants from propagating material obtained from all parts of the world. Next spring, however, it is hoped that time will be found to plant the Fruticetum beds which are arranged in a series of terraces with broad grass paths. This system has its advantages, not only because it permits the visitors a convenient view of the plants, but also because of the thorough drainage it provides. This drainage is most important in the spring when heavy flooding often occurs through the accumulation of water from the melting snow. This spring flooding is a problem throughout the garden, for the soil varies from a porous sand to a heavy clay, and to minimize the losses caused by waterlogging an extensive system of drainage has had to be installed. Fortunately at the end of the garden there is a quarry from which large quantities of stone have been taken for drainage and building throughout the garden. Eventually the quarry will be planted in a naturalistic manner to form a sunken garden.

As noted above, the water flora of the Province is extremely rich, hence an aquatic garden has a place of importance. Over 100 basins of various sizes have been constructed in such a manner that the water level in each one can be controlled as desired. Some basins with running water provide suitable homes for plants from swift running streams. The paths between the basins are sunken so that the plants can be viewed conveniently at table height and their beauty easily be seen. To-day much interest is being shown in biology and genetics, so that a collection of plants illustrating some of the principles of these branches of science will not only prove of interest to the student but also to the layman who reads so much about them in the popular journals of the day. The biological and morphological garden, and the genetics garden, constructed but not yet planted, are located on either side of the water and bog garden. A large area near the nursery has been reserved for plant-breeding experiments which the garden staff hopes to conduct after the construction of the garden is finished. Part of this area is used as a testing ground for new varieties of annual and other plants before they are used elsewhere in the garden, and much valuable information has already been gleaned from these tests.

Believing in the old truth that the younger one starts to learn of the beauties and uses of plants the greater will be one's appreciation in later life, the children have been encouraged. First, children may join a special kindergarten class where simple illustrated talks are given in the winter, followed by demonstrations on living plants

in the summer. Later as they grow up they may partake in the school gardening classes where each child is given a small plot of its own to cultivate under the guidance of a qualified teacher who gives lectures at the schools during the winter. One hundred took part in this endeavour last year. Following the example of other institutes of this kind a course for student gardeners has been organized here, and at present there are some 15 students gaining theoretical knowledge by following a series of lectures on the principles of botany and horticulture. An unusual feature not often incorporated in a botanic garden which has yet to be mentioned is a well equipped playground located on the north west corner of the grounds. It provides a wading pool and other play apparatus for small children as well as three tennis courts and ample space for cricket, football and baseball. During the winter it serves as a skating and hockey rink. A large area for a picnic ground which adjoins the playground is still under construction.

Much work has yet to be done and, as elsewhere throughout the world, the present crisis unfortunately has forced a standstill of the construction work, but let us hope that the day will soon come when the world will be at peace again, and the construction of this highly promising enterprise can be resumed. In the meantime the maintenance of the valuable collections of plants gathered during the past few years from all parts of the world is at least temporarily assured so that when the time comes, stock plants will be available for the raising of large quantities of plants for planting the unfinished sections of the garden. Even under the most favourable conditions it will take many years before this garden has that appearance of age and maturity which mark so many gardens of this nature throughout the world. But if progress continues as it has done during the past three years, and if the policy outlined in the beginning is followed in the future, the Montreal Botanical Garden promises to become eventually an institution of which the British Empire can justly be proud.

XVIII—THE URICURY WAX PALM. F. N. Howes.

A little-known vegetable wax, known as " uricury wax," believed to be new to commerce, has been imported into the United Kingdom from Brazil during the last few years. This wax is also known to have been shipped to some extent to the United States and to certain European countries, notably France and Germany, in small quantities.

In general appearance and in hardness this wax is very similar to carnauba wax (*Copernicia cerifera* Mart.), but manufacturers using it find it possesses certain definite characteristics of its own. In the crude state it is a deeper green colour than is usual with carnauba wax and more resinous. However, it is regarded as quite a good quality wax and intermediate in value between carnauba and

candelilla wax (*Euphorbia cerifera* Alc.) by manufacturers using vegetable waxes. Prices also have been intermediate between those ruling for these two waxes.

Uricury wax is used in much the same way as carnauba wax, which is the best known and most extensively used of the true vegetable waxes. A sample of the wax received at Kew after refinement in this country is chestnut brown in colour, practically odourless, hard and brittle, and possesses a sharp fracture. It can be readily powdered, yielding a pale cream-coloured powder. A sample of the crude unpurified wax is olive green, but somewhat uneven in colouring. It is perhaps not surprising that this wax should show similarity with carnauba wax for it is also the product of a palm and is a leaf wax.

The name " uricury " or " arucuri " which appears to have been adopted in trade circles for the wax is commonly used in Brazil for *Syagrus coronata* (Mart.) Becc. (synonym *Cocos coronata* Mart.), although this name has also been recorded for at least one other palm, *Scheelia Martiana* Burret (syn. *Attalea excelsa* Mart.). However, dried leaflets of the palm from areas where uricury wax is collected, obtained recently through a firm importing the wax, leave little doubt that the palm in question is *Syagrus coronata*. The leaflets, probably from a young or recently expanded leaf, are from 52–65 cm. in length and 3–3½ cm. in width at the widest part. They are somewhat tough or leathery in texture and a pale colour on the undersurface owing to the thin coating of wax which is deposited there. In the dried leaflets this is somewhat powdery and inclined to come off on the fingers in handling. It may be readily removed with the finger-nail and on scraping with a scalpel the blade is soon covered.

The method of collecting and preparing the wax adopted by the natives apparently differs from that usually employed with carnauba wax where the wax is beaten off the leaves in a closed room or shed and collects as dust (Kew Bull. 1936, 509–512). According to reports received a method sometimes adopted in the uricury areas is to crush the leaves and extract the wax with hot water. Another method is to scrape the wax from the undersurface of each leaflet with a blunt knife, a somewhat laborious process. It is possible that as the wax particles appear to cling more tenaciously to the undersurface of the uricury leaf than is the case with carnauba the beating method employed for separating carnauba wax from the leaf may not be satisfactory in the case of uricury wax.

Although the uricury palm is widely distributed in eastern Brazil the amount of wax produced suggests that so far only relatively small areas have been worked. Over wide expanses paucity of population and transport difficulties are regarded as likely to remove any possibility of the palms being exploited for wax. The crude product is in blocks or irregularly shaped pieces and packed in coffee bags for export. The main season is said to be from March

to April. Exports have been from Bahia but may also take place from Rio.

Syagrus coronata occurs in both tropical and sub-tropical Brazil. It is found in Pernambuco, Bahia, Minas Geraës, Santa Cathrina, Rio Grande do Sol, and may be said roughly to occur along the coastal districts from Pernambuco to Uruguay. The palm occurs also inland, often in quite arid areas but generally near rivers or water courses. It is found growing either in groups or singly.

In its natural habitat the palm attains a height of 6–10 m. with a straight cylindrical bole 2 dm. or more in diameter. The bole is generally closely studded with prominent leaf-scars and near the apex the remains of dead leaves remain attached for a considerable time. The individual leaves average about 3 m. in length, have short petioles and the leaflets densely packed along the rachis. A marked spiral arrangement characterises the attachment of the leaves to the trunk. Flowering takes place in August or September and mature fruits appear in December or January in most areas. The fruits are greenish-yellow ovoid drupes 3–4 cm. long with a fibrous but juicy and mucilaginous pulp surrounding the seed, which is said to be edible (Correa, 1926). Seeds vary from 2–3 cm. in length and 1–2 cm. in diameter and have a thick shell (2–4 mm.) and white oleaginous kernel with well-marked central cavity.

The kernels are rich in oil (35–40 per cent.) which may be used for edible purposes. The oil also has medicinal uses among the inhabitants, being esteemed by coast dwellers in Brazil for treating wounds caused by skates (Correa, 1926). Both seeds and kernels have been received at Kew in the past from produce or oil-seed importers, which suggests that attention may have been given to them as a possible commercial source of oil.

Like many other palms the leaves of this species are put to various uses by local inhabitants. They are commonly used for thatching dwellings and afford material for coarse ropes. Fly whisks are also made from the leaflets. A flour or starch may be prepared from the pith or bole which is used as food, but is said to be rather bitter.

This palm has been grown outside South America as an ornamental palm but is not so well known as a decorative palm as many of its near allies in Brazil (e.g., *Cocos plumosa*, *C. schizophylla*, *C. Romanzoffiana*, *C. Weddeliana*, etc.), which are now almost universal as ornamental palms, and some especially favoured as street or avenue palms, in both the tropics and subtropics.

Among its good points as a decorative palm in warm countries is the fact that it will thrive under a fairly wide range of conditions, has dense gracefully arched foliage of a pleasing bright green, and, unlike so many South American palms, is quite devoid of spines.

J. F. Bailey (1913) in referring to " *Cocos plumosa*, *C. flexuosa*, *C. coronata* [*Syagrus coronata*], *C. Romanzoffiana*, *C. Yatay*, *C.*

odorata and *C. Weddelliana* " growing in the open in the Brisbane Botanic Garden in 1913 remarked that " The first four mentioned are very similar in habit ; the first being grown in thousands about Brisbane. They are easily grown, seemingly being not particular as to soil or situation, although on fairly free soil the best results are obtained. Their rapid growth is an important point in their favour, as is also the absence of spines, a great drawback to many showy palms. Being shallow rooters the various kinds of Cocos may be safely transplanted, even when quite large, if ordinary care is observed in the operation, and a time chosen other than when the young leaves are in a sappy condition."

A photograph which this writer gives of a palm of *Syagrus coronata* in the Brisbane Botanic Garden depicts it as a well-grown palm probably about 9 m. in height and 2·5 dm. in diameter. The column of dead leaves under the leaf crown, so characteristic of the palm in the wild state, is absent, the dead leaves having been probably removed from time to time for the sake of appearance.

Whether wax secretion takes place on the under surfaces of the leaves when the palm is grown in other countries, or to what extent, is not at present known. A young palm a few feet in height growing in the somewhat unnatural conditions of the Palm House at Kew clearly shows wax secretion on the undersurfaces of the leaves.

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XIX—CONTRIBUTIONS TOWARDS A FLORA OF BHUTAN : I.

C. E. C. FISCHER.

Comparatively little botanical work has been done in the Indian State of Bhutan since the days of W. Griffith and J. D. Hooker. Mr. B. J. Gould, I.C.S., Government Agent for the States of Sikkim and Bhutan, has taken a keen interest in the flora during the past two years and has sent a considerable collection of herbarium material, as well as seeds, to Kew for determination. The first consignment of about 1100 numbers includes 4 new species already published (K.B. 1939, 663), a new variety, and some species which have not previously been collected either in India or at least in the Eastern Himalayas. In the following list of the new records the countries entered in brackets after the specific name indicate the regions from which the species has previously been recorded.

Hydrangea yunnanensis *Rehd.* [Hydrangeaceae]. (Yunnan).

Tsanka, 2300 m., fls. June, *Gould* 380, 381, " fls. blue " ; *Gould* 679, " fls. white."

Pleurospermum Davidii *Franch.* [Umbelliferae]. (W. China).

Kitiphu, 4150 m., fls. June, *Gould* 530.

Cremanthodium humile *Max.* [Compositae]. (S.E. Tibet and W. China).

Yala, Piala and Gilela areas, 4600 m., fls. Aug. *Gould* 1325.

Saussurea Chapmani *C. E. C. Fischer* [Compositae]. (S.E. Tibet).

Bele-La to Paro, 3700 m., fls. July. *Gould* 966.

Chimaphila japonica *Miq.* [Ericaceae]. (W. China to Japan).

Near Chendebi, 2300 m., fls. June, *Gould* 686.

Trachaelospermum cathayanum *C. K. Schneid.* [Apocynaceae]. (China).

Hinglai-La to Nahi, 2500–2000 m., fls. May, *Gould* 271 ; near Tsarza-La, 2770 m., fls. June, *Gould* 309.

Lagotis yunnanensis *W. W. Smith* [Selaginaceae]. (Yunnan).

Near Bumtang, 3000 m., fls. June, *Gould* 441.

Euphorbia sikkimensis *Boiss.* subsp. **bhutanica** *C. E. C. Fischer,* subsp. nov. [Euphorbiaceae] ; a typo caulis, foliis subter, pedunculis, ovariis, stylisque hirsutis distincta.

Stems 20 cm. or more tall, glabrous below, increasingly flocculent-hairy upwards. *Leaves* linear or linear-lanceolate, acute, narrowed to a rounded base, 3–5·7 cm. long, 8–17 mm. wide, glabrous and dark green above, grey flocculent-hairy below, lateral nerves numerous, obscure, ascending, much reticulated, the upper sometimes reddish ; petioles very short. *Peduncles* up to 5 cm. long, slender, sparsely pubescent ; partial peduncles up to 1·5 cm. long. *Floral leaves* sessile, broadly ovate to subrotund, acute, base rounded or truncate, 1·1–1·3 cm. long, 9–10 mm. wide, glabrous, red or olivaceous-red (when dry). *Involucral-leaves* like the floral but smaller. *Cyathium* turbinate, 2·5–3 mm. long, mouth with 5 short, triangular teeth, white-hairy within ; glands subreniform, 1 mm. long, 2·6 mm. wide. *Stamens* ∞ ; filaments angled, 1·1 mm. long, glabrous ; anthers subglobose, 0·5 mm. diam. *Ovary* articulated on a short glabrous stipe, smooth, subglobose, 1·1 mm. long, more or less hairy ; styles 3, united in their lower third, more or less hairy, bifid at the apex. *Ripe fruit* not seen.

Chang-Na Na to Paro, 2950–2400 m., fls. May, *Gould* 128 (type in Kew Herb.).

Bulbophyllum shweliense *W. W. Smith* [Orchidaceae]. (W. China).

Near Tsanka, 2300 m., fls. June. *Gould* 388.

Cypripedium guttatum *Sw.* [Orchidaceae]. (Siberia, Tibet, China).

Paro to Bele-La, 2400–3300 m., fls. May, *Gould* 142.

This species was also found near Pa-roo in the Chumbi Valley flowering in June by *King's Collector* 452 and " about Chumbi " by *E. H. Walsh* 42.

XX—NOTES ON CAREX: XIV.* E. NELMES.

NEW AFRICAN SPECIES OF THE SUBGENUS INDOCAREX BAILL.

The main purpose of this paper is to describe three further new *Carices* collected by Mr. E. Milne-Redhead during his 1937–38 expedition to Northern Rhodesia and Angola. (See K.B. 1939, 159.)

The name *Carex spicato-paniculata* Boeck. mss. was published, without a description, by C. B. Clarke in Durand et Schinz, Consp. Fl. Afr. **5**, 690 (1894). He took the name from " Boeck. mss. in Rehm. Pl. exsicc. n. 5627 (sp. nov.)."

Clarke described the species as " *Carex spicato-paniculata* (C. B. Clarke in Durand and Schinz, Conspect. Fl. Afr. V. 690) " in Fl. Cap. **7**, 304 (1898), and cited six gatherings, including Rehmann's. These citations were arranged on a geographical basis and no type specimen was indicated.

As one of the new species described below is closely related to *C. spicato-paniculata*, and as Clarke's citations may include more than a single species, it seems desirable to choose a lectotype.

Rehmann's plant, collected at Houtbosch, Transvaal, is at Kew, and would be made the lectotype if it were a good specimen, but its fruits are not fully developed. Their shape would probably have changed considerably if they had reached maturity, and the branches of the panicles, suberect at the time of gathering, would almost certainly have become divaricate later. These are important points in such a difficult genus as *Carex*, and as another of Clarke's cited plants is a fully developed specimen, and agrees well with his description of the species, I call it the lectotype. This is *J. M. Wood* 1190, collected at Inanda, Natal.

The choice of Wood's plant instead of Rehmann's makes C. B. Clarke alone, not Boeckeler ex C. B. Clarke, the authority for the name.

Carex tricholepis *Nelmes*, sp. nov.; affinis *C. spicato-paniculatae* C. B. Clarke, sed paniculis secundariis laxioribus, squamis pubescentibus aristatis pallidioribus, utriculis majoribus magis dense pubescentibus praecipue differt.

Rhizoma lignosum, breve. *Culmi* usque 105 cm. alti, obtuse triquetri, laeves, foliati. *Folia* 8–11 mm. lata, flavescenti-viridia, inflorescentia breviora, viva acute canaliculata, sicca subplana, scabrida, longe attenuata, longe vaginantes; vaginae superne scabridae. *Inflorescentia* anguste paniculata, interrupta; *paniculae secundariae* 8–10, inferioribus 1–2 interdum exceptis binae, subpyramidales, sublaxae, inferiores distantes, inaequaliter longe exserte pedunculatae, superiores subapproximatae, incluse breviter vel brevissime pedunculatae; pedunculi stricti, scabridi. *Rhachis* pubescens, angulis hispidula; ramuli demum oblique vel horizontaliter divaricati, inferiores plerumque 1–3- sed usque 6-stachyi, superiores 1-stachyi. *Bracteae* foliaceae, inferiores longe vaginantes, inflorescentiam sub anthesin longe superantes, inflorescentiam statu fructifero subaequantes, superiores breviter vel vix vaginantes; vaginae superne scabrido-pubescentes. *Spicae* androgynaeceae (pars mascula parte feminea multo brevior), 1–1·5 cm. longae, subdensiflorae; bracteolae scabrido-aristatae, marginibus hispidulae. *Squamae* ovatae, acutae, hispidulo-pubescentes, pallide ferrugineo-virides, carinatae, scabrido-aristatae. *Utriculi* 5 mm. longi, squamis plerumque aequilongi, elliptico-obovati, oblique patentes, superne dense hispidulo-pubescentes, valde plurinerves, trigoni, pallide ferrugineo-virides, in rostrum longum subcylindricum brunneum hispidulo-pubescens ore bidentatum subabrupte contracti. *Stigmata* 3.

NORTHERN RHODESIA: Mwinilunga District; just south of Matonchi Farm in *Brachystegia* woodland, 18 February 1938, *Milne-Redhead* 3686A (type); 15 December 1937, *Milne-Redhead* 3686.

Carex macrophyllidion *Nelmes*, sp. nov.; affinis *C. spicato-paniculatae* C. B. Clarke, sed foliis angustioribus, rhachibus inflorescentiarum angulis solum hirtis, paniculis secundariis laxioribus, squamis pallidioribus, utriculis ellipticis glabris haud subabrupte rostratis, praecipue differt.

Rhizoma lignosum, caespitosum. *Culmi* circiter 60 cm. alti, subteretes, laeves, foliati. *Folia* 3–5·5 mm. lata, superiores inflorescentiam superantes, viva alte canaliculata, saturate viridia, sicca subplana, virescentia, longe attenuata, scabrida, longe vaginantes; vaginae laeves. *Inflorescentia* paniculata, interrupta; *paniculae secundariae* 5–6, inferiores singulae, superiores binae, subpyramidales, inferiores distantes, longe vel longissime exserte pedunculatae, superiores approximatae, brevius inaequaliter exserte pedunculatae; pedunculi stricti, laeviusculi. *Rhachis* angulis hispidulis exceptis glabra; ramuli demum divaricati, plerumque 1-stachyi. *Bracteae* foliaceae, inflorescentiam longe superantes, superiores angustissime, brevissime vel vix vaginantes, inferiores longe vaginantes; vaginae laeves. *Spicae* androgynaeceae (pars mascula parte feminea brevior), 7–10 mm. longae, subdensiflorae; bracteolae longe aristatae, marginibus hispidulae. *Squamae* late ovato-lanceolatae, acutae, glabrae, plurinerves, pallide viridulo-brunneae, marginibus anguste albo-hyalinae, carinatae, scabrido-aristatae. *Utriculi* 5·5–6 mm. longi, oblique patentes, plerumque squamis longiores sed interdum iis aequilongi, elliptici, trigoni, plurinerves, glabri, subinflati, brevissime valde stipitati, in rostrum longum latum marginibus parce hispidulum ore alte bidentatum subsensim desinentes. *Stigmata* 3.

* Continued from K.B. 1940, 137.

ANGOLA: District of Moxico; by R. Mfumbu, in *Brachystegia* woodland, 7 January 1938, *Milne-Redhead* 3971 (type).

NORTHERN RHODESIA: Mwinilunga District; south of Matonchi Farm in *Brachystegia* woodland, 6 December 1937, *Milne-Redhead* 3511, 3684.

For reasons similar to those given above for choosing the lectotype of *C. spicato-paniculata*, it is here proposed to choose that of *C. nyasensis* C. B. Clarke.

This species was first described in Fl. Trop. Afr. **8**, 519 (1902). No type was indicated, but five gatherings were cited, all from Nyasaland, three collected by Whyte and two by Buchanan. The best material is that collected by Whyte on the Plains of Zomba, probably in 1896, and I accordingly make this the lectotype of the name. All the gatherings, except that of Whyte from N. Nyasaland, 1896, which is at least varietally distinct, appear to represent one species.

Carex angolensis *Nelmes*, sp. nov; affinis *C. nyasensi* C. B. Clarke, sed paniculis secundariis magis pyramidalibus et distantibus, spicarum parte mascula breviore, squamis pallidioribus cum utriculis interdum superne hispidulis, utriculis subabrupte rostratis, rostris planioribus differt.

Rhizoma lignosum, breve. *Culmi* 100–125 cm. alti, obtuse trigoni, laeves, foliati. *Folia* 5–8 mm. lata, inflorescentia paullo breviora, viva alte canaliculata, laete viridia, sicca subplana, brunnescentia, longe attenuata, superne scabrida, culmos longe vaginantia; vaginae laeves. *Inflorescentia* paniculata, valde interrupta; *paniculae secundariae* 6–8, superioribus 1–3 interdum exceptis singulae, subpyramidales, sublaxae, inferiores distantes vel remotae, longe vel longissime exserte pedunculatae, superiores subapproximatae, breviter vel brevissime incluse pedunculatae; *pedunculi* stricti, scabridi. *Rhachis* pubescens, angulis hispidula; ramuli demum divaricati, inferiores usque 3-stachyi, superiores 1-stachyi. *Bracteae* foliaceae, inflorescentiam plerumque longe superantes, inferiores longe vel longissime vaginantes, superiores breviter vel vix vaginantes; vaginae laeves. *Spicae* androgynaeceae (*pars mascula brevissima*), 7–13 mm. longae, subdensiflorae; bracteolae scabrido-aristatae, marginibus hispidulae. *Squamae* ovatae, acutae, glabriusculae vel interdum superne pubescentes, tenues, plurinerves, pallidae, aristatae; aristae hispidulo-pubescentes. *Utriculi* 4 mm. longi, oblique patentes, squamis plerumque distincte longiores latioresque, trigoni, obovati vel obovato-elliptici, valde plurinerves, inferne glabri, interdum superne nervis parce hispiduli, in rostrum mediocre latum marginibus hispidulum ore alte bidentatum subabrupte contracti. *Stigmata* 3.

ANGOLA: District of Moxico; between R. Monu and R. Kampashi, in *Brachystegia* woodland, on sand, 19 January 1938, *Milne-Redhead* 4222.

XXI—THE TYPE OF CORYMBIUM AFRICANUM L.

T. A. SPRAGUE.

The following investigation was undertaken in response to a request received from Mrs. M. R. Levyns of Cape Town, in connexion with the Flora of the Cape Peninsula now in course of preparation. The genus *Corymbium* has recently been revised by Miss E. I. Markötter*, who has applied the name *Corymbium africanum* L. to *C. glabrum* L. (*C. nervosum* Thunb.). Miss Markötter's argument may be summed up as follows:

I. *Corymbium africanum* L. (1753) comprised two species now recognized as distinct, namely 1, *C. scabridum* Berg., 1767 (*C. scabrum* L., 1767), and 2, *C. glabrum* L., 1767 (*C. nervosum* Thunb., 1794).

II. Bergius in 1767 based *Corymbium scabridum* Berg., on the first two synonyms of *C. africanum* cited by Linnaeus (Sp. Pl. ed. 1, 928), namely, on *Corymbium foliis ad radicem longissimis liratis* Burm. Afr. 189, t. 70, f.1, and *Bupleurifolia, semine papposo, valerianoides umbellata cauliculo scabro* Pluk. Alm. 73, t. 272, f.5.

III. Linnaeus later in 1767 segregated *C. scabrum* L., which was likewise based on the first two synonyms of *C. africanum* L. (1753). He observed that these synonyms should be excluded from *C. africanum*.

IV. The name *C. africanum* L. must accordingly be restricted to its remaining element, namely, to *Bupleuri similis planta aethiopica, ad caulium nodos tomentosa* Pluk. Alm. 73, t. 272, f.4.

It will be observed that this argument is based on the so-called "method of residue," that is, it rests on the assumption that, when a taxonomic group is divided into two or more groups of the same rank, its name must be retained for *what is left* after segregation of the newly named groups. Such a method of applying names was frequently followed *before* the formal introduction of the type-method into the International Rules in 1930, but is now rejected: under Art. 18, "the application of names of taxonomic groups is determined by means of *nomenclatural types*." The question to be decided is accordingly: What is the type of *Corymbium africanum* L. Sp. Pl. ed. 1, 928 (1753)?

The text of *C. africanum* L. in Sp. Pl. ed. 1 is as follows:

africanum. 1. CORYMBIUM. *Hort. Cliff.* 494.
Corymbium foliis ad radicem longissimis liratis *Burm. afr.* 189, *t.* 70. *f.*1 Bupleurifolia, semine papposo, valerianoides umbellata, cauliculo scabro. *Pluk. alm.* 73. t. 272, f.5.
Bupleuri similis planta aethiopica, ad caulium nodos tomentosa. *Pluk. alm.* 73. *t.* 272, *f.*4.
Habitat in Aethiopia.

It should be noted that *Corymbium africanum* was a binary name for the species named *Corymbium* in Hort. Cliff. Linnaeus

* Engl. Bot. Jahrb. **70**, 354–372 (1939).

did not describe *C. africanum* in Sp. Pl. ed. 1 : no diagnostic phrase was required for the species, since he regarded the genus *Corymbium* as monotypic. He referred, however, to the specific description supplied by him in Hort. Cliff. 494 (1737). The account of *Corymbium* there given is as follows :

CORYMBIUM *cor. g.* 976.

1. CORYMBIUM
   Bupleurifolia semine papposo Valerianoides umbellata, cauliculo scabro. *Pluk. alm.* 73. *t.* 272, *f.*5.

α Bupleuri similis planta aethiopica, ad caulium nodos tomentosa. *Pluk. alm.* 73. *t.* 272, *f.*4.
Crescit in Aethiopia.
Radix coronatur lana seu capillis longis inque tophum congestis. Folia radicalia copiosissima, linearia, margine involuta, hinc subulato-setacea, spithamaea vel pedalia. Caulis pedalis, teres, erectus, purpurascens, scaber, instructus foliis aliquot alternis, lanceolatis, amplexicaulibus, e quorum alis superioribus racemi compositi, qui omnes fastigiati in corymbum flores ferunt.

It will be observed that Linnaeus distinguished typical *Corymbium* and a variety α. The former was based on two elements : (1) *Bupleurifolia etc.* Pluk. t. 272, f.5, and (2) a specimen in the Clifford herbarium, from which he had prepared the description given at the end of his account. There is no dispute that the specimen in the Clifford herbarium is conspecific with *C. scabridum* Berg. (1763), that the description refers to *C. scabridum*, and that Plukenet's t.272, f.5 represents *C. scabridum*. Typical *Corymbium* L. Hort. Cliff. (1737) is accordingly entirely conspecific with *C. scabridum* Berg. The variety α, based on Plukenet's t.272, f.4, is conspecific with *C. glabrum* L.

Since the binary name *Corymbium africanum* L. (1753) was based on *Corymbium* Hort. Cliff., it has *the same type*, and must accordingly be applied to *C. scabridum* Berg.

Comparison of the accounts of *Corymbium* Hort. Cliff. 494 and *C. africanum* Sp. Pl. ed. 1, 928, reveals two differences :

(1) Linnaeus introduced an additional synonym in 1753, namely, *Corymbium foliis ad radicem longissimis liratis* Burm. Afr. 189, t. 70, fig. 1. He inserted this immediately after the reference to Hort. Cliff., that is, *before* those to Plukenet's figures. Burmann's figure represents *C. scabridum* Berg.

(2) Linnaeus in 1753 no longer distinguished *Corymbium* var. α of Hort. Cliff. as a variety : he cited *Bupleuri similis planta aethiopica, ad caulium nodos tomentosa* Pluk. Alm. 73, t. 272, fig. 4, as a direct synonym of *C. africanum*.

The fact that Linnaeus in 1753 no longer distinguished the var. α of Hort. Cliff. as a variety does not mean that he had ceased to regard the strigose-stemmed plant as typical of the species. Indeed, his insertion of the Burman reference *before* the Plukenet's references suggests that he regarded it as a better representation of *C.*

africanum. A further reason, if any were required, for regarding the type of *Corymbium* Hort. Cliff. (1737) as being the type also of *Corymbium africanum* Sp. Pl. ed. 1 (1753), is that Linnaeus had up to the latter date seen no further material which might have led to a re-orientation of his concept of the species. There is no specimen named *Corymbium africanum* in his herbarium—vide B. D. Jackson, Index Linn. Herb. 63 (1912).

Since the publication of a name is validated by the provision of a description, or by a reference to a former description, the specimen on which the description was based is—ceteribus paribus—the type of the name. It follows that the specimen in the Clifford herbarium is the type of *C. africanum* L. Sp. Pl. ed. 1, 928 (1753). No subsequent action, whether by Linnaeus himself or by any other botanist, can affect this conclusion. The name *Corymbium africanum* L. should accordingly be applied to *C. scabridum* Berg.

Up to 1763 Linnaeus seems to have made no modification in his concept of *C. africanum* (1753) : the account of that species in Sp. Pl. ed. 2, 1317 (1763) is the same as that in ed. 1, except for a printer's error in the reference to *Bupleuri similis etc.* Pluk., where " f. 4, 5 " appears instead of " f.4." By 1765, however, Linnaeus had come to the conclusion that his *C. africanum* of 1753 included two distinct species, one with scabrid stems (Pluk. f.5), and the other with smooth stems and broader leaves, bearded in the axil. In a letter to J. and N. L. Burman, dated 8th January 1765, dealing with a collection of Cape plants which they had sent him, he referred to a specimen of *Corymbium*, bearing the number " 2," and asked them to look among their plants to see if there were another, distinct species, with broader leaves, bearded from the axil, and a smooth stem : " Quaere inter tuas numne et alia distincta species detur foliis latioribus ex ala barbatis, caule laevi " (H. C. van Hall, Epist. Ined. Caroli Linnaei, 84 : 1830). At that date Linnaeus apparently regarded the scabrid-stemmed plant [*C. scabridum* Berg.] as typical *C. africanum* and the smooth-stemmed barbate plant [*C. glabrum* L.] as a distinct new species. In his ' Mantissa prima,' (Oct. 1767) Linnaeus segregated the scabrid-stemmed plant under the new name *Corymbium scabrum* L., with the diagnostic phrase " *Corymbium* caule scabro," appending the observation that the relevant synonyms from Burman and Plukenet should be excluded from *Corymbium africanum*. This suggests that Linnaeus intended, at the time of writing, to reserve the name *Corymbium africanum* for the smooth-stemmed plant. But in his ' Systema Naturae,' ed. 12, 2, 582, also published in Oct. 1767, he proposed the name *Corymbium glabrum* L. for the smooth-stemmed plant. As in other instances, he abandoned the original name of the species (*C. africanum*), proposing new names for each of the segregates. It may be noted that, apart from the fact that many page-numbers of the ' Mantissa '* are cited in the " Systema," ed. 12, vol. 2, there is

* E.g. pp. 24, 66, 121, 136 of the " Mantissa " are cited on pp. 56, 272, 591 and 720 of Syst. Nat. ed. 12, vol. 2.

nothing to suggest that the 'Mantissa' appeared first. Indeed, it seems probable that they were issued together, since the last page of the Systema, vol. 2, has the letters "MAN-" near the bottom, an indication that the *next page* began with those letters. According to Richter, Codex Botanicus Linnaeanus, p. xxxi, both works appeared in October 1767.

The name *Corymbium scabridum* Berg. had been published by Bergius, Descr. Pl. Cap. 341 (Sept. 1767) for the scabrid-stemmed species. Miss Markötter states that Bergius described *C. scabridum* as a *new species*. Actually it was a *new name* for an old species, viz., for *Corymbium* L. Hort. Cliff. 494, which Bergius cited as a synonym, and ipso facto a new name for *C. africanum* L. (quoad typum).

CONCLUSIONS.

1. The type of *Corymbium africanum* L. (1753) is the type-specimen of *Corymbium* L. Hort. Cliff. 494.
2. *C. africanum* L. (1753) is conspecific with and antedates *C. scabridum* Berg. (1767).
3. The following changes in the nomenclature adopted in Miss Markötter's revision are accordingly required.

   A : *Corymbium* no. 3, *C. scabridum* Berg., becomes *C. africanum* L. (1753).

   B : *Corymbium* no. 11, *C. africanum* L. sec. Markötter (non L. 1753 quoad typum), becomes *C. glabrum* L. (1767).

XXII—MISCELLANEOUS NOTES.

"Cotine" or "Erbifex."—In the daily press some 10–11 years ago there were frequent references to a new natural fibre called "Cotine" or "Erbifex," *Asclepias incarnata* L., and Kew received numerous enquiries as to its commercial possibilities, about which somewhat extravagant claims were put forward by company-promoting concerns. The species is a native of North America where it is known as "American Swamp Milkweed," and commercial production was attempted in Britain but without success.

It had long been known that this species yielded a fibre and suggestions for its utilization were made in the United States in the latter part of last century. An interesting document has now been received at Kew, however, which shows that the fibrous qualities of the species were known as early as 1815. In a deed drawn up by Charles Whitlow,* Botanist, of the New York Coffee House, Sweetings Alley, Middlesex, addressed to His Most Excellent Majesty King George the Third, we learn that he "should and lawfully might make use exercise and vend within England Wales

* Charles Whitlaw (sometimes spelled Whitlow), author of "Whitlaws New Medical Discoveries, with a defence of the Linnean Doctrine and a translation of his Vegetable Materia Medica, which now appears in an English Dress," London, 1829.

and the Town of Berwick upon Tweed my Invention of The Working or making of certain Manufactures from certain Plants of the Genus Urtica and Esclipius growing in North America and not heretofore used in this Realm whereby the fabricated products usually had made or obtained from Hemp, Flax, Cotton, Silk and other the like fibrous Materials or the Seeds or the parts thereof may be beneficially had made or obtained In which said Letters Patent there is contained a Proviso obliging me the said Charles Whitlow by an Instrument in writing under my hand and seal to cause a particular description of the nature of my said Invention and in what manner the same is to be performed to be Inrolled in His Majesty's High Court of Chancery within six calendar months after the date of the said recited Letters Patent as in and by the same (relation being thereunto had) may more fully and at large appear Now Know Ye that in compliance with the said Proviso I the said Charles Whitlow do hereby declare that the nature of my said Invention and manner of performing the same are particularly described and ascertained in manner following, that is to say— I do take use and manufacture for the purpose aforesaid certain Plants not before worked or manufactured in Great Britain which have been first worked and used by me in Great Britain and of which Plants I do give the Botanical description in the usual words or terms of Art in the Latin language as here follows....."

Three species of *Urtica* are first described and then the *Asclepias* in the following terms :—"Asclepias incarnata Linneus Asclepias pulchra Ehrhart et undique pubescens foliis approximatis oblongis acutis basi obtusis, brevissime petiolatis, umbellis aggregatis origine geminis corniculis appendicum subexsertis. obs. Radix crassa carnosa similis tuberosa."

English translations of the descriptions follow, the document being witnessed and sealed by a magistrate, and a five pound stamp affixed.

Kew is indebted to the honorary secretary of the British Records Association for this interesting document which has been placed in the Museum files.

Vegetative Propagation of Tropical Crops.*—This publication is complementary to that published in 1936 by the Imperial Bureau of Fruit Production (as it was then styled), which dealt with the vegetative propagation of a large variety of fruits grown in the Tropics and Sub-Tropics. The demand experienced for this memoir has led the same authors to compile the present volume, and there is every reason to suppose that it will meet with a similar response from workers in the tropics.

* "Vegetative Propagation of Tropical and Sub-tropical Plantation Crops," by G. St. Clair Feilden and R. J. Garner. Technical Communication No. 13 of the Imperial Bureau of Horticulture and Plantation Crops, East Malling, Kent, England, 1940. Pp. 99. Price 3/6.

The work includes a description of a large number of plantation crops, many of which, such as sugar cane, rubber, coffee, cacao, and sisal, are already of great economic importance, whilst others have at present a limited use which may extend when their values are more properly appreciated in the world of commerce. No mention is made of the cashew nut which now commands a considerable market, and other varieties are now beginning to attract the attention of the planter, so that it will undoubtedly be necessary to bring the volume up to date in a few years time.

One is glad to see that the section of the previous publication which dealt with the methods of vegetative propagation has not only been retained but has been considerably enlarged and that the descriptions are now supported by delightfully simple and clear line drawings. The mention of the use of loosely woven baskets as a substitute for pots or bamboo sections in nursery work in the tropics is also well illustrated, and is deservedly included as this method now has an increasing vogue.

The authors are to be congratulated on having succeeded in bringing together much invaluable information in a compact form, and the volume should prove extremely useful to those engaged in the cultivation of tropical crops.

Botanical Magazine.—Part 4 of vol. 162 which was published on 22nd April contains the following plant portraits:

Iris Wattii Baker (t.9590), Assam and Yunnan; *Camellia Sasanqua* Thunberg (t.9591), southern Japan; *Tritonia flavida* Schlechter (t.9592), Natal; *Primula amoena* M. Bieberstein (t.9593), Caucasus and N.E. Turkey; *Paeonia Clusii* F. C. Stern (t.9594) a new name for a species native of Crete; *Aeschynanthus mimetes* B. L. Burtt (t.9595), a new species, Assam to S.W. Yunnan; *Aristolochia Lindneri* Berger (t.9596), Bolivia; *Rhododendron exquisitum* Hutchinson (t.9597), S.W. Szechwan; *Cyananthus microphyllus* Edgeworth (t.9598), Nepal and N. India; *Viola Stojanowii* W. Becker var. *latifolia* Turrill (t.9599), a new variety, Bulgaria; and *Abies lasiocarpa* (Hook.) Nuttall (t.9600), North America.

The volume is dedicated to Captain Frank Kingdon Ward in recognition of his services to Botany, Horticulture and Geography.

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ROYAL BOTANIC GARDENS, KEW

XXIII—SOME FISH-POISON PLANTS AND THEIR INSECTICIDAL PROPERTIES.

F. Tattersfield,* J. T. Martin* and F. N. Howes.

The well-known insecticidal powers of the fish-poisoning plants belonging to the genera *Derris* and *Lonchocarpus*, now extensively used, have stimulated the search for others in many parts of the world, partly with the object of establishing local industries or of finding local means for the control of insect pests. Periodically such plants have been sent to this country for identification or for the assessment of their insecticidal properties. On other occasions plants have been sent by request, either because they were closely related botanically to the better-known species mentioned, or because it was desirable to have information on specific points, such as the effect of varietal differences or age on insecticidal potency.

None of the plants described in this paper possesses the same insecticidal power as the roots of recent selections of *Derris* and *Lonchocarpus*, yet it may be useful to give a brief account of their distribution, main botanical characteristics and their value as contact insecticides, more especially as, in some cases, the part of the plant used is more readily harvested than the root. There is also the possibility that more potent strains or varieties will be discovered or produced by plant breeding or selection.

The plants examined were:—*Barringtonia racemosa* Roxb., from Kenya (below); *B. asiatica* Kurz, from Arnhem Land, North Australia (p. 170); *Barringtonia* sp., from British Solomon Islands (p. 171); *Careya australis* F. Muell., from Arnhem Land, North Australia (p. 171); *Derris trifoliata* Lour., from British Solomon Islands (p. 171); *Dioscorea* sp. ("Tuba sakut"), from North Borneo (p. 173); *Dolichos pseudopachyrhizus* Harms, from Kenya (p. 174); *Ipomoea* sp., from Santa Isabella, British Solomon Islands (p. 175); *Jacquinia* sp., from Guayaquil (p. 175); *Millettia pachycarpa* Benth., from India (p. 175); *Ostryoderris gabonica* Dunn, from Belgian Congo (p. 176); *Tephrosia macropoda* (E. Meyer) Harv., from Natal (p. 177); *T. Vogelii* Hook. f., from Uganda (p. 178); *Tephrosia* sp. from Arnhem Land, North Australia (p. 180).

Barringtonia racemosa *Roxb.*

The genus *Barringtonia* consists of about three dozen species, many of them common trees in mangrove swamps. A few are to

* Rothamsted Experimental Station, Harpenden, Herts.

be found in East Africa and others in the tropics of Asia, Australia and Polynesia. Most of them contain saponin and it is this that may account for their use as fish-poisons and in native medicine.

Barringtonia racemosa is a medium-sized evergreen tree widely distributed in the warmer areas bordering the Indian Ocean. The fruits are reputed to be used for poisoning wild pigs in the Philippines. Some of the more primitive tribes in Malaya are said to pound the seeds and extract the starch for food, after pouring off the liquor which no doubt carries away deleterious substances. In India the root has medicinal uses. The bark is fibrous and rich in tannin.

Insecticidal properties.—The bark has been reported to have insecticidal properties. V. A. Beckley (*in litt.* to one of us) states that the natives of Kenya use it successfully as a fish-poison and that weak alcoholic extracts showed a fair toxicity to insects. R. R. le G. Worsley (Insecticidal properties of some East African Plants, in Ann. Appl. Biol. **21,** 658 : 1934) found that alcoholic and cold and warm aqueous extracts were completely toxic to Citrus aphis (probably *Toxoptera aurantii* Boy.) at concentrations representing 2–2·5% of the bark and also that the resin fraction contained the bulk of the toxic principles. A sample of the bark kindly sent to Rothamsted by Mr. Beckley showed no toxicity to *Aphis rumicis* when alcoholic extracts equivalent to 2% of the bark were tested. This sample may have lost its activity in transit, but it does not in any case seem probable that *B. racemosa* would replace the much more potent insecticides of the derris class.

Barringtonia asiatica *Kurz* (syn. *B. speciosa* Forst.)

This species is also a medium-sized evergreen tree and is usually found near the sea. It has much the same distribution in tropical Asia and Polynesia, and has been recorded from various parts of northern Australia and Queensland. The tree normally occurs on open sandy beaches.

Both the fruit and the bark of this species are commonly used as fish-poisons. In the Philippines it is well known and the following description is given of the method of using it there—" A sufficient quantity of the bark, preferably taken from a mature tree, is cut into small pieces, which are then comminuted and mixed with earth in a wooden mortar. The proportion is about one part of earth to three parts of bark. The quantity of bark to be used depends upon the size of pond to be poisoned. The mixture is put in a gunny sack ; a half-sack full has been found by experience to be sufficiently strong to kill fish in a pond of about a metre deep and eight metres in diameter. The time of application of the fish-poison has been found to be most satisfactory at early dawn ; then by six or seven o'clock in the morning the stunned fish may be collected from the pool thus treated (The Philippine Agriculturist, **21,** 29 : 1932).

A sample of the bark of *Barringtonia asiatica* collected by Dr. Donald F. Thompson in Arnhem Land, Northern Territory, Australia, showed only a slight insecticidal potency when an alcoholic extract was tested at a concentration of 1% in terms of the bark.

Specimens of the seeds and husks, probably of a species of *Barringtonia* from the British Solomon Islands, also showed no toxicity to *Aphis rumicis*. Mr. Pagden, from whom this sample was received, reports (*in litt.*) that the fresh seed, ground with coral sand, is placed in a small bag and used for killing fish in rock or mud holes, the bag being squeezed to expel a little of the latex.

Careya australis *F. Muell.*

This Australian tree may attain to a large size but does not exceed 10 or even 5 metres in height in some localities. It occurs in the warmer or northern part of the Continent and has been recorded from various parts of Queensland near the coast and in Eucalyptus forest, in areas surrounding the Gulf of Carpentaria, in Arnhem Land, and some of the northern coastal districts of Western Australia.

Apparently the tree was well known to the aborigines and put to various uses by them. The pear-shaped fruit with its seeds was eaten when ripe (roasted) and cordage made from the fibrous bark, which was also used as a fish-poison. The pulped leaves were used medicinally for treating ulcers (F. M. Bailey, Queensland Flora).

We are indebted to Dr. Donald F. Thompson for samples of the bark of both branches and root of *Careya australis* from Arnhem Land, Northern Territory, Australia. Alcoholic extracts did not prove toxic to *Aphis rumicis* at a concentration of 1% in terms of the part of the plant. Hence this material is not likely to prove of interest as a contact insecticide.

Derris trifoliata *Lour.* (syn. *D. uliginosa* Benth.).

This species of *Derris* probably has a wider range of distribution than any other member of the genus. It occurs in India, Ceylon, Malaya, Indo-China, S. China, the Philippines, Polynesia, northern Australia, Madagascar and East Africa. It is usually found near the sea shore and on the banks of tidal rivers near mangrove swamps. It also occurs inland.

This has long been known as a common native fish-poison in many areas, particularly in northern Australia and many parts of Polynesia and the Pacific Islands. In India it is reputed to be used medicinally to some extent—as a stimulant, antispasmodic and counter-irritant. Rough cordage may be made from the tough stems of the plant.

Insecticidal properties. D. trifoliata (*uliginosa*) has been reported on several occasions to have insecticidal properties. Of six species tested by N. E. McIndoo, A. F. Sievers and W. S. Abbott (*Derris* as an Insecticide, in Jour. Agric. Res. **17,** 177 : 1919), only *D.*

elliptica and *D. trifoliata* were found satisfactory insecticides. E. R. De Ong (The comparative insecticidal value of different species of *Derris*, in Jour. Econ. Ent. **23,** 619 : 1930) found the roots of this plant not only aphicidal but to be partially deterrent to the caterpillar *Euphydras chalcedona*. Samples of leaf, branch and root tested at Rothamsted in 1927 showed, however, little or no promise as insecticides. A three year old sample of the root grown in Malaya was reported by J. N. Milsum (*Derris uliginosa*, in Malay. Agric. Jour. **26,** 18 : 1938) to contain 5·0% ether extractives and 0·47% rotenone and thus to be of doubtful commercial value.

In 1934 samples of several plants collected in the British Solomon Islands were received at Rothamsted from Mr. H. T. Pagden. Three were Derris samples, recognised by the Government Botanist, Brisbane, as *D. trifoliata* Lour., and were specified as from Savo (root, stem), Gizo (root), and Tulagi (root). In addition, the stems and leaves of an unrecognised vine from Savo were received (it was later described by the Government Botanist, Brisbane, as indistinguishable from *D. trifoliata*). Mr. Pagden (*in litt.*) reports that the vine is used by the natives both in fresh and salt water for catching fish. The fresh leaves and stems after being ground up with coral sand are dropped in among a shoal of fish, when the majority are killed almost immediately.

Alcoholic extracts of the Savo root at concentrations (in terms of part of plant) of 1·0% gave a moribund and dead figure of 40%, the Savo stem at 2 and 1% concentrations 80 and 40% respectively, the Gizo root at 1% concentration 70%, while the Tulagi root showed no toxicity at or below 1%. They can thus be regarded as of little practical interest as contact insecticides.

The leaf and stem of the " vine " proved distinctly more toxic to *Aphis rumicis*. A series of tests carried out on three separate occasions within three weeks gave the figures shown in Table I. A relatively poor sample of *D. elliptica* root, tested on one of these occasions, is included for comparison. It contained 1·4% of rotenone and 6·8% of ether extractives.

TABLE I.

Toxicity to *Aphis rumicis* of a Vine from the British Solomon Islands.

Description.	% *Concentration in terms of part of plant.*	% *Moribund and dead insects after 2 days.*
Vine—stem	2·0	100
	1·0	90
	0·75	50
	0·5	20
leaf	1·0	100
	0·75	100
	0·5	100
	0·25	65
	0·1	30

Description.	% *Concentration in terms of part of plant.*	% *Moribund and dead insects after 2 days.*
Derris elliptica—root	0·14	100
	0·11	98
	0·09	87
	0·07	82
	0·05	44
	0·035	14
Controls	—	3

The vine clearly does not possess the same degree of insecticidal potency as the sample of *D. elliptica*.

Further samples received in 1935 confirmed that the leaf of the vine was more toxic than root or stem, but not to be of the same order of potency as the roots of *D. elliptica* now available.

In 1936 a specimen of derris root was received from Vella Island, British Solomon Islands, collected by Mr. R. A. Lever and said to be a very potent fish-poison. The natives use stems, leaves and roots for fishing in the sea. The root was completely toxic at a concentration of 1% and accounted for 73% of the insects at 0·5%. The whole series of results obtained with *D. trifoliata*, although indicating that there are strains or physiological races of different potencies, do not show this species to be capable of commercial exploitation in competition with either *D. elliptica*, *D. malaccensis* or certain species of *Lonchocarpus*. The fact, however, that a vine of rather indefinite botanical description but apparently *D. trifoliata* possesses leaves and stems showing toxicity to insects is of considerable interest.

Dioscorea sp.

Dioscorea piscatorum Prain & Burkill is a large climber found in Malaya, Sumatra and Borneo. The tubers, which are near the surface and sometimes protected by thorns, are red in colour and well known to the Malays as a fish-poison, being called by them " tuba ubi." The Sahai in Malaya are said to eat the tubers after roasting, the toxic or deleterious substances being destroyed by heat (I. H. Burkill, A Dictionary of the Economic Products of the Malay Peninsula).

Insecticidal properties. A sample of the tuber of " Tuba sakut." provisionally identified as *Dioscorea flabellifolia* or *D. piscatorum*, was received at Rothamsted in 1933 from the Imperial Institute. It was sent from North Borneo to the Imperial Institute and was reported as a more potent fish-poison than many species of *Derris*. Alcoholic and aqueous extracts showed only a very slight insecticidal action, but the expressed sap itself showed rather more potency, but not to such an extent as to warrant an extended investigation.

Dolichos pseudopachyrhizus *Harms.*

The genus *Dolichos* is well represented throughout Africa and there are several species which possess fleshy or tuberous rootstocks. These are edible in some instances and used by the natives as food. The above species is of special interest on account of the large dimensions the rootstock sometimes attains, for it may reach 20–25 cm. in diameter and weigh 20–30 lbs. or more. It is not edible.

The plant has a wide distribution in the warmer parts of Africa and there is little doubt that several distinct geographical forms or varieties of it exist. It occurs generally in open savannah or slightly wooded country, and sometimes in tall grass.

Several separate climbing or scandent stems may arise from each tuber. These trail over trees or rocks extending sometimes as much as 12 metres.

The rootstock may be somewhat corrugated externally and is covered with a thick laminated brown bark which no doubt affords good protection under desiccating conditions. It contains much fibrous tissue when mature. Various writers and collectors have referred to the alleged poisonous nature of the tubers and their use by natives in poisoning fish. Broun and Massey (Flora of the Sudan, 203) state that " both the tubers and the beans contain a poisonous resin which is an active fish poison " and that " in the Bahr El Ghazal the tuber is mixed with the sap of the ' Heglig ' (*Balanites aegyptiaca*) and used as a substitute for soap."

The present sample of root was examined anatomically at Kew (by Dr. C. R. Metcalfe) and compared with another sample of root from the dry coastal area of Kenya, alleged to be *Dolichos pseudopachyrhizus*. The two specimens were found to be similar in general characters, but there were small differences, notably in the structure of a portion of the starch grains and in the presence or absence of crystals, suggesting that the two specimens may have originated from different forms of the plant—or even from different species.

Insecticidal properties.—The sample was received at Rothamsted in August 1936, from Mr. E. W. Bovill, and was derived from Taveta, from the Kenya side of the Kenya-Tanganyika frontier, near Mount Kilimanjaro. It is reported that the natives boil the bulbous root and use the resultant fluid for the removal of ticks, etc., from sheep and goats. It is also reported that a little rotenone has been found, but whether the term is used in a general sense for a rotenone-like substance is not known.

The root was received in an undried state. A portion of it was dried at about 35°C. and alcoholic extracts made of both the dried and undried material. The toxicities of the extracts were determined in threefold replication using *Aphis rumicis* as a test subject. The extracts of undried root showed very little insecticidal action at concentrations of 2% or below, probably owing to the large amount

of moisture present. The results for the dried root were as follows :—

	Concentration in terms of root.		*% of insects paralysed.*
	1·0	...	100
	0·5	...	83·2
	0·25	...	17·2
Controls—Alcohol 10%			
Saponin 0·5%		...	6·9

These results, while showing a definite insecticidal effect, demonstrate that this root is not of commercial interest, but that it might have some value for local use.

Ipomoea sp.

A sample of the tubers of a species of *Ipomoea* was received from Santa Isabella, British Solomon Islands, through the Imperial Institute. The tubers contained much sap. Alcoholic extracts were not toxic to *Aphis rumicis*.

Jacquinia sp.

Jacquinia Sprucei Mez (*Myrsinaceae*) occurs as a low bushy tree in Guayaquil in Ecuador. Several observers, including Robert Spruce, have recorded the use of the small orange-like fruits in Ecuador for stupefying fish.

The fruits of what was considered at Kew to be a species of *Jacquinia*, probably *J. Sprucei* Mez, and derived from Guayaquil, being known there as " Barbasco " and used as a fish-poison, were without toxicity to *Aphis rumicis*.

Millettia pachycarpa *Benth.*

Over 60 species of *Millettia* have been recorded from different parts of India.

Millettia pachycarpa, a strong-growing woody climber, might easily be mistaken for a species of *Derris* when not in flower or fruit, for its vegetative characters and general appearance are very similar. Like *Derris* it is well known as a fish-poison plant and is commonly employed by natives to procure fish from the hill streams and pools in regions where it grows. According to Brandis (Indian Trees, 219 : 1906) the fruit of this species is used for intoxicating fish besides the milky juice of the root. An allied Indian species which is also used as a fish-poison is *Millettia auriculata* Baker.

Insecticidal properties.—The genus *Millettia* contains several species with insecticidal properties. K. Nagai (Journ. Tokyo Chem. Soc. **23**, 744 : 1902) isolated rotenone as one of the constituents of *M. taiwaniana*. T. Kariyone, K. Atsumi and M. Shimida (Journ. Pharm. Soc. Japan, No. 500, 739 : 1923) confirmed this result and showed that this compound was common both to this plant and to *D. elliptica*. It was due to this work that the name " rotenone " replaced all others for the chief active principle of the fish-poison

insecticides of *Derris* and *Lonchocarpus* species. The root of *M. auriculata* is stated by N. E. McIndoo and A. F. Sievers on the authority of Greshoff (1913), to be used as an insecticide. (Plants tested for or reported to possess insecticidal properties, in Dept. Agr. U.S., Bull. no. 1201, 44 : 1924.) Chin Pi Chen (Science (China), **19,** 1405 : 1935, and Chem. Absts. **30,** no. 1, 225 : 1936) reported *M. pachycarpa* to be both a contact and stomach poison to insects, to contain much saponin and possibly rotenone. It is listed as an Indian fish-poison by M. B. Raizada and B. S. Varma (Indian Plants reported as Fish-poisons, in Indian Forester, **63,** no. 4, 198 : 1937). T. P. Ghose and S. Krishna (Occurrence of rotenone in *Millettia pachycarpa*, in Current Science, **6,** 57 : 1937) found the roots to contain 4% of total resins and 1·2% of rotenone.

The specimen tested at Rothamsted was received from the Forest Research Institute, Dehra Dun, U.P., India, in 1937 and was probably derived from the same source as that analysed by Ghose and Krishna.

An alcoholic extract was made and diluted with saponin solution, so that each concentration used contained 0·5% saponin and 5% of alcohol, and atomised in the usual way upon the adult apterous females of *Aphis rumicis*. The results were :

Concentration expressed in terms of root.		% *paralysed.*
1·0	...	100
0·5	...	100
0·25	...	100
0·1	...	55
0·05	...	20
0·025	...	5
Controls—Saponin 0·5%		
Alcohol 5·0%	...	5

The results show this root to have a relatively high toxicity, better than the leaves of *Tephrosia Vogelii* and equal to the root of *T. macropoda* which were tested at the same time. The insecticidal potency of the root of *M. pachycarpa*, however, is not of the same order as that of the rotenone-rich specimens of *D. elliptica*. Unless greatly improved by selection it could not commercially compete with the latter, but where locally available, it should prove of value for purposes of insect control.

Ostryoderris gabonica *Dunn.*

Ostryoderris is a small genus of trees or woody climbers in tropical Africa which is allied to *Derris* and *Lonchocarpus*. Four species occur in West Tropical Africa, *O. gabonica* being one of them. It is a straggling or climbing shrub found in southern Nigeria, the Cameroons and Gabon, and may occur further East. As far as is known the plant does not possess any special economic properties.

Insecticidal properties.—Samples of root, stem and leaf of this plant were obtained from the Jardin Botanique d'Eala, Belgian Congo, through the kind assistance of the Director General, Ministry of Colonies, Brussels. The plant is known locally as "Bolemba."

Tested on *Aphis rumicis* the following results were obtained :

Concentrations tested. %		% *paralysed insects.* *Stem.*		*Root.*
5	...	100	...	100
2	...	70	...	90
1	...	0	...	20
Control—Saponin Alcohol		3	...	3

The leaf was not insecticidal.

While interesting, these results show that no part of this plant is comparable in insecticidal activity with *D. elliptica*.

Tephrosia macropoda *(E. Mey.) Harv.*

This *Tephrosia* is considerably smaller than *Tephrosia Vogelii* and is straggling in habit, seldom exceeding 7–8 dm. in height. Its distribution is also very much more restricted for it occurs only in the eastern portion of South Africa. It is common in parts of the coastal grassveld of Natal and Zululand.

A variety (var. *angustifolia* E. Mey.) with smaller narrower leaflets, and altogether a smaller plant, has been recorded from Natal and the Eastern Cape Province, but whether its toxic or piscicidal properties differ from those of the ordinary form is not known. Experiments with *T. macropoda* in Natal have shown that it is of fairly rapid growth and responds well to cultivation, producing a larger and less twisted rootstock than in the wild state. The root may be 45 cm. in length and is straight and tapering in well-tilled soil.

In districts where it occurs the plant is well known to the natives as a fish-poison, the root only being used. It is also employed by them in freeing the head of vermin and for medicinal purposes. It is applied externally to sores and in skin complaints, and is also said to be a specific (after roasting) in enteric fever and to be used as an anthelmintic for cattle. In early days the roots were used by settlers as a wash for ridding dogs of fleas.

Insecticidal properties.—Tattersfield and Gimingham (The insecticidal properties of *Tephrosia macropoda* Harv. etc., in Annals Appl. Biol. **19,** 253 : 1932) have already reported upon the toxicity of samples of *T. macropoda* from Natal to *Aphis rumicis* and to larvae of *Selenia tetralunaria* and *Orgyia antiqua*. Howes (*Tephrosia macropoda* as a possible insecticidal plant, in Kew Bulletin, 1937 : 510) has described the results of experiments in Natal designed to obtain information upon the behaviour of the plant when cultivated. A sample of *T. macropoda* roots (cured under cover) was received in

1934 from Dr. A. P. D. McClean of the Natal Herbarium, Department of Agriculture and Forestry, Durban. The ground root was extracted in the cold by soaking with absolute alcohol, and the extract, diluted with 0·5% saponin solution, tested against *A. rumicis*. The results were as follows :

% *concentrations tested in terms of root.*		% *paralysed insects.*
0·25	...	96
0·10	...	53
0·05	...	30
Controls	...	20

Two further samples of roots one and two years old respectively, from an experimental plot, were received from Dr. McClean, via Kew, in 1935 and 1936. These were tested as before against *A. rumicis*. The results were :

% *concentrations tested in terms of root.*		% *paralysed insects.* 1 *year old root.*		2 *year old root.*
0·5	...	100	...	100
0·25	...	96	...	100
0·20	...	90	...	—
0·10	...	14	...	50
0·075	...	—	...	20
Controls	...	3·8	...	3

The leaf of the plant one year old showed little or no toxicity when tested at 1·0% concentration in the spray fluid.

Chemical tests.—The sample received in 1934 was examined chemically. (Martin, J. T., Occurrence of rotenone in *Tephrosia macropoda* Harv., in Nature, **137,** 1075 : 1936.) The ether extract amounted to 4·2% of the root. Tephrosal was obtained as a pale yellow oil (0·14% of root) of refractive index 1·485 (17°C.). Rotenone, separated from the ether extract as a complex with carbon tetrachloride, was found to be present to the extent of 0·3–0·4% of the root.

From the biological and chemical results, it is unlikely that, unless considerably improved by selection or breeding, *T. macropoda* would be able to compete with derris root in the European or American markets (see also Martin, *loc. cit.*, and Howes, *loc. cit.*).

Tephrosia Vogelii *Hk. f.*

This is one of the best known and most widely cultivated of the several species of *Tephrosia* known to have toxic properties or to be used as fish-poisons. It is a much branched, erect, woody shrub up to 2·5–3 metres in height. It is found both wild and in cultivation and is used by natives as a fish-poison more or less throughout tropical Africa. In forest regions of West Tropical Africa it is commonly cultivated in the fields of the riverine peoples for use in stupefying fish. Both the leaves and the pods may be used.

The plant appears to exist in two forms, the one with white and the other with purplish or violet flowers. Apart from this difference in flower colour the two forms are similar morphologically. Throughout East Africa the white-flowered form predominates but in West Africa the purple-flowered form is the one generally met with.

Apart from its use as a fish-poison this species is reputed to have other uses among the natives. In Uganda the dried, powdered leaves are strewn in huts in order to drive away fleas.

Insecticidal properties.—Tattersfield, Gimingham, and Morris (A quantitative examination of the toxicity of *Tephrosia Vogelii* Hk. f., in Ann. Appl. Biol. **12,** 66 : 1925) and Worsley (Insecticidal Properties of some East African Plants, in Ann. Appl. Biol. **21,** 659 : 1934) showed the leaf and seed to be insecticidal. There appeared to be some possibilities of its economic use. The discovery of very potent strains of *Derris* and *Lonchocarpus* species has limited the practical employment of this plant to localities where it is found. Georgi (Note on the ether extract of *Tephrosia Vogelii*, in Malay. Agric. Jour. **25,** 300 : 1937) has pointed out that the amount of the extract is very low compared with that of high-grade *D. elliptica*. The fact that the toxic principles are chiefly concentrated in readily harvested parts of the plant has given an added interest to this plant, and the question has arisen whether varieties exist with an enhanced potency.

Three samples from Uganda were sent by the Imperial Institute to Rothamsted in 1936. One of the samples had purple-coloured flowers. Tested by our usual technique the results given in Table 2 were obtained :

TABLE 2.

Toxicity of the leaf of *Tephrosia Vogelii* to *Aphis rumicis*.

% *Concentrations tested in terms of leaf.*		% *Moribund and Dead Insects.* *Toro sample* *Flower colour not given.*		*Kampala samples.* *White Flower.*		*Purple Flower.*
1·0	...	100	...	100	...	100
0·5	...	100	...	100	...	100
0·25	...	25	...	25	...	85
0·1	...	5	...	10	...	5
0·05	...	5	...	5	...	5
Controls	...	0	...	0	...	0

The samples are not sufficiently potent to justify any confidence that they would compete successfully with species of *Derris* and *Lonchocarpus* now firmly established as insecticides in the markets of Europe and America. The leaf of the variety possessing purple-coloured flowers appeared somewhat superior to the other two, but this may be due to chance. The selection of much more potent strains than these would be needed to warrant more than a local use.

Tephrosia sp.

A sample of the root of a legume collected in Arnhem Land, North Australia, by Dr. Donald F. Thompson was tested. It is known to the aborigines as " moiyongo " and reported as a species of *Tephrosia*. Alcoholic extracts showed some toxicity to *Aphis rumicis*. Concentrations in terms of root of 1·0 and 0·1% gave percentage figures of paralysed insects of 90 and 40 respectively. This root might possibly find a local use as an insecticide.

SUMMARY.

The distribution, native uses, and contact insecticidal properties of a number of fish-poisoning plants are described. None is of the same order of effectiveness as *Derris elliptica*. The most interesting from an insecticidal point of view are a vine from the British Solomon Islands, indistinguishable from *Derris trifoliata*, the leaves of which are toxic, *Dolichos pseudopachyrhizus* from Kenya, *Millettia pachycarpa* from India, *Tephrosia macropoda* from Natal and *T. Vogelii* from Uganda.

XXIV—CONTRIBUTIONS TO THE FLORA OF SIAM (THAILAND). ADDITAMENTUM LIII.*

Gaertnera sralensis (*Pierre ex Pitard*) *Kerr*, comb. nov. (Loganiaceae–Gaertnereae). *Psychotria sralensis* Pierre ex Pitard in Fl. Gén. Ind.-Chin. **3**, 344 (1924).

Krat, Kao Kuap, 700–900 m., evergreen forest, *Kerr* 17764, 17798, *Put* 2939.

The transference of this species to the genus *Gaertnera* is made on account of its inferior calyx.

Gaertnera taiensis *Kerr* (Loganiaceae–Gaertnereae); species *G. ramosae* Ridl. affinis, inflorescentia glabra, floribus minoribus praecipue differt.

Frutex vel *arbuscula* usque 5 m. altus, stipulis exceptis omnino glaber, ramulis siccitate nigro-purpureis laevibus teretibus vel subquadrangularibus, ad petioli insertionem callo U-formi notatis. *Folia* oblongo-elliptica vel oblongo-oblanceolata, basi cuneata, apice acute acuminata, 11·5–17·5 cm. longa, 3·2–4·8 cm. lata, chartacea, costa supra prominula subtus prominente, nervis lateralibus 6–8 paribus subtus prominentibus leviter arcuatis marginem versus evanescentibus, nervis transversis subconspicuis; petiolus 1·5–1·9 cm. longus, supra subplanus; stipulae usque ad medium vel ultra connatae, usque 1·5 cm. longae, parte libera apice bifida, pilis brevibus appressis sparse obsitae, deciduae sed parte basali saepe annulatim persistente. *Inflorescentia* terminalis, glabra, paniculato-cymosa, 2·5–4 cm. longa, pedunculo ramulisque valde complanatis; bracteae cito deciduae; pedicelli circiter 1–2 mm. longi. *Calyx* 5-dentatus, 0·5 mm. altus, extra glaber, intus basin versus cingulo setarum brevium praeditus. *Corolla* alba; tubus 5 mm. longus, superne sensim ampliatus, extra glaber, intus fauce longe villosus; lobi 3 mm. longi, anguste triangulares, apice inflexi. *Stamina* in fauce inserta, glabra, filamentis circiter 1·75 mm. longis, antheris 2 mm. longis. *Ovarium* glabrum; stylus 6·5 mm. longus, ramis stigmaticis 1·75 mm. longis. *Fructus* didymus vel globosus, circiter 5 mm. diametro.

Trang, Kao Soi Dao, circiter 300 m., in evergreen forest, *Kerr* 19137.

Canscora hexagona *Kerr* (Gentianaceae–Chironieae); species *C. pentantherae* C. B. Clarke affinis, calycis tubo valde 6-angulato facile distinguenda.

Herba annua, erecta, plus minusve dichotome ramosus, 7–45 cm. alta, omnino glabra; caulis anguste 4-alatus. *Folia* inferiora petiolata, ovato-lanceolata vel ovata, basi late cuneata vel rotundata, apice obtusa, membranacea, usque 7 cm. longa, 4·8 cm. lata, trinervia vel triplinervia; petiolus 3–5 mm. longus, supra concavus; folia superiora sessilia, superne sensim decrescentia, omnia distincta. *Inflorescentia* cymosa, multiflora; bracteae anguste ovatae vel lineares, 1–1·5 mm. longae; pedicelli graciles, 2–10 mm. longi. *Calyx* urceolatus, 6-dentatus, scariosus, manifeste reticulato-nervosus; tubus valde 6-angulatus, 5 mm. longus; dentes acuti, mucronati, 1·5 mm. longi. *Corolla* alba, 6-lobata; tubus subcylindricus, superne leviter sensimque ampliatus, 5 mm. longus; lobi aequales, obovati, rotundati, 2 mm. longi, 1·2 mm. lati. *Stamina* 6, aequalia, medio tubi affixa, filamenta 4·8 mm. longa; antherae 1·8 mm. longae, exsertae. *Ovarium* ovoideum, 3 mm. longum; stylus 4·5 mm. longus; stigma bilobatum, lobis subrotundis. *Capsula* circiter 4 mm. longa, siccitate rugosa, bivalvis, secundum suturas dehiscens; semina ovoidea, minute rugulosa, 0·3 mm. longa.

Korat, Chan Tuk, circiter 300 m., edge of savannah, *Kerr* 8059.

Gentiana (§ Chondrophylla) arenicola *Kerr* (Gentianaceae–Swertieae); species *G. capitatae* Buch.-Ham. affinis, calyce corollae aequilongo, calycis lobis obtusis differt.

Herba annua, erecta, glabra, simplex vel corymboso-ramosa, 7–11 cm. alta, caule siccitate longitudinaliter striatula et minute purpureo-punctato, internodiis usque 2 cm. longis. *Folia* intervallis aequalibus secundum caulem ordinata, sessilia vel brevissime petiolata, oblongo-obovata, basin versus sensim attenuata, apice obtusa, margine minutissime parceque ciliata, haud hyalina, 1·8–2·2 cm. longa, 0·7–1·0 cm. lata. *Inflorescentia* terminalis, subcapitata, 4–20-flora, foliis superioribus cum bracteis pseudo-involucrum efformantibus; bracteae spathulatae, apice rotundatae mucronataeque, scariosae nisi apicem versus viridulae, 3-nerviae, usque 1·6 cm. longae, 0·5 cm. latae. *Calyx* corollae ± aequilongus; tubus 5–8 mm. longus, scariosus; lobi oblongi vel oblongo-spathulati

* Continued from K.B. 1939, 465.

apice rotundati apiculatique, 5·5–7 mm. longi, 2–3 mm. lati, 1-nervii, scariosi nisi apicem versus viriduli. *Corolla* infundibuliformis, circiter 14 mm. longa; tubus circiter 11·5 mm. longus; lobi triangulares, circiter 2·5 mm. longi; plicae triangulares, obtusae, lobis duplo breviores. *Stamina* aequalia, 3 mm. supra basin corollae tubi affixa; filamenta circiter 5 mm. longa, basin versus sensim dilatata; antherae 2 mm. longae. *Capsula* matura e corolla vix exserta, obovoidea, 15 mm. longa, stipite 5 mm. longo incluso, apice alata, alis dentatis; semina ellipsoidea, utrinque apiculata, fusca, longitudinaliter leviter rugosa, circiter 1·2 mm. longa.

Sakon, Wanawn, circiter 200 m., open grassy deciduous forest, *Kerr* 8493.

The specific name refers to the sandy soil of the forests of Eastern Thailand where this plant grows, evidence of which is manifest on the roots of the dried material.

Gentiana Lakshnakarae *Kerr* (Gentianaceae–Swertieae); species *G. Hesselianae* Hoss. affinis, habitu nano, foliis pro rata angustioribus valde diversa.

Herba annua, 3–5 cm. alta; caulis brevis, 1–2 cm. altus, simplex vel pauciramosus. *Folia* rosularia, sessilia vel subsessilia, plana, anguste elliptica vel lanceolata, basin et apicem versus sensim attenuata, apice mucronata, margine haud vel vix hyalina leviter asperula, nervis obscuris, usque 5 cm. longa, 1·6 cm. lata. *Flores* sessiles, caerulei, 2–8 in apicibus caulis et ramulorum dispositi. *Calycis* tubus membranaceus, 5–6·5 mm. longus; lobi ovati, longe aristati, basin versus membranaceus, 4·5–5·5 mm. longi, basi 1·5 mm. lati, margine minute parceque asperuli. *Corollae* tubus circiter 13 mm. longus; lobi ovati, mucronati, circiter 3 mm. longi; plicae lobis duplo breviores, triangulares, apice minute apiculatae. *Stamina* aequilonga, 4·5 mm. supra basin tubi inserta; filamenta circiter 4·3 mm. longa, basin versus leviter dilatata; antherae circiter 2·5 mm. longae. *Capsula* obovata, dimidio superiore satis alte alata, stylo perbrevi, stigmatibus recurvatis 3–4 mm. longis, stipite excluso circiter 5 mm. longa, primo breviter stipitata, denique stipite 9 mm. longo suffulta. *Semina* fusca, ellipsoidea, utrinque apiculata, minute striatula, circiter 0·75 mm. longa.

Loi, Kao Krading, circiter 1200 m., open pine forest, *Lakshnakara* 1392, *Kerr* 8697A (*type*).

Gentiana (§ Chondrophylla) timida *Kerr* (Gentianaceae–Swertieae); species *G. capitatae* var. *Andersonii* C. B. Clarke et *G. cephalodi* Edgew. affinis, ab ambabus tota planta multo minore, calycis lobis pro rata brevioribus distinguenda.

Herba annua, erecta, simplex, circiter 2·8–6·5 cm. alta; caulis gracilis, teres vel subquadratus, minute papillosus, apicem versus scabridulus. *Folia* basalia 0; caulina 4–6, caulis apicem versus aggregata, sessilia, late elliptica vel oblanceolata, apice subacuta,

minute mucronata, margine anguste hyalina et minute ciliata, 6×3·4–11×6 mm. magna, glabra, trinervia. *Flores* 3–6 in apice caulis aggregati, sessiles vel brevissime pedicellati, 9–12 mm. longi, caerulei. *Calycis* tubus c. 2 mm. longus; lobi erecti, longe aristati, 3 mm. longi, margine hyalini. *Corollae* tubus 6·5–8·5 mm. longus; lobi ovati, apiculati, circiter 1·5 mm. longi; plicae leviter bifidae, lobis duplo breviores. *Stamina* aequalia vel subaequalia; filamenta circiter 3 mm. longa; antherae 1 mm. longae. *Capsula* matura e corolla leviter exserta, obovata, dimidio superiore anguste alata, longe stipitata, stipite 7–9·5 mm. longo; semina ellipsoidea, leviter rugulosa, fusca, circiter 1 mm. longa.

Doi Sutep, 1500 m., among grass in open forest, *Kerr* 1579B.

The specific name of this small plant refers to its habit. It is usually more or less hidden by the grass among which it grows, and seldom expands its flowers.

Swertia (§ Ophelia) calcicola *Kerr* (Gentianaceae–Swertieae); species *S. bellae* Hemsl. affinis, floribus minoribus saepius 5-meris, corollae glandulis angustioribus longius fimbriatis distinguenda.

Herba annua, erecta, glabra, leviter ramosa, 8–20 cm. alta; caulis leviter quadrialatus. *Folia* sessilia vel brevissime petiolata, lanceolata vel elliptica, apice apiculata, usque 2·5 cm. longa, 0·8 cm. lata. *Flores* saepius 5-meri, rarius 4-meri, longe pedicellati, pedicellis vulgo plus minusve curvatis 1·5–3·5 cm. longis. *Calyx* usque ad basin 5-fidus; lobi sub anthesi elliptici, apice acute apiculati, circiter 5 mm. longi, 1·5 mm. lati, cito accrescentes, demum late lanceolati, usque 13 mm. longi, 5·5 mm. lati. *Corolla* alba, purpureo-nervosa, accrescens; tubus sub anthesi 1 mm. longus; lobi subrhombiformes, 9 mm. longi, 3 mm. lati, apice acute apiculati, basi intus glandulis oblongis binis squamulis apice longe fimbriatis obtectis praediti. *Stamina* distincta, in corollae tubo inserta; filamenta circiter 4 mm. longa, basi vix dilatata; antherae circiter 1 mm. longae. *Ovarium* circiter 7 mm. altum; stigma sessile, bilobum. *Semina* ovoidea, minute foveolata, circiter 0·5–0·7 mm. diametro.

Doi Chiengdao, 2000–2100 m., on rocks (limestone), *Kerr* 6543.

Swertia (§ Ophelia) pinetorum *Kerr* (Gentianaceae–Swertieae); *S. striatae* Coll. et Hemsl. affinis, foliis minoribus, corollae lobis obovatis distinguitur.

Herba annua, erecta, glabra, 10–25 cm. alta, plus minusve ramosa; caulis quadrangularis, foliosus; rami ascendentes. *Folia* sessilia, lanceolata vel elliptica, 3-nervia, caulis parte inferiore circiter 1·5–2 cm. longa, 0·7–0·9 mm. lata, sursum decrescentia. *Flores* 5-meri, rarius 4-meri; pedicelli 1–2·5 cm. longi. *Calyx* usque ad basin 5-fidus; lobi lanceolati, acuti, 3-nervii, circiter 5 mm. longi, basi 1·5 mm. lati. *Corolla* alba, violaceo-striata (ex *Garrett*), circiter 1·8 cm. diametro; lobi obovati, apiculati, circiter 9·5 mm. longi, 5·5 mm. lati, basi glandulis binis oblongis ore fimbriatis praediti;

tubus circiter 1·5 mm. longus. *Stamina* distincta; filamenta circiter 4·3 mm. longa; antherae 2 mm. longae. *Ovarium* 6 mm. altum; stigma sessile, bilobum. *Semina* plus minusve rotunda, leviter complanata, minute foveolata, 0·5 mm. diametro.

Chawm Tawng, Doi Dawk, circiter 1780 m., open grassy land under pine, *Garrett* 619.

Nymphoides siamensis (*Ostenf.*) *Kerr* (Gentianaceae–Menyanthеae), comb. nov., descr. emend. et ampl.—*Limnanthemum indicum* var. *siamense* Ostenf. in Bot. Tidsskr. **24**, 263 (1902).

Herba glabra. *Folia* natantia, ambitu late ovata, basi alte cordata; petiolus 1–4 cm. longus. *Inflorescentia* 2–20-flora. *Flores* albi, 5-meri. *Calyx* alte 5-fidus; lobi oblongo-lanceolati, acuti, 3-nervii, 6 mm. longi, 1·7 mm. lati. *Corollae* tubus calyce brevior. *Stamina* medio tubo inserta; antherae circiter 1·5 mm. longae. *Nectaria* 5, parva, lobata, ad ovarii basin affixa. *Ovarium* ovoideum, circiter 2·5 mm. altum; stylus circiter 4·5 mm. longus; lobi stigmatici 2–3, ovati, circiter 1·5 mm. longi. *Capsula* calycem vix excedens, circiter 4–6-sperma; semina lenticularia, leviter muricata, circiter 1·2 mm. diametro.

Krat, Kao Saming, under 20 m. alt., in shallow pond, *Kerr* 9432; Satul, Tola, circiter 50 m., in muddy pond, *Kerr* 13865.

The above amplified description is chiefly taken from *Kerr* 9432, which comes from a locality near that of Schmidt's collection, on which Ostenfeld based his var. *siamense*. The description of the fruit and seed is from *Kerr* 13865. Ostenfeld recognised that his variety differed considerably from *N. indica*, but, his material being poor, refrained from giving it specific rank. The further material now available amply warrants its recognition as a species quite distinct from *N. indica*. Probably in this, as in some other species of *Nymphoides*, the flowers are dimorphic, in which case the above description applies to the long-styled form.

Cordia Mhaya *Kerr* (Boraginaceae–Cordieae); species *C. obliquae* Willd. affinis, foliis acuminatis supra minute albo-punctatis distinguitur.

Arbor, ramulis teretibus cortice pallide cinereo lenticellis parvis ovalibus pallidis consperso obtectis, innovationibus brunneo-tomentosis cito glabrescentibus. *Folia* coriacea, supra minute albo-punctata, glabra nisi subtus secundum costam et nervos laterales pilis paucis brevibus conspersa, ovata vel late elliptica, basi rotundata vel subcordata, rarius late cuneata, apice abrupte acuminata, margine integra vel repando-crenata, penninervia, costa cum nervis lateralibus subtus prominente supra leviter convexa, nervis lateralibus 5–8 paribus patentibus fere rectis prope marginem anastomosantibus, nervis transversis et rete venularum supra modice subtus valde prominulis, usque 16 cm. longa, 10·5 cm. lata; petiolus 4–5·5 cm. longus, glaber, supra alte concavus. *Inflorescentia* lateralis, cymosa, usque 15 cm. longa. *Calyx* circiter 6 mm. longus,

inaequaliter 2–3-lobatus, extra glaber, intus dense villosus. *Corollae* tubus circiter 4 mm. longus; lobi 5, reflexi, oblongi, obtusi, circiter 6 mm. longi. *Stamina* 5, corollae fauci inserta; filamenta basin versus sat dense pilosa. Cetera ignota.

BURMA: Pegu, *Kurz* (401) 2345 (type). THAILAND: Kanburi, Wangka, c. 200 m., lofty tree in bamboo forest, *Kerr* 10300.

Kurz, For. Fl. Burma, **2**, 208, in a note after *C. Myxa*, states: "There is another species of *Cordia* (apparently) of which only the leaves are known. These leaves are largely employed by the Burmese for cigar-envelopes. It is called 'mhaya,' and is said to grow abundantly in the Pegu Yomah." In Kew Herbarium there is a sheet of *Cordia* with a Kurz label, on which appears the number (401) 2345, the name Cordia Myxa L. and the locality Pegu. The first number has been crossed through and the second added. It is necessary to note this, as there is another sheet, of probably a different species, with the number (395) 2345. To the first sheet Brandis has attached the following observation: "This I identify with the species mentioned by Kurz on p. 208, F.Fl.II, as Mhaya, largely employed as covering leaves for the large Burman cheroots. From *C. Myxa* it differs by longer petioles, adult leaves minutely hairy beneath, rough above with minute cystolith cells. June 1903. D.B." In his Indian Trees, 479 (1906), Brandis further refers to this species, giving a short description of the leaves and adding that it is a small tree, but refrains from giving it a name. Kurz says nothing about the size of the tree. Kurz's specimen consists of a branch with several leaves. Some loose male flowers are in a capsule attached to the sheet. The Thai collection agrees very closely with Kurz's, as far as the material goes. It carries inflorescences just coming into flower; but here again all the flowers are male. They agree well with the loose flowers in the capsule of the Kurz sheet. The above description has been drawn up chiefly from the Kurz sheet, that of the inflorescence being taken from the Thai material.

Tournefortia intonsa *Kerr* (Boraginaceae–Heliotropieae); species affinis *T. Roxburghii* C. B. Clarke et *T. Wightii* C. B. Clarke, ab ambabus foliis majoribus basi cuneatis, nervis lateralibus patentioribus distinguitur; necnon a *T. ovata* Wall. foliis densius tomentosis, floribus confertioribus recedit.—*T. ovata* Craib in Kew Bull. 1911, 422, non Wall.

Frutex scandens, ramulis striatis fulvo-tomentosis. *Folia* oblongo-elliptica vel oblongo-lanceolata, basi anguste cuneata, apice sensim attenuata, acuta, margine integra, chartacea, supra pilis brevibus adpressis parce hirsuta, subtus sat dense tomentosa, usque 18 cm. longa, 6 cm. lata, supra costa cum nervis lateralibus leviter impressa, subtus prominula, nervis transversis supra obscuris subtus subconspicuis, nervis lateralibus 8–10 paribus angulo 45° e costa arcuato-ascendentibus; petiolus 0·7–1·2 cm. longus, dense tomentosus. *Inflorescentia* terminalis, vel ramulos breves laterales terminans, fulvo-tomentosa; pedunculus 4–9 cm.

longus; rami saepius iterum ramosi; spicae dense multiflorae, 12–25 mm. longae. *Flores* pallide virides, sessiles. *Calyx* 5-fidus; lobi anguste triangulares, acuti, extra intusque dense tomentosi, circiter 1·5 mm. longi. *Corollae* tubus circiter 10 mm. longus, inferne leviter ampliatus, extra tomentosus, intus glaber; lobi 5, rotundati, circiter 1·5 mm. longi. *Stamina* circiter 3 mm. supra basin tubi inserta; antherae lineares, minute apiculatae, circiter 2 mm. longae; filamenta circiter 0·5 mm. longa. *Ovarium* circiter 1·5 mm. altum; stigma sessile, bilobum.

Doi Sutep, c. 900 m., evergreen forest, *Kerr* 2285 (type); Ban Me Ta (between Lampang and Pre), near stream, *Kerr* 997.

XXV—CONTRIBUTIONS TO THE FLORA OF BURMA: XVII.*

The regions in brackets after the specific epithet are those from which the species has been reported previously.

Polygala trichophylla *Chodat* [Polygalaceae] (E. Himalayas in India).

Nam Hat Valley, 27°35′N., 97°55′E., 1850 m., fls. Sept., *F. Kingdon Ward* 7381: "Liana in upper forest of Oak, Rhododendron, etc. Calyx and reflexed standard purple, keel and wings bright yellow." Moulmein, *Lobb*, without information. Thaton District: Dawna Range, west side, frt. Feb., *J. H. Lace* 6336.

Anisadenia saxatilis *Griff.* [Linaceae] (Nepal to Assam).

Nam Tamai Valley, 27°45′N., 97°55′E., 1550–1850 m., fls. Aug., *Ward* 7318: "Epiphyte in the forest. Fls. white." N. E. Upper Burma, 3000 m., fls. Sept., *G. Forrest* 24918.

Fagara oxyphylla (*Edgew.*) *Engl.* [Rutaceae] (Himalayas from Garhwal to Khasia, W. China).

Seinghku Wang, 2000 m., fls. May, *Ward* 6745: "Scrambling up many feet through thickets. Fls. dull-purple with conspicuous bright-yellow anthers; seeds black, polished, like small shot. Whole plant strongly aromatic."

Apios carnosa (*Wall.*) *Benth. ex Baker* [Papilionaceae] (Nepal to Khasia).

Zayul Valley, Kahao, 2150 m., fls. July, *Ward* 7167: "Twiner in thickets in Pine Forest. Fls. red." Ruby Mines District: Kabaing to Kathpyin, 900-1200 m., fls. Oct., *Lace* 5992.

Desmodium podocarpum *DC.* [Papilionaceae] (Simla to Khasia, China, Japan).

Zayul valley, Kahao, 1550 m., fls. July, *Ward* 7157: "In woods. Tall, slender shrub with drooping branches. Fls. pale-pinkish-purple."

* Continued from K.B. 1939, 337.

Millettia Dielsiana *Harms* [Papilionaceae] (W. China).

Zayul valley, Kahao, 1500 m., fls. July, *Ward* 7153: "Large twiner, spreading over rocks and shrubs in rocky ravines on pine-clad slopes; fls. a sort of raw-meat purple or crimson."

Rhynchosia himalensis *Benth. ex Baker* [Papilionaceae] (India, Himalayas).

Zayul Valley, Kahao, 1500 m., fls. July, *Ward* 7156: "Twiner in open pastures and rocky places forming low massive growths; fls. yellow, standard heavily veined with purple."

Fragaria nubicola *Lindl.* [Rosaceae] (Himalayas as far East as Sikkim).

Seinghku Wang, 28°8′N., 97°24′E., 3400 m., fls. June, *Ward* 6919: "In open pastures and on boulders. Fls. white."

Maddenia hypoxantha *Koehne* [Rosaceae] (W. China).

Seinghku Wang, 3100 m., fls. early June, *Ward* 6811: "Small shrub in thickets or in the open on steep faces. Fls. white, very fragrant."

Neillia thyrsiflora *Don* [Rosaceae] (Central and Eastern Indian Himalayas, China, Java).

Seinghku Valley, 1200–1500 m., fls. Aug., *Ward* 7278: "Lax shrub 6–10 ft. high, sending up many branches which droop over. In thickets and open places at edges of the forest. Fls. white."

Potentilla peduncularis *Don* [Rosaceae] (Himalayas as far East as Sikkim).

Seinghku Valley, 28°10′N., 97°20′E., 3400 m., fls. Oct., *Ward* 7595: "Scattered on sunny turf or grit slopes. Fls. golden-yellow."

Prunus rufa *Wall.* [Rosaceae] (Nepal to Bhutan).

Seinghku Wang, 28°8′N., 97°24′E., 3400 m., fls. June, *Ward* 6949. "Small, spreading shrub, branches expanding horizontally. In thickets amongst boulders in the valley. Fls. pale-pink, hanging from the flattened branches." 2750–3100 m., fls. early June, *Ward* 6983: "6–10 m. high. In thickets and on meadow-clad slopes. Fls. white."

Rosa sericea *Lindl.* [Rosaceae] (Kumaon to Bhutan, W. China).

Seinghku Wang, 28°8′N., 97°24′E., 3400–3700 m., fls. July, *Ward* 7035: "Dwarf shrub, more or less prostrate, branches ascending, compact. On sloping granite rocks in thickets of dwarf Rhododendron. Fls. pale-sulphur, anthers cream, stigmas golden."

Rubus eustephanos *Focke* [Rosaceae] (W. China).

Nam Tamai, 1200–1500 m., fls. and young frt. early May, *Ward* 6690: "In thickets of secondary, mostly scrub jungle on old cultivated slopes. Small, spreading, scrambling bush. Stems red; fls. pure-white, slightly fragrant."

Rubus Hookeri *Focke* [Rosaceae] (Sikkim).

Seinghku Wang, 2300 m., fls. end May, *Ward* 6778: "*On steep*, stony slopes on the edge of the 'dry' forests (i.e., facing the sun) or in thickets in open shaded situations. Undershrub, more or less prostrate and ascending. Fls. large, nodding, cream."

Sorbus Rehderiana *Koehne* [Pomaceae] (W. China).

Seinghku Wang, 28°8′N., 97°24′E., 3700–4000 m., fls. July, *Ward* 7095: "Shrub 2·5–3·5 m. high, growing among Rhododendrons on the more sheltered slopes. Leaves polished. Fls. white unpleasantly scented."

Sorbus ursina *Wenz.* [Pomaceae] (Kumaon to Sikkim).

Seinghku Wang, 3100 m., fls. early May, *Ward* 8658: "Small tree in tanglewood and open thickets. Fls. dull-red."

Leptodermis Wardii *C. E. C. Fischer et K. N. Kaul*, sp. nov. [Rubiaceae]; *L. Potanini* Batal. similis, sed foliis adultis rigidis glabris (nervis supra hispidis exceptis) reticulationibus obscuris, stipulis rigidis longitudine sua latioribus a petiolis liberis, corollis extra glabris, antherarum filamentis longioribus.

A bushy *undershrub* about 33 cm. high; stems up to 4 mm. diam., greyish and glabrous below, with 2 lines of hispid pubescence and often reddish above; lower internodes up to 5 cm. long, upper much shorter. *Leaves* rigid, elliptic to broadly ovate, acute at both ends, 1·2–4·1 cm. long, 0·6–2·4 cm. wide, dark-brown (when dry) above, pale below, glabrous except the hispid midrib and the 3–4 pairs of primary nerves above, more pronounced when young, reticulations obscure, margins ciliolate; petioles 1–5 mm. long, hispidulous above; stipules rigid, free from the petioles. *Inflorescence* terminal on the branchets and axillary in the upper leaves; flowers solitary or a few fascicled; pedicels 0–2 mm. long; bracts united in a short sheath round the pedicels, the free ends broadly ovate or broader than long, acute, with a sharp tooth on either side a little below the ciliolate apex, keeled, 2 mm. long; bracteoles 2 at the base of the ovary, resembling the bracts but much smaller. *Calyx-tube* and ovary obconic, 2·5–3 mm. long, glabrous, blackish when dry; tube above the ovary very short; lobes 5 (rarely 6), triangular-lanceolate, acute, 1 mm. long. *Corolla-tube* narrowly funnel-shaped, straight or slightly curved, 7·5–8·5 mm. long, glabrous without, crisped-hairy above the middle within; lobes 5, induplicate-valvate, shortly decurrent on the tube, lanceolate to ovate, acute, 2·5 mm. long, minutely puberulous at the tip without, beset with thickish white hairs within. *Stamens* 5, inserted above the middle of the corolla-tube; filaments slender, 1·6 mm. long, glabrous; anthers linear, 2·6–2·9 mm. long, dorsifixed, half exserted. *Ovary* 4–5-celled, crown flat; style slender, 4–4·5 mm. long, glabrous, stigmas 3–5, filiform, papillose, about reaching the base of the filaments. *Fruit* not seen.

Seinghku Valley, 28°5′N., 97°30′E., 2770 m., fls. Oct., *Ward* 7610: "*Forming compact clumps on limestone cliffs facing south on the open ridge.* Fls. cream, slightly fragrant."

Codonopsis Benthami *Hook. f.* [Campanulaceae] (Sikkim).

Di Chu Valley, 3400 m., fls. end July, *Ward* 7193: "Erect or weakly twining, 1 m. or more long. Often in clumps in meadows. Fls. bright-yellow, base finely purple-speckled, ovary and style purple-black; fragrant." Seinghku Valley, 28°10′N., 97°20′E., 4000 m., fls. and frt. early Oct., *Ward* 7531: "On steep grass slopes, semi-erect or ascending or lying along the slopes in clumps or singly; abundant. Fls. pale greenish-yellow, purple-speckled at the base within."

Lonicera chlamydata *W. W. Sm.* [Caprifoliaceae] (Yunnan).

Seinghku Wang, 28°8′N., 97°24′E., 3400 m., fls. June, *Ward* 6906: "Spreading, 1 m. or less high, sometimes forming a thick bush. On or amongst boulders on steep slopes. In thickets of shrubs or solitary. Fls. rather dull-yellow; berries translucent blood-red."

Lonicera hispida *Pall. ex Roem. et Schult.* [Caprifoliaceae] (Central Asia, Kashmir to Sikkim, China).

Seinghku Wang, 28°8′N., 97°24′E., 3400–3700 m., fls. June, *Ward* 6946: "1 m. or less high, branches outspread. In thickets on boulder slopes beneath *Abies* forest on the sheltered slope of the valley. Fls. yellow; berries glaucous blue." The specimens are not typical of the species.

Lonicera Myrtillus *Hook. f. et T.* [Caprifoliaceae] (Kashmir to Sikkim).

Seinghku Wang, 28°8′N., 97°24′E., 3400 m., fls. June, *Ward* 6973: "Almost prostrate, spreading shrub growing over boulders in the open valley. Fls. purple-rose."

Lonicera trichosantha *Bur. et Franch.* [Caprifoliaceae] (W. China).

Di Chu Valley, 3100–3400 m., fls. July, *Ward* 7127: "Large, spreading bush. Fls. cream when first open, changing to a deeper yellow with age; berries bright translucent orange."

Hoya erythrostemma *Kerr* [Asclepiadaceae] (Siam).

S. Tenasserim, Thebyu Chaung, 65 m., fls. Feb., *C. E. Parkinson* 1680: "Climber. Juice milky; fls. white to mauve."

Centranthera grandiflora *Benth.* [Scrophulariaceae] (Sikkim, Assam).

Zayul Valley, Kahao, 1850 m., fls. July, *Ward* 7165: "Only seen on the upper pine- and bracken-clad terraces; fairly abundant. Roots orange; fls. bright-yellow."

Pedicularis diffusa *Prain* [Scrophulariaceae] (Sikkim).

Seinghku Wang, 28°8′N., 97°24′E., 3400 m., fls. early July, *Ward* 7028: "In pastures by streams. Fls. pinkish-purple."

Pedicularis Elwesii *Hook. f.* [Scrophulariaceae] (Sikkim, Yunnan).

Seinghku Wang, 28°8′N., 97°24′E., 3400 m., fls. early July, *Ward* 7027: "In open pastures on mossy boulders, etc. Fls. rich purple."

Pedicularis nana *C. E. C. Fischer*, sp. nov. [Scrophulariaceae]; a *P. collata* Prain caule verticillo foliorum 4–5 supra bina basalia instructo, foliis pedicellis floribusque brevioribus, corolla intus glabra, labii marginibus denticulatis, galea margine integra differt.

A diminutive, caespitose *herb*; roots fibrous; stems slender, 1–3 cm. long, glabrous below, more or less pubescent upwards. *Leaves* few, a basal opposite pair a little above the base and a whorl of 4–5 higher up, usually above the middle; blade subcircular, oblong or linear-oblong in outline, 4–6 mm. long, 2–4 mm. wide, pinnatifid into 3–4 pairs of rotund to ovate thick segments with lobulate margins; petioles slender, 6–12 mm. long. *Racemes* terminal, subcapitate, few-flowered; bracts like the leaves but shorter and with wider, 1-costate petioles; pedicels 2–3 mm. long. *Calyx* tubular-campanulate, slightly oblique at the base, sparingly villous without; tube entire, thinly membranous, 4·5 mm. long, with 10 dark veins; lobes 5, subequal, oblong, obtuse, 1·5 mm. long, somewhat thickened and dark at the apex. *Corolla* crimson; tube cylindric, slightly widened at the mouth, 1·1 cm. long, 15-veined below; lip reniform in outline, 5·5 mm. long, 8·5 mm. wide, 3-lobed, apical margins denticulate, midlobe rounded, 2·4 mm. long, lateral rotund-oblong, 3·7 mm. long; galea erect, 4·5 mm. long. *Stamens* inserted near the base of the corolla; filaments narrowly strap-shaped, 1-costate, glabrous, one pair slightly longer than the other; anthers broadly ovate, 1·5 mm. long, base of cells acute. *Ovary* sessile, ellipsoid, 1·5 mm. long; style filiform, stigma globose, hardly exserted. *Capsules* (of previous year and devoid of seed) oblong-lanceolate, acuminate, 6·5 mm. long.

Seinghku Wang, 28°8′N., 97°24′E., fls. July, *Ward* 7093A: "On grassy ledges of limestone cliffs, embedded with other species of *Pedicularis* and mosses in mats of dwarf *Salix*."

Pedicularis Pantlingii *Prain* [Scrophulariaceae] (Nepal, Sikkim).

Seinghku Wang, 28°8′N., 97°24′E., 2150 m., fls. and young frt. end May, *Ward* 6772: "In alder copse. Fls. pinkish-purple with darker veins." 2900 m., fls. early June, *Ward* 6895: "On meadow slopes in the open." 3400 m., fls. late June, *Ward* 6999: "On steep earth banks. Fls. pale purplish-pink."

Pedicularis rotundifolia *C. E. C. Fischer* sp. nov. [Scrophulariaceae]; *P. sabaënsi* Bonati affinis, sed foliis bracteisque brevioribus subcircularibus flabellatim lobatis, calyce breviore haud translucente, labii marginibus integris differt.

A low *herb*; rootstock slender, fusiform; stems several, woody, slender, terete, slightly sulcate near the apex, 10–15 cm. long, with

two lines of pubescence below and at the apex, glabrous in the middle, internodes long. *Leaves*: radical not seen; cauline opposite, 2 pairs, circular or slightly broader than long, 4–7 mm. diam., the upper the larger, shallowly 8–10-lobed, lobes oblong or flabellate, bluntly 3-lobiculate and these again often bluntly, rarely acutely, 2-lobed, veins obscure, furfuraceous hairy on both faces; petioles 0 or very short. *Inflorescence* terminal in congested or slightly lax heads; bracts like the leaves; pedicels very short. *Calyx* tubular; tube entire, 4–5 mm. long, villous without; lobes 5, posterior ensiform, acute, 1·5 mm. long, the others rotund, subequal, coarsely crenate, 2 mm. diam., pubescent on both sides. *Corolla* crimson; tube slender, 1·07–1·3 cm. long, sparingly puberulous without; lip broadly ovate, 7·5 mm. long, 6·7 mm. wide, 3-lobed, midlobe oblong, 3·5 mm. long, lateral semicircular, 3–5 mm. diam.; galea glabrous, bent at right angles, slightly swollen at the bend, erect portion 3·5–4·5 mm. long; beak straight or slightly curved, 6·2–7·2 mm. long, apex entire, truncate. *Stamens* inserted above the middle of the corolla-tube; filaments filiform, glabrous; anthers elliptic-oblong, 2 mm. long. *Ovary* sessile, ellipsoid, 2·5 mm. long; style filiform; stigma capitate. *Fruit* not seen.

Seinghku Valley, 3380 m., fls. late July, *Ward* 7216: "In pastures and meadows."

Briggsia muscicola (*Diels*) *Craib* [Gesneriaceae] (Yunnan).

Di Chu Valley, 2770 m., fls. July, *Ward* 7135: "On mossy tree-trunks in mixed forest. Fls. egg-yellow finely mottled with red-brown."

Ficus nemoralis *Wall.* [Moraceae] (Indian Himalayas).

Seinghku Wang, 1540 m., young receptacles May, *Ward* 6723: "Medium-sized, spreading tree, common but confined to the jungle by the river. Usually laden with epiphytes and often hanging over the river. One of the very few species of *Ficus* at this altitude."

Larix Griffithii *Hook. f. et Thoms.* [Coniferae] (Nepal to Bhutan.)

Di Chu Valley, 3400–3700 m., cones end July, *Ward* 7191: "Tall, graceful tree on the steep granite cliffs and flanks of the valley, with *Abies*; nowhere forming forests by itself. Much more abundant on the North side of the snow range than on the Burma side, where it is rare."

Iris kumaonensis *Wall.* [Iridaceae] (Kashmir to Kumaon).

Seinghku Wang, 28°8′N., 97°24′E. 3400–3700 m., fls. June, seeds Oct., *Ward* 6917: "In tight dwarf clumps on steep grassy banks amongst Rhododendron bushes. Falls rich gleaming purple, standards white with a purple band down the centre, beard yellow; fragrant."

Allium Wallichii *Kunth* [Liliaceae] (Gilgit to Sikkim).

Seinghku Valley, 28°10′N., 97°20′E., 3400–3700 m., fls. Oct., *Ward* 7554: "In alpine meadow. Fls. purple." 28°8′N., 97°25′E.,

3100–3400 m. fls. late Sept., *Ward* 7517: "On steep meadow slopes beneath the cliffs, 60-100 cm. high; fls. mauve; whole plant strongly scented."

XXVI—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XVII.*

TWO NEW BORNEAN RUBIACEAE. C. E. B. BREMEKAMP.

Lecariocalyx *Bremek.*, gen. nov. *Psychotriearum*, inflorescentia terminali una cum endospermo ruminato ad *Grumileam* Gaertn. et ad *Peripelum* Pierre accedens, calyce rotato, fructu accrescente ab iis recedens.

Rami novelli et *folia* infra pilis septatis vestita. *Stipulae* in vaginam ampliorem connatae, lobis interpetiolaribus apice in aristas duas exeuntibus. *Inflorescentia* terminalis, sed ope ramuli axillaris mox in positionem lateralem coacta, pedunculata, capitata vel e capitulis pluribus composita; bracteae angustae, ciliatae; bracteolae nullae. *Flores* hermaphroditi, 4- vel 5-meri, forsitan heterostyli. *Ovarium* biloculare; ovula in quoque loculo solitaria, ascendentia. *Calyx* rotatus, lobis ovatis vel ovato-orbicularibus trinerviis magnis. *Corolla* hypocrateriformis, tubo os versus tamen paulum dilatato fauce dense sericeo-villoso, lobis aestivatione valvatis. *Stamina* in corollae fauce inserta, antheris basifixis introrsis. *Discus* semiglobosus, sulcatus. *Stylus* filiformis; stigmata 2, oblonga, brevia. *Fructus* drupaceus, calyce accrescente coronatus, subcostatus, bipyrenus. *Semina* endospermo ruminato praedita, embryone parvo.

Genus adhuc monotypicum terrae Borneënsis partem occidentalem habitans.

Lecariocalyx borneënsis *Bremek.*, sp. nov. (unica).

Habitus ignotus. *Rami novelli* teretes, 2·5 mm. diametro, dense hirtello-tomentosi. *Folia* petiolo dense hirtello-tomentoso 2–4 mm. longo suffulta; lamina elliptica vel obovata, 5–6·5 cm. longa, 2–2·7 cm. lata, apice longius acuminata, basi acuta et haud raro conduplicata, subcoriacea, siccitate supra saturate et subtus dilute brunnea, supra glaberrima, subtus costa nervisque dense hirtello-tomentosa, inter nervos sparse et fugaciter pilosa et minute albido-lepidota, costa subtus crassa valde prominente, nervis utroque latere costae 8–9 supra immersis subtus prominulis, venulis paucis. *Stipulae* in vaginam 4 mm. altam connatae, lobis late triangularibus 5 mm. latis 1 mm. altis, aristis gemellis 1·5 mm. longis, extra sparse hirtellae, basin versus glabrescentes, axilla sericeae. *Inflorescentia* pedunculo dense hirtello-tomentoso 2·7–3·0 cm. longo elata, nunc e capitulo singulo, nunc trichotome ramificata et e capitulis tribus formata, in quo casu ramuli 1 cm. longi foliis lineari-lanceolatis 3 cm. longis suffulti; capitula 1·7–2·0 cm. diametro, basi foliis linearibus

* Continued from K.B. 1939, 545.

1·3–2·0 cm. longis suffulta; flores dichasialiter dispositi, bracteis linearibus margine *graciliter ciliatis* extra basin versus hirtello-tomentosis costa hirtellis suffulti. *Flores* alii 4-meri, alii 5-meri. *Ovarium* turbinatum, extra dense et longe sericeum. *Calycis* tubus late infundibuliformis, 1–1·5 mm. altus, 1·4 mm. diametro, intus sericeo-villosus; lobi 4, aequales, vel 5, nunc aequales, nunc inaequales, 4 mm. longi, 3·5 mm. lati, extra sparse hirtelli, margine subpellucide ciliati, intus glabri. *Corollae* tubus 4·5 mm. longus, basi 1·2 mm., fauce 1·6 mm. diametro, extra glaber; lobi oblongi, 2·5 mm. longi, 0·9 mm. lati, apice acuto incurvati, extra apice hirtelli, intus glabri. *Stamina* filamentis glabris 2 mm. longis exserta; antherae oblongae, obtusae, 1 mm. longae. *Discus* glaber. *Stylus* glaber, 4·5 mm. longus; stigmata 0·5 mm. longa, subinclusa. *Drupa* hirtello-tomentosa, calyce ad magnitudinem duplam aucto coronata.

SARAWAK. Sine loc., *Native Collector* (*Sarawak Museum*) 1362 (typus, Herb. Kew.).

The difference in height between the anthers and the stigmata suggests heterostyly, a condition not uncommon among the *Psychotrieae*.

Gaertnera schizocalyx *Bremek.*, sp. nov., a congeneribus omnibus calyce in lobos lineares partito conspicue diversa; inflorescentia hirtella et congesta etiam facile cognoscenda.

Habitus ignotus. *Rami novelli* pilis incurvatis dense griseo-villosi, deinde glabrescentes et mox cortice albido vestiti, teretes. *Folia* petiolo supra glabro subtus dense hirsuto 5–6 mm. longo suffulta; lamina oblanceolata vel anguste obovata, 8·5–12·5 cm. longa, 2·5–4 cm. lata, caudato-acuminata, basi acuta, subcoriacea, supra nitidula, siccitate supra saturate subtus dilute brunnea, supra glaberrima et dense nigro-punctata, subtus costa nervisque satis dense et inter nervos sparse hirsuta et albo-punctata, nervis utroque latere costae 5 subtus prominulis sub margine arcuatim collectis, venulis pluribus e costa ortis patentibus. *Stipulae* petiolum margine satis lato cingentes, supra petiolum in vaginam villosam 4 mm. altam connatae et utrinque in aristas duas villosas 2·5 mm. longas exeuntes, intus glabrae, axilla sericeae. *Inflorescentia* breviter pedunculata, subglobosa, 1·5 cm. diametro, dense hirtella; bracteae lineares, 4 mm. longae, basi dilatatae et appendicibus utroque latere 3 pectinatae, extra et praesertim margine hirtellae, intus subglabrae; bracteolae anguste lineares, 3 mm. longae, basi interdum subdilatatae, et hinc inde appendicibus brevibus munitae, extra hirtellae. *Flores* sessiles, 5-meri. *Ovarium* semi-inferum, extra sparse et brevius hirtellum, usque ad calycis insertionem, 0·6 mm. altum. *Calyx* extra et praesertim margine hirtellus, intus glaber, tubo 0·7 mm. alto, lobis linearibus subobtusis 2·5 mm. longis 0·7 mm. latis. *Corollae* tubus cylindricus, 3 mm. altus, 0·8 mm. diametro, extra glaber, intus fauce dense albo-barbatus; lobi crassiusculi, extra dense hirtelli, intus glabri, 1·8 mm. longi, 0·5 mm. lati.

Stamina in corollae fauce inserta, filamentis glabris applanatis 0·7 mm. longis, antheris basifixis ovoideis obtusis 0·8 mm. longis. *Discus* (dimidium superius ovarii) glaber, 0·5 mm. altus. *Stylus* glaber, stigmatibus filiformibus 0·3 mm. longis comprehensis 4 mm. longus, i.e., sicut stamina breviter exsertus. *Drupa* ignota.

SARAWAK. Sine loc., *Beccari* 1799 (typus, Herb. Kew.).

The half-inferior ovary, but perhaps even more the peculiar way in which the petioles are surrounded by a collar-like excrescence from the stipular sheath, and the black dots on the upper side of the leaves assign to this plant a place in the genus *Gaertnera* Lam. On account of the long calyx lobes it occupies an isolated position, for in the other species the calyx is cupular and subtruncate.

XXVII—PLANTS NEW TO ASSAM: XII.*

The regions in round brackets indicate the localities from which the species have been previously recorded.

Lonicera deleiensis *C. E. C. Fischer et K. N. Kaul*, sp. nov. [Caprifoliaceae]; *L. angustifoliae* Wall. affinis, foliis haud lanceolatis haud acutis subtus vix albis, bracteis ovatis, floribus duplo majoribus distat.

A small *shrub*; branchlets solid, reddish, shining, 2–3 mm. diam., peeling, nodes sometimes considerably swollen; lateral twigs short, subtended by numerous brown, ovate, keeled scales up to 2 mm. long. *Leaves* varied, nearly circular, broadly elliptic, ovate or obovate, apex rounded or slightly narrowed, obtuse, base usually cuneate, sometimes rounded, 1–5 cm. long, 0·7–3 cm. wide, primary nerves 4–9 pairs, with the midrib and fine reticulations slightly impressed above, brown (when dry) and glabrous above, pale below and abundantly dotted with minute grey scales, margins slightly revolute; petioles 2–3 mm. long. *Inflorescence* axillary; peduncles solitary, slender, 2·5–3·5 cm. long; bracts free, ovate, obtuse, 5–5·5 mm. long; bracteoles united into a thin, entire cup 2·5 mm. long. *Ovaries* completely fused into a sessile subglobose element 3·2 mm. long, each 2–3-celled. *Calyx* yellowish; tube very short, with a fold across the outer side; lobes 5, ovate or oblong, obtuse, 7 mm. long. *Corolla* tubular-funnel-shaped, base slightly oblique, 1·1–1·2 cm. long, glabrous without, hairy on the upper ⅔ within; lobes 5, nearly circular or broader than long, 5–5·5 mm. diam. glabrous outside, minutely papillose within. *Stamens* 5, inserted a little below the middle of the corolla tube, included; filaments 1·5–2 mm. long, glabrous; anthers linear, 2 mm. long. *Style* subulate, 5 mm. long, glabrous; stigma capitate, 1·5 mm. diam. *Fruit* not seen.

DELEI VALLEY; 28° 20′N., 96°37′E., 3380–3700 m., fls. June, *F. Kingdon Ward* 8349: "Scattered in the *Abies-Rhododendron* forest. Fls. opening pink, usually fading white."

* Continued from K.B. 1940, 42.

Lonicera Henryi *Hemsl.* [Caprifoliaceae] (N. Burma, W. China).

DELEI VALLEY; 28°20′N, 96°35′E, 2450–2770 m., fls. late July, *Ward* 8498: "Twiner in *Tsuga-Rhododendron* forest. Fls. cream." 2770–3000m., fls. mid-Aug., *Ward* 8558: "Twiner in thickets along the ridge. Fls. opening cream, later turning a darker yellow."

Lonicera Kingdonii *C. E. C. Fischer et K. N. Kaul*, sp. nov. [Caprifoliaceae]; *L. tanguticae* Max. affinis, foliis obovatis acutis glabris, bracteolis praesentibus, corollis basi angustis, stylis inclusis differt.

A small *shrub*; branchlets solid, pale-brown, 2–3 mm. diam, peeling; ultimate twigs bifarious, very slender, 3–12 cm. long, reddish-brown, subtended by several pale-brown, ovate or lanceolate, acute, keeled scales 3–4 mm. long. *Leaves* membranous, elliptic, elliptic-lanceolate or elliptic-oblong, tapering to an acute or subacute apex, base cuneate, 2–5 cm. long, 0·7–1·3 cm. wide, when dry dark-olivaceous above, greyish below, midrib impressed above and slightly raised below, primary nerves 5–9 pairs, ultimate reticulation minute, clearly visible below, very slightly (under the lens) bullate above, margins slightly revolute, at least when dry; petioles 2–4 mm. long, slightly widened at the base and the opposite pairs joined by a shallow ridge. *Inflorescence* axillary; peduncles solitary, filiform, 2·5–4 cm. long, 2-flowered; bracts free, narrowly lanceolate, acute, 8·5 mm. long, 1-costate; bracteoles united into a thin cup 1·6 mm. long. *Ovaries* united in the lower half, ovoid, 2 mm. long, 2-celled, ovule solitary. *Calyx-tube* 0·5 mm. long; lobes 5 subequal, oblong, subacute, 1 mm. long. *Corolla-tube* cylindric, slightly narrowed at the base, 1·1 cm. long, 10 veined, glabrous without, thinly pubescent within; lobes 5, slightly unequal, ovate, broadly oblong or semi-circular, 2·5–3·1 mm. long. *Stamens* 5, included, inserted below the middle of the corolla-tube; filaments filiform, 1·5 mm. long; anthers linear, 2·2 mm. long. *Style* subulate, 2·3 mm. long; stigma capitate, globose or broadly oblong, entire, 1 mm. long. *Fruit* not seen.

DELEI VALLEY; 28°21′N., 96°37′E., in forest at 3080–3390 m., fls. June, *Ward* 8331: "Fls. white, faintly tinged with purple."

Viburnum cordifolium *Wall.* [Caprifoliaceae] (Kumaon to Bhutan).

DELEI VALLEY; 28°21′N., 96°37′E., 3370–3680 m., fls. June, *Ward* 8314: "With birch and scrub *Rhododendron* all along the ridge in *Abies* forest, especially where there is bamboo. A scrub bush with fragrant white flowers, anthers purple." 28°15′N., 96°35′E., 2760–3680 m., fls. and young frt. late Aug., *Ward* 8618: "Small tree very common in *Rhododendron* forest. Berries now red, a few already black." 28°15′N., 96°40′E., 3680 m., ripe frt. early Oct., *Ward* 8687: "Small shrub along open ridges amongst *Rhododendron* and other shrubs. Ripe berries black."

Androsace Henryi *Oliv.* [Primulaceae] (N. Burma, W. China).

DELEI VALLEY; 28°15′N., 96°35′E., 2770–3100 m., frt. Aug., *Ward* 8565: "On steep shady bank of North-facing gully in *Rhododendron-Tsuga* forest; heavily shaded and more or less hidden amongst undergrowth."

Buddleja Hookeri *Marq.* [Loganiaceae] (Sikkim, N. Burma).

DELEI VALLEY; 28°15′N., 96°35′E., 2770 m., fls. late Aug., *Ward* 8598: "Small shrub in thickets on the sunny slope. Fls. cream with orange centre; very fragrant."

Onosma emodi *Wall.* [Boraginaceae] (Garhwal to Bhutan, S. Tibet).

DELEI VALLEY; 28°21′N., 96°37′E., 3380 m., fls. June, *Ward* 8348: "In colonies on ledges of gneiss cliffs in *Abies-Rhododendron* forest facing south. Fls. in drooping heads, opening purple but ultimately more or less blue.

Trigonotis rotundifolia (*Wall.*) *Benth.* [Boraginaceae] (Punjab to Sikkim).

DELEI VALLEY; Kaso, 28°21′N., 96°37′E., 3650–4000 m., fls. and frt. early July, *Ward* 8418: "On steep subalpine slopes facing South. Fls. pale sky-blue."

Chirita stolonifera *C. E. C. Fischer et K. N. Kaul*, sp. nov. [Gesneriaceae]; *C. lachenensi* C. B. Clarke peraffinis, caule stolonifero, foliis solitariis cordatis, maturis subtus glabris, pedunculis 1- raro 2-floris, inflorescentia haud glandulosa differt.

A stoloniferous *herb*; stolons slender, up to 20 cm. long, nearly black, sparsely (densely when young) crisped brown-hairy. *Leaves* solitary, radical, thinly membranous, cordate, obtuse, sinus usually deep, basal lobes rounded, equal or somewhat unequal, 5·3–10·5 cm. long, 4·5–8 cm. wide, primary nerves 6 pairs, silvery-brown felted on both faces at first, when mature dark and sparsely dotted with short hairs above, paler and glabrous or nearly so below, margins distinctly and shallowly crenate-serrate or sometimes more closely and coarsely dentate; petioles 7–20 cm. long, densely brown-villous when young, becoming nearly glabrous with age. *Peduncles* erect, solitary in the axils of the young leaves, usually 1-, rarely 2-flowered, slender, dark, sparsely brown-pilose, 6–8 cm. long; bracts 2, opposite, above the middle of the peduncle but well below the nodding flower, up to 4 mm. long, brown-hairy. *Calyx-segments* 5, nearly free, caducous, narrowly lanceolate, acuminate, subequal, 5–7 mm. long, sparsely brown-pilose. *Corolla* funnel-shaped, mouth oblique, puberulous without; tube 1·7–2 cm. long, glabrous within, with 2 longitudinal folds opposite the stamens; limb 2-lipped, lobes 5, rounded, subequal, 7–10 mm. diam. *Stamens* 2, included, inserted a little below the middle of the tube; filaments ensiform from a moderately broad base, 4–5 mm. long, pubescent upwards; anthers rounded, 2 mm. diam. *Staminodes* 2, linear, short. *Ovary*

sessile, linear, 5·6 mm. long, puberulous; style as long, puberulous; stigma funnel-shaped. *Capsule* (immature) linear, straight, 4 cm. long, glabrous.

DELEI VALLEY; 28°21′N., 96°37′E., 1850–2150 m., fls. July, *Ward* 8462: "On rocks and banks in the forest. Fls. more or less hidden beneath the leaves, mouth of corolla pure violet, throat white with yellow streaks."

Radermachera Borii *C. E. C. Fischer*, sp. nov. [Bignoniaceae]; *R. xylocarpae* (Roxb.) K. Sch. similis, sed foliolis caudatis, calycibus majoribus lageniformibus inferne valde 5-sulcatis, corollis anguste infundibularibus, capsulis multo angustioribus spiralibus, seminibus minoribus.

A *tree*. *Leaves* bipinnate, 35 cm. or more long; petiole sulcate above; pinnae, 4 pairs and a terminal, up to 17 cm. long, partial petioles terete, up to 3·5 cm. long, the lower the longer; leaflets 2–3 pairs and a terminal (uppermost 3-foliolate), lanceolate, caudate, base acute, 4·5–8 cm. long, 1·5–3 cm. wide, primary nerves 4–6 pairs, dark-olivaceous (when dry) and minutely puberulous above, especially on the midrib and nerves, paler and dotted with minute discoid scales below; petiolules terete, 4–15 mm. long, the lowest the longest, glabrous or minutely puberulous. *Cymes* dichotomous apparently few-flowered; partial rhachises (in fruit) somewhat compressed, pale-brown; pedicels terete, 4–4·5 cm. long. *Calyx* fleshy, flagon-shaped, 2·7 cm. long, swollen and thickened at the base, 1·2 cm. diam., 5-grooved, tubular portion 7–8 mm. diam., longer than the swollen portion, 5-ribbed, the ribs arising from the apices of the grooves, shortly split anteriorly; lobes 3, unequal, ovate, obtuse, 4 mm. long. *Corolla* cylindric-funnel-shaped; tube 4 cm. long, 4 mm. diam. at base, 8·9 mm. diam. at the mouth and there slightly laterally compressed; lobes 5, rather fleshy, rotund-oblate, much plicately imbricate in bud, margins crisped, 1·5 cm. long, 2 cm. wide. *Stamens* 4 perfect, inserted about ⅓ up the corolla-tube; filaments subulate, 2·8 cm. long; anthers of 2 divaricate, linear cells 4 mm. long, connective apiculate, 1·3 mm. long; staminode 0 or 1 slender, less than half as long as the filaments. *Disk* annular, 1 mm. long. *Ovary* linear, 6·3 mm. long, covered with minute discoid scales; ovules in 8–10 rows; style slender, overtopping the anthers; stigmas 2, oblate, flat, 3 mm. long, 4 mm. wide. *Capsules* slender, acuminate, subterrate, spiral, up to 45 cm. long, 4–5 mm. diam., pale brown, dotted with very small tubercules; septum lenticular in section, longitudinally sinuate; seeds usually 2·5–3 mm. long, 4–5 mm. wide, and with a wing spread of 1·1 cm., but sometimes a few larger, 4 mm. long, 6 mm. wide, spread 2·5 mm.

NAGA HILLS; Khonoma, 1850 m., fls. Aug., frt. Nov.–Dec., *N. L. Bor* 2699. Corolla cream-coloured. Vernacular name: *Thaprü*. I have only seen a single rather young leaf, detached flowers and one or two cymes in fruit. The description may, therefore, require amplification.

Isotrema Griffithii (*Hook. f. et Thoms. ex Duchartre*) *C. E. C. Fischer*, comb. nov. [Aristolochiaceae] (Sikkim, Bhutan).—*Aristolochia Griffithii* Hook. f. et Thoms. ex Duchartre in DC. Prodr. **15,** 1, 437 (1864).

DELEI VALLEY; 28°21′N., 96°37′E., 2150–2460 m., fls. May, *Ward* 8226: "Twiner among bushes on open ridge at edge of jungle, but in full sun or light. Fls. about 4 in. high, 3 in. across the open mouth; tube a dirty greenish-white, strongly about 12-ribbed, thickly clothed with rather glistening golden brown silky hairs; limb dull-purple outside with reticulate veins, inside covered with sharp projecting dull dark-purple spikes; foetid."

Iris kumaonensis *Wall.* [Iridaceae] (Kashmir to Kumaon).

DELEI VALLEY; 28°21′N., 96°37′E., 3380–4200 m., fls. early June, *Ward* 8281: "In massy clumps on steep gravelly gully-slopes lined with bamboos, along the ridge under bamboos on a rocky outcrop and also on alpine turf slopes. Falls and standards violet; beard white tinged violet; sometimes the whole fl. more purple, the falls mottled; delicately but distinctly fragrant."

Allium Wallichii *Kunth* [Liliaceae] (Gilgit to Sikkim).

DELEI VALLEY; 28°15′N., 96°35′E., 3380–3700 m., fls. just passed, Sept., *Ward* 8663: "In open places on boggy ground or on steep slopes. Fls. violet." 28°15′N, 96°40′E., 3700 m., fls. early Oct., *Ward* 8688: "On sheltered alpine meadow slopes. 2–3 ft. high; fls. palest-purple, almost mauve."

Nomocharis Souliei (*Franch.*) *W. W. Sm. et W. E. Evans* [Liliaceae] (W. China, S. E. Tibet).

DELEI VALLEY; 28°21′N., 96°37′E., 3700–4000 m., fls. late July, *Ward* 8370: "Under bamboos in black, tenacious loam. 12 in. high; fls. solitary, tepals dull brownish-red with a small yellow area at base, 3 outer shortly saccate at base."

XXVIII—MISCELLANEOUS NOTES.

The Correct Name for Akania Hillii Hook. f.—*Akania Hillii* was first published in Volume I, Part i, of Bentham & Hooker's "Genera Plantarum" (p. 409), which bears the date 1862 upon the title-page. An entry in Bentham's MS. diary shows that this part actually appeared not earlier than August 7th of that year. In vol. 17, p. 28, under date 6.8.62, we read: "Out at various com[mission]s—to the Linnean Society—to the Printers to settle accounts for the first part of our Genera which is to be out to-morrow . . . ." The part was reviewed in Gard. Chron. & Agric. Gaz. 1862, no. 36, 838, dated September 6th.

Bentham, in his account of *Akania Hillii* the following year (Fl. Austral. **1,** 471 : 1863), cited as a synonym *Cupania lucens* F. Muell., and subsequent authors, including the most recent (Harms in Engl. Pflanzenfam. ed. 2, **19b I,** 175 : 1940), have unanimously followed him.

Cupania lucens was published in Mueller's Fragm. Phytogr. Austral. **3,** 44 (1862). But Fascicle xix, which comprised pages 41–60, was published in July (*vide* p. 60). This gives *C. lucens* at least a week's and at most two months' priority over *A. Hillii*, and the following new combination is accordingly necessary:

Akania lucens (*F. Muell.*) *Airy-Shaw*, comb. nov.

Cupania lucens F. Muell. Fragm. Phytogr. Austral. **3,** 44 (Jul. 1862).

Akania Hillii Hook. fil. in Benth. et Hook. f. Gen. Plant. **1,** 409 (inter 7 Aug. et 6 Sept. 1862), et auct. omn.

The genus seems so closely related to *Harpullia*, in spite of the differences of calyx, disk, aestivation, etc., pointed out by Stapf and others, that the wisdom of separating it from the *Sapindaceae* may be doubted. Engler's treatment—placing it next to the *Meliaceae*—to which Harms has been obliged to conform (with evident misgivings), appears to indicate a failure to appreciate the value of *facies* (cf. Sprague in Huxley, The New Systematics, 441, 449 : 1940). H. K. AIRY-SHAW.

Jacquemontia tamnifolia (*L.*) *Griseb.**—Dr. S. J. v. Ooststroom has written to point out that the identity of *J. capitata* with this species was recognized by H. Hallier as long ago as 1899 in his paper "Zur Convolvulaceenflora Amerikas" in Jahr. Hamburg. Wiss. Anst. 1898, **16,** Beih. 3, p. 28 (1899). He also used it as an example of a species occurring in both South America and Africa. See Meded. Rijks Herb. Leiden, **35,** 5 (1918).

A new Strychnos from Thailand.—In working over the Thai species of *Strychnos* for the *Florae Siamensis Enumeratio* it was found that a specimen collected by Dr. A. F. G. Kerr at Krabi in Southern Thailand represented a new species. This is closely allied to *S. ovalifolia* Wall. of the Malay Peninsula, but has not got the characteristically abbreviated inflorescence of that species. *S. Wallichiana* Benth. is also closely allied, but differs in having constantly oblong leaves and a hairy style.

Strychnos krabiensis *A. W. Hill*, sp. nov. ex affinitate *S. ovalifoliae* Wall., a qua inflorescentiis longioribus, floribus paullo majoribus recedit; a *S. Wallichiana* Benth. foliis ellipticis vel ovato-ellipticis, nec oblongis, stylo glabro differt.

Planta scandens, lignosa, cortice haud annulata (*fide* Kerr). *Ramuli* teretes, glabri vel primum breviter et patule pubescens. *Petioli* 1 cm. longi, supra basi crassa articulati, canaliculati, glabri. *Lamina* elliptica vel ovato-elliptica, 8–13 cm. longa, 5–5·75 cm. lata, basi subabrupte angustata vel rotundata, apice acumine 1 cm. longo instructa, e basi valide trinervis, nervis intramarginalibus ut

* See K.B. 1940, 63.

secondariis tenuioribus, utrinque glabra. *Inflorescentiae* e cymis paniculatis compositae axillares, efoliatae, ut videtur circiter 7 cm. longae. *Pedunculus communis* 3–3·4 cm. longus, glaber. *Rami inflorescentiae*, ut pedicelli, pilis brevibus fulvo-brunneis patule pubescentes. *Flores* laterales pedicellis 3–4 mm. longis instructi, terminales sessiles. *Calyx* sepalis 5 ovoideo-triangularibus subacutis vel acutis 1·75 mm. longis pubescentibus. *Corolla* 1·3 cm. longa, tubo 1·1 cm. longo intus ad basin versus piloso lobis 5 triangularibus subacutis 2 mm. longis. *Stamina* 8 mm. supra basi tubi affixa. *Antherae* 2 mm. longae, dorsifixae, subsessiles. *Ovarium* globosum, 1 mm. diametro, glabrum; stylus 6·5 mm. longus, glaber.

THAILAND. Puket: Krabi, Ao Luk, c.100 m., in evergreen forest on limestone hill, 10 March, 1930, *Kerr* 18532. *Native name Ya mû lek.*

A. W. HILL.

The New Systematics.*—This book is a collection of essays by twenty-two contributors on diverse topics directly or indirectly bearing upon the modern problems of taxonomy. Rather less than half of these are mainly botanical. The Editor contributes a helpful introduction which is in some sense a summary of the contents and which serves to bring into focus the rather disconnected chapters of the other contributors.

The objectivity of species, that is stressed by certain of the writers, and the aggregate character of species, emphasised by others, are both important aspects of what Huxley rightly claims are groups that, in the great majority of instances, present no intrinsic difficulty in their separation. The individuals that comprise species are frequently subject to genetic change, and the consequences of such may transcend the limits which one or other biologist regards as justifiably included within their species concept. In this degree the species must be an aggregate depending upon human judgment, although there are many instances where the limits of the specific group are clearly defined alike by geographical and physiological isolation. Yet the normal view of species breaks down where there are hybrid swarms, where apomixis occurs or where descent is reticulate. Thus the necessity arises for the experimental culture of taxonomic units with which W. B. Turrill deals. Most will probably endorse his view that it is only by a combination of all the methods of investigation that there is any hope of obtaining satisfactory evidence on the nature and genesis of taxonomic unity.

J. S. L. Gilmour starts on the high note of epistemology and philosophical promise, but if the fulfilment, as he himself is the first to admit, be somewhat vague, it is well that we should not lose sight of the fact that our only knowledge, even of type specimens, is a complex of sense impressions, the character of which is to some extent conditioned by the individuality of the sensory mechanism.

The phylogenetic basis of classification is claimed both by Sprague and Calman. Gilmour, on the other hand, regards phylogeny as forming a sort of background to natural classification. Much of such difference in point of view may be an outcome of the common confusion of thought between affinities and phylogeny, a distinction with a real difference. A crude illustration will make this point clear. If the problem were to classify a number of human beings of unknown relationships but including members of several families with near and distant relatives, it is quite probable that an intelligent and competent observer would be able, on the basis of resemblances in morphology and behaviour, to place the members of the respective families and some of their nearer relatives into separate groups. One might further draw the not unreasonable inference that these resemblances were indications of probable affinity, but they would afford little if any clue to the phylogenetic relationships. We should be entirely unguided as to whether two individuals exhibiting a certain degree of resemblance were for instance, cousins or an uncle and a nephew. The study of taxonomy is essentially one of the study of differences and resemblances and though such may guide us in assessing affinities it is only rarely in the past that we have obtained any real clue to phylogeny. Occasionally, as W. J. Arkell and J. A. Moy-Thomas in their chapter on "Palaeontology and the Taxonomic Problem" show, fossil evidence may indicate the phylogeny of lineages, but they state that "the major problems of palaeontological taxonomy may be summarised by saying that a phylogenetic and a practical classification are frequently incompatible." Too often our series, if and when established, are capable of being viewed from either direction, and to expect our taxonomic system, which ought to be a summation of all ascertained facts, to be more than an always imperfect, but ever improving, indication of affinities, with but rare adumbrations of phylogeny as a by-product, is to expect a complex differentiating process to be confined to the straight jacket of our preconceptions and prejudices. The contributions of cytology and genetics bid fair to provide far more frequent and reliable indications of immediate phylogeny than in the past, particularly, as Darlington indicates, within the species; but even so, the complexity and variety of the ways in which the hereditary changes come about will maintain the problematic character of phylogenetic speculations.

The examples given in the chapter contributed by Timofeeff-Ressovsky show that the various types of combination and mutation, gene, chromosome or genome, and their experimentally ascertained effects are adequate to account for subspeciation and geographical variation when subject to the action of selection and isolation. This topic is also treated by Muller, who discusses how the investigations on Drosophila have shed light on the processes by which

* Edited by Julian Huxley. Sponsored by the Association for the Study of Systematics in relation to General Biology. Oxford: at the Clarendon Press, 1940. Pp. viii+583. Price, 21s. net.

organisms have come to be differentiated and tend to show that species originate by the accumulation of small differences. The distinction which Timofeeff-Ressovsky makes between micro- and macro-evolution is important, since the former can be the subject of experimental test, whereas to attribute the latter entirely to the same causes is at present mere speculative extrapolation that may, or may not, prove justified.

Several of the contributors treat, from various aspects, of the importance of isolation. The effect of geographical isolation is considered in relation to fishes by E. B. Worthington, who stresses the significance of unoccupied ecological niches and the absence of predators. He also draws attention to the higher rate of differentiation of cold-blooded animals in warm waters. Darlington, writing on taxonomic species and genetic systems, deals with the isolating action of internal changes, such as an inverted chromosome segment, and discusses the significance and consequences of structural hybridity. Sewall-Wright from a consideration of certain statistical aspects of mendelian heredity concludes that partial isolation of large interbreeding groups furnishes the most favourable conditions for evolutionary change, and Diver, who writes on the subject of closely allied species living in the same area, holds that random differentiation in small partially isolated populations is the most probable general cause.

The ecological significance of sub-specific groups is considered by Salisbury, who also treats of the effects of plasticity, such as its influence on isolation.

Other contributors deal more especially with aspects which present difficulties in classification. Thus de Beer, treating of the contribution of embryology to taxonomy, points out the special problems that may arise as, for example, where the classification of adult forms is not congruent with that based on the larval stages. Thorp in relation to insects stresses the occurrence of species which are physiologically but not morphologically distinct. Ford discusses polymorphism, whilst Allen discusses wild hybrids. Crane and Vavilov write on the subjects of the origin and taxonomy of cultivated plants, and Ramsbottom deals with the special problems presented by the classification of the Fungi. Finally Smart envisages the practical problems which face the entomologist, and Calman, from his wide experience, lays emphasis upon the rarity of aberrant types.

It is clearly impossible in a short review to do more than indicate the nature of the contents of so varied a series of essays as are comprised in this volume, but it will be obvious from the foregoing that most aspects of taxonomic problems are considered in its pages and that it is a work that should be studied by all who are interested in the classification of either plants or animals.

E. J. SALISBURY.

Planting Design.*—This book by the Assistant Professor of Landscape Architecture in the University of Illinois is naturally written for American readers, and though it contains much of value on garden design and planning in relation to colour effects and in connexion with the house itself, much of the work will be more fully appreciated in the United States than in this country, where we seem to manage by our own innate " flair " for garden design and planting to achieve good results without professorial aid !

Following a useful introduction come chapters on " Color Theory " and " The Use of Color " in which much sound advice on the proper blending of colours is given and suggestions as to the plants to be used to produce the desired results. Then come chapters on " Texture," " The Attributes of Mass " and " Mass : grouping and arrangement," which deal with the many elusive qualities of light and shade, harmony in design, shapes of trees and shrubs and the pattern produced by well-blended colour, whether of flowers or different shades of foliage.

Part II deals with the ecological factors of soil and climate which should be of great value to American readers and also useful to horticulturists in this country. Part III is headed " Applications," and the themes considered are " Planting about Buildings " and " Public Plantings," both chapters being well illustrated ; these show that Professor Robinson has a fine sense of the relation that should exist between the layout of the garden and the house to which it leads up.

The book concludes with a series of interesting " problems " which deserve careful study by anyone who may be designing a garden, especially in relation to its surroundings.

The Scientific Principles of Plant Protection.†—It is interesting to note the publication of a third edition of Martin's well known " Scientific Principles of Plant Protection " only four years after the appearance of the second (K.B. 1936, 444). The new edition follows the same lines as the last, the sequence and titles of the chapters being the same as before, and the book only a few pages longer. Whilst the book is mainly concerned with the principles of controlling fungus diseases and insect pests of plants and the soil in which they grow by chemical methods, there are important chapters dealing with Plant Resistance, Biological Control, Traps, and the Elimination of Infection Centres. Recent developments in these subjects have been fully summarized, whilst the text of the second edition has been shortened in places in order to make room for the fresh information. It is impossible to note

* By Florence Bell Robinson. Published by the McGraw-Hill Publishing Company Ltd., Aldwych House, London, W.C.2. Pp. 215. Illustrated. Price 15*s*. net.

† " The Scientific Principles of Plant Protection, with special reference to Chemical Control." By Hubert Martin. London, Edward Arnold and Co., 1940. Pp. x+385. Price 22*s*. 6*d*. net.

in detail all of the changes which have been made, but some of the more comprehensive alterations are in the sections dealing with the "spreaders" and "stickers" used in spray fluids, the copper fungicides, the measurement of the degree of toxicity, and the spread of virus diseases. Those who have attempted to destroy slugs in their gardens will almost certainly agree with the recommendation to use metaldehyde ("Meta") for this purpose rather than the sulphates which have hitherto been commonly employed. It is rather curious, however, that the elimination of slugs should still be discussed in a chapter on "weed killers." It is to be hoped that the new edition of Mr. Martin's book will be accessible to all those who are interested in cultivating crop plants under the best possible conditions, the importance of which is, if possible, even greater now than in time of peace. C. R. METCALFE.

Mr. C. E. C. FISCHER, who was appointed to the post of Assistant for India in the Herbarium at Kew on January 26th, 1925 (see K.B. 1925, 41), retired from this post on reaching the age limit on June 30th, 1940. He is succeeded by Mr. K. N. KAUL, M.Sc., whose selection for this post, by the Government of India, was announced in the Bulletin, 1939, 313.

Since the announcement of Mr. Kaul's appointment, the Government of India decided to retain Mr. Fischer's services as Assistant for India until the end of June, 1940, so that Mr. Kaul might have the full benefit of his knowledge of the Indian Flora and of the historic Indian collections in the Herbarium.

Mr. Fischer entered the Royal Indian Engineering College, Coopers Hill, as a Probationer for the Indian Forest Service in 1892, and on passing out at the end of 1895, he joined the Service in the Madras Presidency. During his time in India he was a constant collector of botanical specimens. After a short term at Dehra Dun in 1907 as acting Forest Entomologist, he studied Plant Pathology at Munich and London while on study leave in 1908–9. From 1915 to 1917 Mr. Fischer was Principal of the Madras Forest College. In 1920 he became Conservator of Forests and remained in that post until he left India at the end of 1923. He finally retired from the Indian Forest Service in 1926.

After the death of Mr. J. S. Gamble in 1925, Mr. Fischer undertook the completion of the Flora of the Presidency of Madras, which had been begun by Mr. Gamble in 1915. Parts 8, 9, 10 and 11 were prepared by Mr. Fischer, the final part appearing in February, 1936.

During his service of more than fifteen years at Kew, Mr. Fischer's kindliness and enthusiasm have endeared him to all his colleagues, and they wish him many years of activity and happiness in his retirement.

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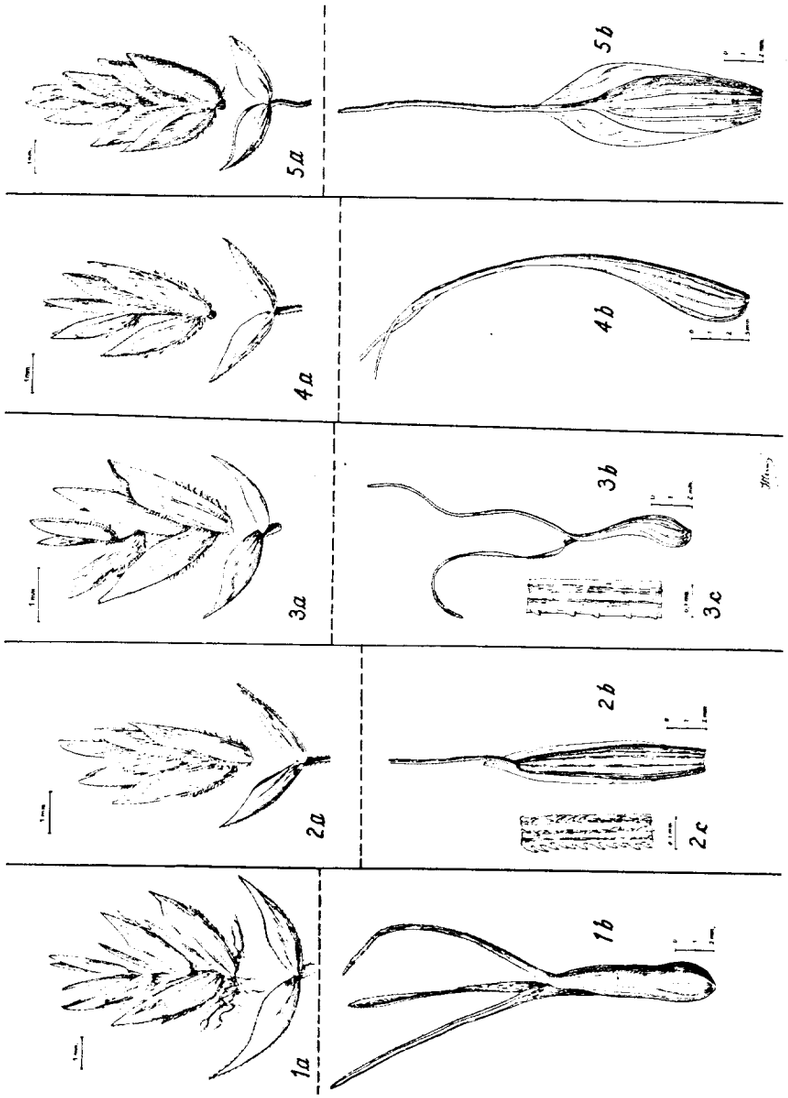
PLATE VII



1. *Poa bulbosa* L. 2. *P. sinaica* Steud. 3. *P. Eigii* Feinbr.
4. *P. Hackeli* Post. 5. *P. Timoleontis* Heldr.

a. Spikelet. *b*. Bulb or sheath or radical leaf with ligula.
c. Portion of lamina showing scabrosity.

[*To face page* 277.

BULLETIN OF MISCELLANEOUS INFORMATION No. 7 1940
ROYAL BOTANIC GARDENS, KEW

XXXV — POA SERIES BULBOSAE ROSHEV. OF PALESTINE AND SYRIA.

NAOMI FEINBRUN (Hebrew University, Jerusalem).

The series *Bulbosae* has recently been distinguished from the Sect. *Bulbophorum* Asch. et Gr. by Roshevitz (1934). This series comprises those species of *Poa* whose sheaths of radical leaves are thickened to form small bulbs tunicated by sheaths of preceding years. The region of concentration of species which comprise this group is the Irano-Turanian (Eig, 1931). While the European species of Sect. *Bulbophorum* have been studied in some detail (Ascherson and Graebner, 1900; Hegi, 1907; Achtaroff, 1939), little was known of the Asiatic group of species until rather recently. In the Flora URSS (1934), a revision of the Russian species of this group is given by Roshevitz. No revision, however, of the species of the Near East has been made since Boissier (1884). These are insufficiently known both taxonomically and phytogeographically. We may cite the following passage on the S. European *P. Timoleontis* Heldr. (*P. bulbosa* ssp. *Timoleontis*) by Achtaroff (1939, 130): "Meiner Schaetzung nach muss diese Unterart als das letzte und das xerophilste Glied in der phylogenetischen Entwicklung der Sektion Bulbophorum betrachtet werden."

A revision of this group from Palestine and Syria seems thus to be desirable.

The species belonging to this group and reported from Palestine are as follows (Post, 1896, 1933; Eig, 1932):—(1) *P. bulbosa* L., (2) *P. sinaica* Steud., (3) *P. Hackeli* Post.

For Syria two more species are recorded:—(4) *P. macroglossa* Hack. and (5) *P. Timoleontis* Heldr.

However, since Post no new data have been obtained on the last four species.

This revision is based on the abundant material preserved at the Herbarium of the Hebrew University, Jerusalem, and collected by the staff of the Botanical Department during phytosociological and phytogeographical studies conducted especially in the steppe and desert sections of Palestine, Syria and Iraq. We were also able to examine the material found at the Dinsmore Herbarium (Jerusalem) and the Post Herbarium (Beirut).*

* The author wishes to express her gratitude to Mr. J. E. Dinsmore for placing at her disposal the material of his Herbarium and for help in procuring the type specimens of Post's Herbarium.

KEY TO POA SER. BULBOSAE ROSHEV. OF PALESTINE AND SYRIA.

1. Rhachis of spikelet always bearing long fleece at the base of the lower pales. Height of plant 15–30 cm.....**P. bulbosa** *L.*
   Rhachis of spikelet destitute of long fleece at the base of the lower pales, or, when bearing a few long hairs, height of plant 35–50 cm.....2
2. Ligules of radical leaves and tips of membranous sheaths enveloping the bulbils, 2–4 mm. long, produced above the tufts; blades densely scabrous at the margins and along prominent nerves (fig. 2b, c).....3
   Ligules of radical leaves and tips of membranous sheaths short, generally not produced; blades sparsely scabrous at the margins (fig. 3b, c).....4
3. Sheaths of radical leaves obovate, scarcely 1 cm. long; their ligules about 4 mm. long, generally entire, continued as broad margins of the sheath (fig. 5b). Plant 10–20 cm., rarely 25 cm. high. Spikelets 6–10-flowered.....**P. Timoleontis** *Heldr.*
   Sheaths of radical leaves usually more than 1 cm. long, oblong; ligules about 2 mm. long, generally fringed; plants 15–25 cm. high and then 4–5-flowered, or tall plants, 30–35 cm. high, with 6–7-flowered spikelets (Moab).....**P. sinaica** *Steud.*
4. Plants 10–25 cm. high forming dense and short tufts; glumes 2–2·5 mm. long; panicle 2·5–5 cm. long; sheaths of radical leaves about 1 cm. long.....**P. Eigii** *Feinbr.*
   Plants 35–50 cm. high growing in small, mostly isolated tufts; lower glumes 3–3·5 mm. long; panicle 5–10 cm. long; sheaths of radical leaves 2–3 cm. long.....**P. Hackeli** *Post*

ENUMERATION.

Poa bulbosa *L.* Specimens seen*:—Palestine: Upper Galilee: Ramah (1927 Smoly); Birket-Ram (1925 Smoly). Mt. Carmel, near Haifa (1923 E). Judean Mountains: Jerusalem, Mt. Scopus (1931 Amdursky); Jerusalem, Gehenne (1924 E); Wadi Shiban (1930 FZ); Motsa (1924 E); env. of Bethlehem (1924 E). Amman: env. of Ain Sueli (1929 EZ). Moab: Medaba (1911 Meyers & Dinsmore). Syria: Amanus Mts., Col de Beylan, 700 m. (1932 Delbes); sortie Est d'Antioche, 100 m. (1935 Delbes); ca. Aleppo (1931 Z); Lebanon, Brummana (1900 Warburg); Antilebanon (1930 Warburg).

The outstanding differential characteristic of this species, as compared with other species of this group, is the presence of long crisp fleece on the rhachis of the spikelet at the base of the lower pales

* Abbreviations:
Collectors: E—Eig, F—Feinbrun, G—Grizi, Z—Zohary.
Herbaria: DH—Dinsmore Herbarium, American Colony, Jerusalem.
PH—Post Herbarium, Beirut.
When not otherwise mentioned the specimens are from the Herbarium of the Hebrew University, Jerusalem.

(fig. 1a). *P. bulbosa* is a rather low grass (15–30 cm. high), forming small, more or less isolated tufts, with inflated bulbils at the base (fig. 1b). In Palestine, this species shows forms transitional to *P. Hackeli* Post (see below). Viviparous forms are rather frequent.

According to its geographical range this species is a plant of the Euro-Siberian-Boreo-American, Mediterranean, and Irano-Turanian regions (Eig, 1932). Roshevitz (1934) reports this species from European Russia, W. Siberia, and the Caucasus (Euro-Siberian-Boreo-American region), and from Middle Asia (Irano-Turanian region). In Palestine and Syria, however, we found it only in the eu-Mediterranean territory. There it generally appears in the last degradation stages of the constantly destroyed shrub associations, and occasionally in somewhat ruderal localities. Eig, Feinbrun, and Zohary (1934) regarded it chiefly as an Irano-Turanian species. This was based on the fact that they comprised under the name *P. bulbosa* four different species, *P. bulbosa*, *P. Hackeli*, *P. sinaica*, and *P. Eigii*. The associations in which *P. bulbosa* is given by them as principal indicator refer to the last two species which are actually Irano-Turanian. Only the following passage can be referred chiefly to the true *P. bulbosa*: "In Mediterranean Palestine *P. bulbosa* is a leading plant of an association of a very limited extension, but the genesis of this association reveals rather a secondary origin."

It is a matter of doubt whether the *P. bulbosa* of the United States is conspecific with the European plant. It is most probably a separate species, differing in height (it is 30–60 cm. tall) and in several other characteristics (Halperin, 1931, Hitchcock, 1935). Halperin, who gives a detailed description of the Californian *P. bulbosa*, does not mention the fleece of the rhachis. The species is given as introduced from Europe. If so, it would be an interesting case of a new type developed during a few hundred of years at most.

P. Hackeli *Post.* Specimens seen:—Palestine: Judean Mountains: Solomon's Pools (1886 Post, type!, PH); Jerusalem (1924 E); Wadi Rijan (1930 FZ); Kiryath Anavim (1923 E). Acre Plain: Jidro (1927 Smoly). Sharon: Herzlia to Arsuf (1926 Z). Shefelah: Gedera (1927 EFZ); Shekhunath Borokhov (1927 EFZ). Near Negeb: Tel Milh (1922 E); Tel Arad (1922 E). Syria: Col de Beylan (1932 Delbes); ca. Riha (1931 Z); ca. Aleppo (1931 Z); Bshetfin (1899 Post, PH). S. Turkey: Aintab (1887, Post, type!, PH); Midyat (Post, type!, PH).

Post (1897) distinguishes this species from *P. bulbosa* as follows: "Species *P. bulbosae* L. affinis praesertim glumella carina marginibusque rigidule pectinato-ciliata basi non protrahendo-lanata distincta (In Poa bulbosa cilia mollia, basi convexa, lana protrahenda)." The most important difference thus would be the long fleece at the base of the lower pales of *P. bulbosa*. The examination of the three type specimens of *P. Hackeli* Post (1, Solomon's Pools; 2, Aintab; 3, Midyat) from Post's Herbarium (Beirut) showed, however, that their florets were not altogether destitute of long

crisp hairs. At the base of the 1–3 lower florets we found 2–3 long hairs, while the upper ones were destitute of them or bore 1–2 shorter hairs. These hairs could be easily distinguished from the rather long cilia of the keel and margins. In our Herbarium, however, we found many species of *P. Hackeli* completely destitute of fleece on the rhachis (fig. 4a). On the other hand we possess other specimens forming a series of transitions from the true *P. bulbosa* to *P. Hackeli*.

Another important characteristic of *P. Hackeli* is its height. Post gives it as " planta sesquipedalis," i.e. about 50 cm. high and so are the type specimens from Aintab and Midyat (S. Turkey), while that of Solomon's Pools (Palestine, S. of Jerusalem) is only about 35 cm. high ; the specimens of our Herbarium are 35–50 cm. high. As given by the majority of European Floras, the height of *P. bulbosa* is 15–30 cm. Our specimens of *P. bulbosa* correspond, therefore, to these measurements. However, we also possess a few specimens transitional both in presence of fleece and height between *P. Hackeli* and *P. bulbosa*, so that it is difficult to decide in which of the two species they should be classed. These transitional forms may have been produced at the meeting place of *P. bulbosa* and *P. Hackeli* by hybridization, or else *P. Hackeli* may be regarded as a more or less recent derivative of *P. bulbosa* still connected by transitional forms with its maternal species. At all events *P. Hackeli* seems to be nearer *P. bulbosa* than other Palestinian and Syrian species of the series *Bulbosae* Roshev. All other species of this region are completely destitute of fleece.

Other important characteristics of this species are : growth in small tufts remote from one another and almost destitute of remnants of preceding years (however it is not annual as described by Post) ; culms geniculate at base ; radical leaves with very short not produced ligules and their sheaths 2–3 cm. long (fig. 4b) and their blades about 5 cm. long, generally scabrous only at the margins ; panicle 5–10 cm. long.

P. Hackeli is an East-Mediterranean species. In Palestine it is chiefly restricted to non-eu-Mediterranean parts of the country. It occurs on the one hand on the light soils of the coastal plain, where it is rather common in natural non-Mediterranean associations (as *Helianthemetum elliptici* and others). On the other hand, it is found in the eastern and southern parts of the Judean Mountains, bordering on the Irano-Turanian Judean Desert and Negeb.

Poa Eigii *Feinbr.*, sp. nov. ; affinis *P. bulbosae* L., *P. Hackeli* Post, et *P. sinaicae* Steud., sed a prima flosculis lana non connexis, caespitibus densis compactis, a secunda plantis minoribus, vaginis foliorum basalium brevioribus residuis vaginarum vetustarum dense obtectis, paniculis brevioribus, a tertia ligulis foliorum basalium brevioribus, vaginis haud membranaceo-marginatis, laminis molliori-bus glabris margine scabriusculis, glumis acuminatis, glumellis brevioribus differt.

Perennis, dense caespitosa ; culmi erecti, 10–25 cm. alti, basi bulbiformi-incrassati et foliorum vaginis residuis dense tecti ; folia convoluta, tenuia, glabra, margine scabriuscula, radicalia numerosa, 2–4 cm. longa, ligulis brevibus (1–1·5 mm. longis), vaginis 1–1·5 cm. longis saepissime violaceis marginibus membranaceis destitutis ; panicula anguste oblongo-lanceolata, 2·5–5 cm. longa, ramis brevibus strictis ; spiculae confertae, ovatae ; flosculi 3–5, lana non connexi ; glumae subaequales, ovato-oblongae, acuminatae, 2–2·5 mm. longae ; glumella oblonga, acutiuscula, saepe breviter mucronata, carina et margine dense et longe ciliata. Spiculae in gemmas foliiferas saepe mutatae.

Specimens seen :—Palestine : Judean Desert ; km. 18 on the Jerusalem-Jericho road (1935 EZG, type !) ; Ain Hod (1935 EZ) ; Tal'at ed Dam (1935 EZ). Near Negeb : E of Tel-Arad (1934 EFZ) ; Qurnub to Beersheba (1934 EFZ).

This species differs from *P. bulbosa* L. chiefly in the lack of connecting fleece and in its dense compact tufts forming great patches or surfaces. From *P. Hackeli* Post it differs in the smaller size of the plant ; in the short sheaths of the radical leaves, which are densely covered by the residues of sheaths of the preceding years ; in the shorter panicle ; the smaller lower glume (2-2·5 mm., not 3–3·5 mm. long). From *P. sinaica* Steud. it can be distinguished by short, generally not produced ligules of the radical leaves, not continued as a broad membraneous margin of the sheath (fig. 3b) ; by softer and glabrous leaves, scabridulous only at the margins (fig. 3c) ; by acuminate, more unequal glumes and shorter lower pales (fig. 3a).

Phytogeographically this species is to be regarded as belonging to the Irano-Turanian element. It is an endemic possessing a restricted area (only Judean Desert and Near Negeb), but there it is very important phytosociologically. It is an important component of several Irano-Turanian plant associations and forms their spring aspect (as for instance in *Noaea mucronata—Poa Eigii* association, *Ononis Natrix—Poa Eigii* association, etc.). Its high sociability is most remarkable. The plant vegetates for a very short season ; the green colour that its tufts give to the mountain slopes at the beginning of the rainy season soon changes into a yellowish colour.

P. sinaica *Steud.* The confusion surrounding this species was probably caused by Boissier (1884). His description of the lower pales is erroneous and runs as follows: " . . . glumella . . .undique plus minusve pruinoso-scabrida," and further : " Ab affini *P. bulbosa* foliis tenuissimis, panicula angustiore, flosculis lana destitutis, glumellis undique pruinosis vel glabratis nec lineatim sericeis distincta. *P. concinna* Gaud. . . .differt . . .glumella ad carinam et margines sericea " (p. 606). This is rather puzzling because the original diagnosis of Steudel (1855, 256) is very clear on this point : " flosculis . . . margine dorsoque pilosis caeterum glabris." Probably

in accordance with Boissier, Schweinfurth described his var. *aegyptiaca*, reported by Muschler (1912, 135) as follows. "This variety differs from the typical form by . . . the flowering glumes with dense ciliate nerves." It is obvious that the var. *aegyptiaca* Schweinf. is identical with the type of *P. sinaica* Steud.

In Post's Herbarium, Beirut, there are several sheets of this species. One of them was determined by Hackel who, however, considered this species as "eine schwache Art" (in the letter to Post mentioned below). The eminent agrostologist probably did not have at his disposal a sufficient number of specimens and ignored the phytogeographical importance of this species. Now there is no doubt that *P. sinaica* is a good species; within this species we were even able to distinguish several paramorphs. It is also recognised as such by Roshevitz (1934).

The most characteristic features of this species are the following: —(1) Ligules of radical leaves and tips of membraneous sheaths usually enveloping the bulbil, produced above the tuft; length of ligule about 2 mm. (2) Blades of radical leaves very narrow, convolute, densely scabrous at the margins and along the prominent nerves of the lower surface (fig. 2c). (3) Bulbils oblong, often scarcely inflated below, densely covered by residues of sheaths of preceding years. (4) Tufts rather dense; culms generally not geniculate.

The following paramorphs were distinguished:

P. sinaica *Steud.* ssp. **typica** *Feinbr.* ssp. nov.

Plantae 15–25 cm. altae; flosculi 4–5; paniculae ramuli breves.

var. **aegyptiaca** *Schweinf.*

Glumellae margine dorsoque ciliatae.

Some of the specimens seen: Sinai: Near Tih, Escarpement (1882 Post, HP). Palestine: Moab: S. of Ziza, 700 m. (1937 Dinsmore No. 10571, HD). Edom: Ain Musa, near spring (1929 EZ); 40 km S. of Ma'an, Nubian sandstone (1929 EZ); Aneze to Ma'an (1929 EZ); 12 km. S. of Jurf ed Derawish, 1000 m., Artemisietum Herbae albae (1936 EFZ); 9 km. N. of Aneze, 1050 m., Halogetonetum alopecuroides (1936 EFZ). Syria: Ain el Wa'ul to Ain el Beidha; Nebk to Karyetein; Karyetein to Ain el Wa'ul (1890 Post, det. Hackel, PH); Tell esh Shamat, 87 km. E. of Damascus; 366 km. E. of Damascus; 538 km. E. of Damascus; Wadi Muhammadi, 105 km. W. of Ramadi; 47 km. E. of Ramadi (all: 1933 EZ); 65 km. E. of Deir es Zor (1939 Dinsmore, HD); Jebel Mukeibra, 30 km. W. of Soukhne, 800 m., 17 km. W. of Hussetché, 320 m.; 120 km. S. of Homs, 1430 m. Iraq: 9 km. N. of Tauq (betw. Baquba and Kirkuk); 140 km. N.E. of Deltawa, 180 m.; 35 km. N.W. of Kirkuk; 21 km. N.W. of Kirkuk; 15 km. N. of Altum Keupri, 320 m.; Jebel Atshan (E. of Mosul), 500 m.; 10 km. N.E. of Tel Abu Dahir, 400 m.; 35 km. N.W. of Mosul, ca. 540 m.; 2–3 km. N. of Balad Sindjar, 600 m. (all: 1933, EZ).

var. **glabrescens** *Feinbr.* var. nov.

Glumella tota glabra.

Specimens seen: Palestine: Edom: 23 km. S.W. of Ma'an (1936 EFZ type); Ain Musa, near spring (1929 EZ).

ssp. **moabitica** *Feinbr.* ssp. nov.

Planta elata (30–50 cm.); foliorum radicalium vaginae 3–4 cm. longae; panicula diffusa, usque ad 13 cm. longa et 5 cm. lata; rami elongati, inferiores 5–6 cm. longi, pedunculi ramorum parte reliqua saepe longiores. Spiculae 6–7-florae; glumella glabra.

Specimens seen: Palestine: Moab: Ziza to Um el Ammud (1929 EZ type); Amman to Ziza (1929 EZ).

The geographical area of *P. sinaica* is wide, and extends over Galala of Egypt, Sinai Pensinsula, the steppe parts of Transjordan, Eastern Syria, and the Syrian Desert up to Iraq. It probably continues through Persia and is reported from Transcaucasia and Russian Middle Asia. *P. sinaica* is a typical steppe plant and, in the Near East at least, is very important phytosociologically. In the *Poa bulbosa-Carex stenophylla* and *Phlomis Bruguieri-Poa bulbosa* associations mentioned by Eig, Feinbrun, and Zohary (1934), the name *Poa bulbosa* must be replaced by *Poa sinaica*. The same relates to the *Poa bulbosa-Carex stenophylla-Ranunculus asiaticus* association characteristic of oviposition fields of the Moroccan locust. (Eig, 1935).

P. Timoleontis *Heldr.*—The record of this species from Syria in Post's Flora is based upon one specimen from El Beidha to El Jebah (Syrian Desert). This specimen, marked No. 5, was sent for determination to Hackel who designated it in his letter to Post as "genau gleich den Original-Exemplaren." Comparing this specimen with the specimens of *Heldreich* 104 we find that it is rather untypical as to its ligules, forming a transition to *P. sinaica* from which *P. Timoleontis* was never differentiated. The differential characteristics of *P. Timoleontis* are: (1) Ligules of radical leaves longer (3–4 mm.) and broader than in *P. sinaica* (fig. 5b). (2) Sheaths of radical leaves obovate, not oblong, with broader membranous margin. (3) Leaves setaceous, narrower than in *P. sinaica*. (4) Spikelets 6–10-flowered. (5) Height of plant 10–25 cm.

Phytogeographically *P. Timoleontis* differs from *P. sinaica*, which is an Irano-Turanian species. The area of *P. Timoleontis* is the Balkan Peninsula reaching as far as S. Dobrogea in the north; it grows often in community with *P. bulbosa* (Hermann, 1939). The isolated station of this species in the Syrian Desert is rather curious. Further findings are necessary to confirm its occurrence there.

At the same time there is evidence for assuming that the so-called *P. macroglossa* Hack. from Aintab (S. Turkey) is the viviparous form of *P. Timoleontis*. We shall now discuss this species.

P. macroglossa was published first in Post's Flora (1896) with reference to a letter of Hackel ("Hackel in letter"). The letter,

dated 1890, is found attached to the type specimen of this species in Post's Herbarium. The respective passage may be cited here: " Die *Poa* von Aintab ist sehr interessant. Mit *P. bulbosa* ist sie nicht nahe verwandt, sondern mit *P. alpina* L., doch scheint sie mir auch von dieser durch die sehr grosse gezaehnte Ligula hinlaenglich verschieden zu sein. Jedoch kann ich auf Grund des einzigen Halmes kein sicheres Urteil abgeben, umsoweniger als das uebersandte Exemplar kein normales, sondern *vivipar* ist. Aber auch hierbei verhaelt es sich anders als *P. alpina* und *P. bulbosa*. Denn bei letzteren entspringt die aus der Spelze hervorwachsende Laubblattspreite (lamina) aus der Spitze, bei Ihrer *Poa* aber auf dem Ruecken. Ich glaube demnach wohl annehmen zu duerfen, dass es sich hier um eine neue Art handelt, welche ich provisorisch (wegen der grossen Ligula) *P. macroglossa* nenne; allein ich wuerde dieselbe nicht eher publizieren, bis ich davon mehr Material und namentlich auch Examplare mit entwickelten *Blueten* (nicht Brutknospen, propagula, vulgo " flores vivipari ") gesehen haben werde. Vielleicht gelingt es Thoren naechstes Jahr, solche zu erlangen." However, as testified by the remark of Post (1896 and 1933), normal specimens of the species have never been collected. He wrote: " The only specimens thus far seen are the so-called viviparous forms." No other specimens are found in Post's Herbarium. As emphasised by Hackel, it is impossible to establish a species upon a few viviparous specimens. To ascertain if the curious ligules of the viviparous bulbils occur in *P. sinaica*, we examined many viviparous specimens of this species, but found none similar to those of Aintab. However, the description of the viviparous form of *P. Timoleontis* given by Hermann (1939) corresponds fairly well to *P. macroglossa*. It is curious that on one of the two sheets of *P. macroglossa* we found the following remark made by Post: " Barbey in Plantae Postianae, 14, says that it is *Poa Timoleontis*, Heldr. forma *vivipara* " (cf. Pl. Postianae, fasc. 1, p. 14). *P. macroglossa* must be thus regarded as conspecific with *P. Timoleontis*. This widens the geographical range of this species further east to S. Turkey and the Syrian Desert. More detailed investigation of the plant in this part of its area, especially with regard to its phytoscciology, would be desirable.

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XXXVI—SOME FUNGI FROM AFGHANISTAN.

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In the summer of 1939 I paid a hurried visit, lasting about six weeks, to Afghanistan. The trip, which began on the 25th of June, covered nearly 2700 miles in the northern, eastern and southern parts of the country. The north-eastern part, comprising the Pamirs and Nuristan, the central part known as the Hazarajat and the western part, comprising the province of Herat, could not be visited as the roads had been damaged and bridges washed away by the unprecedented floods of the previous spring.

Afghanistan is for the most part a mountainous country, but in the north stretches a vast prairie-like region, the southerly extension of the great central Asian Steppe. The mountains are mostly barren and vegetation is rather scarce. In the valleys which are traversed by the rivers, however, principal among which are the Kabul and the Kunduz, intensive cultivation is carried on by the people. The rivers are in spate in the late spring and early summer, but for the rest of the year they are usually dry. Annual precipitation is chiefly in the form of snow in winter; rain is scarce.

Conditions on the whole apparently did not favour the growth and development of fungi, and the damage due to them in fields, orchards and vineyards was negligible. Both because of the scarcity of fungi and the hurry with which the journey was made, there was little time to make either close observations or any extensive collections. The few collections that were made have been

identified, and, as they may be of interest, are listed below. They are deposited in the *Herbarium Cryptogamicum Indiae Orientalis* of the Imperial Agricultural Research Institute, Delhi.

I wish to place on record my gratitude to Mr. A. M. Mustafa, Agricultural Officer, Baluchistan, and the leader of the party that visited Afghanistan, for the interest he took in my work and the help he rendered. I also wish to thank Mr. Mohammad Taslim of the Mycology section of this Institute for the aid he gave in making the identifications.

Phycomycetes.

PERONOSPORALES.

Cystopus candidus (Pers.) De Bary.
On leaves and stems of *Brassica Napus* L. Char-e-khar.
Cystopus Ipomoeae-panduranae (Schw.) Stevens and Swingle.
On leaves of *Ipomoea* sp. Paghman.
Plasmopara viticola (Berk. et Curt.) Berl. and De Toni.
On leaves of *Vitis vinifera* L. (Cult.) Kandahar.
Peronospora aestivalis Sydow.
On leaves of *Medicago* sp. Phul-i-kumri.
Peronospora Viciae (Berk.) De Bary.
On leaves of *Vicia* sp. Paghman.

Ascomycetes.

PERISPORIALES.

Uncinula necator (Schw.) Burr.
On leaves and berries of *Vitis vinifera* L. Kandahar.

DOTHIDEALES.

Phyllachora Cynodontis (Sacc.) Niessl.
On leaves of *Cynodon Dactylon* (L.) Pers. Kalat-e-gilzai.

HYPOCREALES.

Ustilaginoidea virens (Cooke) Takahashi.
In ovaries of *Oryza sativa* L. Laghman valley.

Basidiomycetes.

USTILAGINALES.

Entyloma Oryzae Sydow.
On leaves of *Oryza sativa* L. Laghman valley.
Sphacelotheca Sorghi (Link) Clinton.
In ovaries of *Sorghum halepense* (L.) Pers. Mazar-i-shariff.
Tilletia foetida (Wallr.) Liro.
In ovaries of *Triticum vulgare* Vill. Road-side between Mukur and Kalat-i-galzai. *Leg.* T. Ahmad.
Urocystis Tritici Koernicke.
On leaves of *Triticum vulgare* Vill. South of Kabul, on Ghazni road.

Ustilago Cynodontis P. Henn.
In inflorescence of *Cynodon Dactylon* (L.) Pers. Baglan.
Ustilago Hordei (Pers.) Lagerh.
In ovaries of *Hordeum vulgare* L. (Cult.) Khanabad, Chardeh-ghorbund.
Ustilago Kolleri Wille.
In ovaries of *Avena sativa* L. Aibak.
Ustilago nuda (Jens.) Rostrup.
In ovaries of *Hordeum vulgare* L. (Cult.) Bamian.
Ustilago Tritici (Pers.) Rostrup.
In inflorescence of *Triticum vulgare* Vill. Baglan, Balkh, Khanabad, Ghazni, Mukur.

UREDINALES.

Aecidium Mori Barclay.
On leaves of *Morus alba* L. Isstalif, Char-e-khar.
Melampsora Lini (Pers.) Lév.
On leaves and stems of *Linum usitatissimum* L. Bhutkak, Baglan.
Puccinia artemisiella Sydow.
On *Artemisia* sp. Kunduz.
Puccinia Cynodontis Desm.
On leaves of *Cynodon Dactylon* (L.) Pers. Ghazni.
Puccinia glumarum (Schm.) Eriks. et Henn.
On leaves and culms of *Triticum vulgare* Vill. Mukur, Bamian, Ghazni.
Puccinia graminis Pers.
On culms of *Avena sativa* L. Chardeh-ghorbund. On culms, leaves, and glumes of *Triticum vulgare* Vill. Bhutkak, Ghazni, Balkh, Tashqurkhan, and Bamian.
Puccinia Taraxaci Plowr.
On leaves of *Taraxacum officinale* Weber. Kabul.
Puccinia triticina Eriks.
On leaves and culms of *Triticum vulgare* Vill. Chardeh-ghorbund.
Uromyces Fabae (Pers.) De Bary.
On leaves and pods of *Pisum sativum* L. Kabul.
Uromyces Hobsoni Vize.
On stems, petioles and leaves of *Jasminum* sp. Paghman.

Fungi Imperfecti.

MONILIALES.

Alternaria Solani (Ell. et Mart.) Jones et Grout.
On leaves of *Solanum tuberosum* L. Kabul, Gulbagh.
Cercospora beticola Sacc.
On leaves of *Beta vulgaris* L. Baglan.
Cercospora concors (Casp.) Sacc.
On leaves of *Solanum tuberosum* L. Kabul.

Cercospora neriella Sacc.

On leaves of *Nerium odorum* Soland. Rishkhor (Kabul).

Helminthosporium Oryzae Breda de Haan.

On leaves and glumes of *Oryza sativa* L. Laghman valley.

Helminthosporium teres Sacc.

On leaves of *Hordeum vulgare* L. Ghazni.

MELANCONIALES.

Septoria Tritici Desm.

On leaves of *Triticum vulgare* Vill. Kunduz.

XXXVII — CONTRIBUTIONS TO THE FLORA OF BURMA: XVIII.* C. E. C. FISCHER.

The regions quoted in round brackets are those from which the species concerned has been reported previously.

Anemone vitifolia *Ham.* [Ranunculaceae] (Sikkim, Mishmi).

Seinghku Valley, 2150 m., fls. early Aug. *F. Kingdon Ward* 7245: "In meadow. Sepals white, slightly flushed purple on reverse; anthers golden."

Ranunculus sceleratus *Linn.* [Ranunculaceae] (N. India, N. Temperate zone).

Nsop, 150 m., fls. and frt. end March, *Ward* 6606: "In wet sand in the open bed of the river, growing with *Polygonum*. Fls. butter-yellow."

Ilex Hookeri *King* [Aquifoliaceae] (Sikkim).

Seinghku Valley, 2935 m., fls. early June, *Ward* 6860: "Small shrub in dense thickets, open situations on the steep sheltered face of the valley. Fls. cream."

Dipentodon sinicus *Dunn* [Celastraceae] (W. China).

Seinghku Wang, 2300 m., fls. end May, *Ward* 6779: "In thickets on the edge of the 'dry' forest. Fls. cream, young anthers crimson." Near Kan-fan, 26°16′ N., 98°47′ E., 2770 m., *Forrest* 26540: "In mixed forests on the W. flank of the divide. Fls. grey-green." 25°58′ N., 98°29′ E., 2460 m., fls. May, *Forrest* 26561: "In open thickets by streams in the hills. Fls. green-white." N.E. Burma, 2450 m., *Forrest* 2448, without date or precise locality: "In mixed forests."

In the original description of this genus and species (K.B. 1911, 310) Dunn refers to the difficulty of discovering its affinity. He placed it provisionally in the family *Celastraceae*. I am of opinion that it is better fitted into the *Samydaceae* (*Flacourtiaceae, sensu* Pflanzenfamilien), and akin to the genus *Casearia*. In this opinion I receive some support from Dr. C. R. Metcalfe, who kindly undertook to make anatomical comparisons between this plant and a

* Continued from K.B. 1940, p. 186.

species of *Casearia* and of one species of each of the genera of *Celastraceae* quoted by Dunn. He finds the anatomical characters of *Dipentodon* very similar to those of *Casearia* but still more so to those of *Perrottetia*, and it seems probable that the latter genus also should be transferred to the *Flacourtiaceae*. The question, however, demands much further investigation and until this has been done the genus may be left where Dunn placed it.

The leaves are sometimes ovate and the base may be cuneate or emarginate. The perianth of 10 segments appears to me to be inseparable into sepals and petals. The disk lines the perianth-tube.

Photinia rufa *C. E. C. Fischer*, sp. nov. [Pomaceae]; prope *P. mollem* Hook. f. ponenda, tomento rufo, corymbis minoribus atque magis compactis, calycis dimidio superiore glabro, disco glabro differt.

A small *tree*; branchlets and older twigs nearly black (when dry); twigs of the year densely fulvous-tomentose. *Leaves* elliptic, acuminate, base cuneate, 4–6·2 cm. long, 1·4–2·3 cm. wide, midrib slightly impressed above, raised below as are the 5–8 parallel, nearly straight primary nerves, ultimate network very fine, above olivaceous (when dry) and glabrous except that occasionally the midrib near the base is pubescent, pale below and densely fulvous-tomentose on the midrib and nerves, less so between them, margins evenly denticulate except for the basal third; petioles 4–10 *mm.* long, channelled above, densely fulvous-tomentose; stipules absent, presumably early caducous. *Corymbs* terminal on the twigs, up to 3·5 cm. diam., many-flowered; rhachis, its branches and pedicels more or less densely rufous-tomentose; pedicels 2–5 *mm.* long; bracts linear-ensiform, acuminate, 5 mm. long, caducous; bracteoles filiform. *Calyx* turbinate, rufous-tomentose in lower half, glabrous above, 3·5 mm. long; lobes triangular-lanceolate-ovate, subacute, 1·5 mm. long. *Petals* broadly obovate or trapezoid, obtuse, base narrowed but hardly clawed, 3·5 mm. long, reflexed in flower. *Stamens* about 20; filaments subulate, 2–2·5 mm. long, glabrous; anthers subglobose. *Disk* thin, lining the calyx-tube. *Ovary* 2-celled; crown glabrous; ovules 2 in each cell; styles 2, very shortly united at the base, 3 mm. long. *Fruit* not seen.

Seinghku Wang, 2770 m., fls. May, *Ward* 6756: "In the tangle-wood forest. Fls. white; fragrant."

Saxifraga nigroglandulosa *Engl. et Irmsch.* [Saxifragaceae] (Yunnan).

Seinghku Valley, 28°10′ N., 97°20′ E., 3400–3700 m., fls. early Oct., *Ward* 7544: "On rocky shrub-clad slopes. Fls. bright-orange with darker spots." 4100 m., fls. early Oct., *Ward* 7565: "Commonest rock Saxifrage at 3700–4100 m., forming clumps amongst stones. Fls. either bright-orange with darker spots or bright-sulphur with orange spots."

Saxifraga stella-aurea *Hook. f. et Thoms.* [Saxifragaceae] (Sikkim, Tibet).

Seinghku Wang, 3400–3700 m., fls. late July, *Ward* 7206: " On boulder slopes. Fls. bright-yellow with orange spots."

Osbeckia yunnanensis *Franch. ex Craib* [Melastomaceae] (Yunnan).

Seinghku-Adung confluence, 1230 m., fls. Aug., *Ward* 7287: " In thickets; 2–3 m. high. Fls. pinkish-purple."

Trichosanthes Wallichiana *Wight* [Cucurbitaceae] (Sikkim, Khasia, Malaya).

Seinghku Valley, 2150 m., fls. early Aug., *Ward* 7248: " Climber in thickets; keeping in the open. Fls. pink."

Heracleum candicans *Wall.* [Umbelliferae] (Kashmir to Kumaon).

Seinghku Valley, 28°10′ N., 97°20′E., 3700–4000 m., fls. and frt. Oct., *Ward* 7561: " Amongst mossy boulders and stones in dry gullies. Fls. white or tinged purple."

Oenanthe Thomsoni *C.B.Clarke* [Umbelliferae] (Sikkim to Khasia).

Seinghku Valley, 2150 m., fls. early Aug. *Ward* 7254: " In damp, boggy meadow. Fls. white; scented."

Pleurospermum dentatum *Benth.* [Umbelliferae] (Kumaon to Sikkim).

Seinghku Valley, 28°10′N., 97°20′ E., 3400–3700 m., fls. and frt. Oct., *Ward* 7560: " In colonies amongst moss-covered stones in the steep rock-bed of a torrent (now dry). Fls. white; whole plant scented."

Helwingia himalaica *Hook. f. et Thoms.* [Araliaceae] (Sikkim to Khasia, W. China).

Seinghku Wang, 1550 m., fls. May, *Ward* 6714: " Small shrub with weak, drooping branches; epiphytic on trees in the jungle by the river. Leaves highly polished; flowers green tipped with purple, anthers cream."

Macropanax undulatum *Seem.* [Araliaceae] (Sikkim to Assam).

Nogmung Nam Tisaing, 450–670 m., and by the Nam Tamai at 1240 m., fls. April–May, *Ward* 6644: " Long, limp scrambler, stems many feet in length growing up through thickets in the jungle. Fls. pale-green."

Schefflera glauca (*Clarke*) *Harms* [Araliaceae] (Assam).

Seinghku Valley, 2150–2800 m., fls. Sept., *Ward* 7503: " Tall, slim, unbranched, palm-like tree of the upper temperate rain-forest. Fls. cream."

Leycesteria glaucophylla *Hook. f.* [Caprifoliaceae] (Sikkim).

Seinghku Wang, 2150 m., fls. end May, *Ward* 6777: " Small straggling bush in alder copse in the stony river-bed. Fls. pale-sulphur or greenish."

Viburnum erubescens *Wall.* [Caprifoliaceae] (Kumaon to Bhutan, Dekkan, Ceylon).

Seinghku Wang, 2600 m., fls. May, *Ward* 6744: " Shrub or small tree on open bracken-clad slopes or in bamboo thickets. Fls. hanging in bunches, chalk-white; slightly fragrant."

Viburnum tricostatum *C.E.C.Fischer*, sp. nov. [Caprifoliaceae]; prope *V. Davidii* Franch. atque *V. cinnamomifolium* Rehd. ponendum, ab utroque foliis chartaceis, inflorescentiae rhachi pubescente, corolla tubulari differt.

A *tree* 7–10 m. high; twigs terete, the terminal sulcate, brownish when dry, sometimes with a purplish tinge, glabrous, sparingly minutely pustulate. *Leaves* opposite, chartaceous, elliptic or elliptic-oblong, caudate-acuminate, base narrowed and rounded, sometimes slightly inequilateral, 9–19 cm. long, 3–5 cm. wide, 3-ribbed from 2–6 mm. above the base, the ribs running to the apex, sometimes in a continuous gentle curve and at others indented at the junction with the very few usually oblique primary nerves, a number of finer nearly horizontal veins between, ultimate network small, glabrous, olivaceous (when dry) above with the ribs, nerves and reticulations slightly impressed, yellowish-green below and abundantly but obscurely punctate, margins entire or with a few minute, distant teeth in the apical third; petioles 1·3–2·5 cm. long, narrowly channelled above, often pustulate. *Corymbs* terminal, umbel-like, 3–4 cm. wide; peduncles 1·5–2·5 cm. long, sparingly pubescent as are its branches, primary branches 4–7, 1·4–2 cm. long, secondary 3–4, 6–10 mm. long, both furrowed (at least when dry); pedicels 2–3 mm. long; bracts linear 5 mm. long; bracteoles appressed to the ovaries, oblong, truncate, 1·5 mm. long. *Ovary* turbinate or oblong, angled, 1·7 mm. long, 1-celled. *Calyx* very short; lobes 5, short, broad, obtuse. *Corolla* tubular; tube 4·5 mm. long; lobes 5, rounded, 0·7 mm. long, 1·5 mm. wide. *Stamens* 5, inserted about ⅓ above the base of the corolla; filaments strap-shaped, 4·5 mm. long; anthers oblong, pendent, 1·5 mm. long, exserted. *Style* broadly conical, 1 mm. long; stigmas 2. *Fruit* not seen.

Seinghku Wang, 2000 m., fls. end May, *Ward* 6802: " In thickets. Corolla violet, anthers violet."

Brachytome Wardii *C. E. C. Fischer*, sp. nov. [Rubiaceae]; *B. Wallichii* Hook. f. valde affinis, ramulis foliisque infra puberulis, inflorescentia pubescente, cymis brevioribus atque magis compactis, corollis brevioribus atque latioribus differt.

A small *shrub*; lateral twigs sulcate on the upper side near the leaves, brownish, rather densely brown-puberulous, especially at the apex. *Leaves* elliptic-oblong to oblanceolate or obovate, rather abruptly caudate, narrowed to the slightly inequilateral base, when one of the pair of leaves is suppressed the other is broad and equilateral, 17–20 cm. long, 5·5–7·5 cm. wide, midrib and 10 pairs of primary nerves prominent below, the latter anastomosing near the

margins, joined by usually straight or oblique, infrequently branched veins, when mature glabrous above, puberulous on the nerves below, dark-brown or olivaceous above when dry, paler below; petioles 5–10 mm. long, of the single leaves the longer, densely puberulous. *Cymes* in the axils of suppressed leaves, up to 2·5 cm. long; basal bracts small, loosely enfolding the peduncles; peduncles up to 5 mm. long, with its branches, pedicels, bracts and bracteoles densely appressed fuscous-pubescent; bract narrowly ensiform, finely acuminate, 2 mm. long; pedicels 3·5 mm. long; bracteoles like the bracts, minute. *Ovary* subglobose or oblong, 4 mm. long, puberulous. *Calyx* cupular, 2 mm. long, puberulous; teeth 5, minute, distant. *Corolla* rather broadly funnel-shaped; tube 6·5 mm. long, 3·5 mm. diam. at the mouth, glabrous outside, villous in the upper half within; lobes 5, overlapping clockwise in bud, subcircular, 2·3 mm. diam. *Stamens* 5, inserted above the middle of the corolla-tube; filaments very short; anthers linear, included, 3·3 mm. long, dorsifixed below the middle. *Crown* of ovary cushion-shaped, 0·7 mm. high. *Style* stout, 2·5 mm. long, stigmatic lobes 2, elliptic, subacute, 3·5 mm. long. *Fruit* not seen.

Seinghku-Adung confluence, 1380 m., fls. May, *Ward* 6702: " In thickets as jungle undergrowth. Fls. cream; slightly scented."

Lasianthus Wardii *C. E. C. Fischer et K. N. Kaul*, sp. nov. [Rubiaceae]; *L. tubifero* Hook. f. valde affinis, ramulis fistulosis hirsutis, foliis subtus magis hirsutis, petiolis brevioribus hirsutis, stipulis hirsutis, calyce breviore differt.

A *shrub*; twigs compressed, fistular, fuscous hairy. *Leaves* chartaceous, distichous, elliptic-oblong to oblanceolate-oblong, caudate-acuminate, base cuneate, 12–17 cm. long, 3·5–6 cm. wide, midrib and 7 pairs of primary nerves raised below, dark-olivaceous (when dry) and glabrous above, brown and fuscous-hairy, especially on the nerves, below; petioles 5–10 mm. long, hairy; stipules short, broadly ovate, cuspidate, margins toothed or not. *Inflorescence* of few-flowered, sessile or shortly peduncled fascicles. *Ovary* cupular, brown-hairy, 4 mm. long, crown cushion-shaped, 1·2 mm. high, 5-loculae; ovules oblong, compressed. *Calyx* brown-hairy on both sides; tube very short; lobes 5, oblong, obtuse, 3 mm. long. *Corolla* tubular below, funnel-shaped above, short brown-hairy outside; tube 1·6 cm. long, 5 mm. diam. at the mouth, whitish- or brownish-pilose in the apical two-thirds within; lobes 5, triangular-ovate, subacute, 4·5 mm. long. *Stamens* 5, in the corolla throat; filaments 1 mm. long; anthers included, linear, 2·5 mm. long, basifixed. *Style* slender, widened at the apex, 7·5 mm. long, minutely brown-puberulous; stigmas 3, sometimes 5, linear, 1·4 mm. long. *Fruit* not seen.

Nam Tamai, 920–1070 m., fls. early May, *Ward* 6679: " Hanging over cliffs in the river bed. Fls. white or pale-purple, upper face of corolla-lobes purple.

Leptodermis gracilis *C. E. C. Fischer*, sp. nov. [Rubiaceae]; prope *L. lanceolatam* Wall. ponenda, ramulis cinereis gracilioribus, foliis fere glabris, pedunculis floribusque brevioribus, bracteolarum dentibus brevioribus trinerviis differt.

A *shrub*; branches long, thin, eventually drooping, ashy. *Leaves* opposite, membranous, elliptic to lanceolate, acute, base cuneate, more or less decurrent, 1·4–3·5 cm. long, 5–13 mm. wide, primary nerves 4–6 pairs, glabrous except for the sparingly hispidulous midrib and sometimes near the margins above, olivaceous (when dry) above, paler below, margins hispidulous-ciliolate; petioles 2–6 mm. long; stipules interpetiolar, long cuspidate from a broad base, 3 mm. long, minutely puberulous and ciliolate. *Inflorescence* terminal and from the upper axils, forming a thyrse; peduncles striate, angular, 3·5 mm. long, minutely puberulous; flowers sessile in threes; bracts narrowly elliptic-lanceolate, acute, 4 mm. long, ciliolate; bracteoles united into a 2-toothed, chartaceous sheath, tube 2·5 mm. long, teeth ovate, apiculate, 1 mm. long, 3-veined. *Ovary* turbinate, strongly 5-ribbed, 1·2 mm. long. *Calyx* campanulate; tube 0·7–1 mm. long; lobes 5, oblong, rounded or truncate, 1 mm. long, ciliolate. *Corolla* narrowly funnel-shaped; tube very slender, 8 mm. long, pubescent in the upper $\frac{7}{8}$ within; lobes 5, ensiform, subacute, 1·5 mm. long. *Stamens* 5; anthers sessile, inserted on the throat of the corolla, included, linear, 1·5 mm. long. *Style* very slender, shortly exserted; stigmas 3, filiform, 1–1·5 mm. long, papillose. *Capsules* linear-oblong, 5-valved, 5 mm. long. *Seeds* fallen.

Zayul River: Kahao, 1500 m., fls. July, *Ward* 7182: " Compact, almost spiny shrub on the open hillside; lanky in shaded thickets. Fls. white or purple."

Dipsacus inermis *Wall.* [Dipsacaceae] (Kashmir to Bhutan).

Seinghku Valley, 28°10′N., 97°25′ E., 2770–3100 m., fls. Oct., *Ward* 7603: " Meadow plant, 1–1$\frac{1}{3}$ m. high. Fls. cream with purple stamens."

Morina betonicoides *Benth.* [Dipsacaceae] (Sikkim).

Seinghku Wang, 28°8′ N., 97°24′ E., 3400 m., fls. early July, *Ward* 7033: " On granite boulders in the open valley. Fls. purple, darker in the centre; very fragrant." *Ward* 7065: " On grassy banks with Nomocharis and Iris. Fls. white, tinged purple."

Veronica himalensis *Don* [Scrophulariaceae] (Himalayas, Nepal to Sikkim, S. Tibet).

Seinghku Wang, 28°8′ N.: 97°24′ E., 3400 m., fls. end June, *Ward* 7008: " On steep earth-bank facing South. Fls. blue."

Edgeworthia Gardneri *Meissn.* [Thymelaeaceae] (Nepal to Bhutan, China, Japan).

Seinghku Wang, 2770 m., fls. May, *Ward* 6758: " On very steep, rocky, rather open slopes where there are no trees, only thickets;

common in the valley below at 1250 m., but there the fls. are long since over. Fls. at first golden-yellow, later fading to white; leaves appear after the fls. are over."

XXXVIII—NEW SPECIES AND RECORDS FROM TIBET: II.*

The regions quoted in round brackets are those from which the species concerned has been previously reported.

Geum elatum *Wall.* [Rosaceae] (Kashmir to Sikkim).
Hills East of Yatung, 3700 m., fls. June, *B. J. Gould* 2096.

Potentilla latipetiolata *C. E. C. Fischer*, sp. nov. [Rosaceae]; *P. articulatae* Franch. similis sed planta minor, caulibus simplicibus, foliolis cum petiolis latioribus haud articulatis, bracteolis oblongis differt.

A perennial *herb*; root woody, 3–4 cm. long; caudex short, together with the stems concealed by the densely imbricate leaves, 1–2 cm. long. *Leaves* digitately 3-foliolate; leaflets rigid, sessile, linear-oblong, obtuse, 5–6·2 mm. long, 1–2 mm. wide, pubescent and with an apical tuft of hairs, margins revolute (at least when dry), 1-ribbed; petiole 4–8 mm. long, 2–3 mm. wide, including the adhering bases of the stipules; stipules adhering to within 1 mm. of the leaflets, free portion linear-ensiform, up to 3·3 mm. long, pubescent. *Flowers* very few, axillary, solitary; peduncles 8 mm. long, sparingly hairy; bracts 2, opposite, linear-oblong, acute, 6 mm. long, thinly hairy; pedicels 3 mm. long, thinly hairy. *Sepals* 5, ovate, acute, 4 mm. long, greenish, purple-splashed. *Bracteoles* 5, oblong, obtuse, 2–3·5 mm. long. *Petals* 5, nearly circular, not clawed, 6 mm. long, apex entire, emarginate or 3-lobulate, golden-yellow. *Stamens* 20 or more; filaments slender, 2–2·5 mm. long, glabrous; anthers small. *Disk* white-villous. *Carpels* many, oblong, gibbous on one side, 1·3 mm. long, green, the apex often purple, glabrous; style lateral from close to the apex, slender, 2 mm. long, hooked at the apex; stigma capitate, minute. *Fruit* not seen.

Rama to Dumpa Gompa, 4900 m., fls. end June, *Gould* 2272.

In the specimens the individual plants are separate, in nature they may be aggregated to form cushions; the leaves form a globose or oblong mass around the stem 1·5–2 cm. long and about 1·5 cm. in diameter.

Potentilla purpurea *Royle* [Rosaceae] (N.W. Himalayas).
Rama to Dumpa Gompa, 4900 m., fls. end June, *Gould* 2261.

Sanguisorba filiformis (*Hook. f.*) *Hand.-Mazz.* [Rosaceae] (Sikkim).
Tuna to Khambu, 4900 m., fls. July, *Gould* 2349.

* Continued from K.B. 1940, 269.

Saxifraga subsessiliflora *Engl. et Irmsch.* [Saxifragaceae] (Sikkim).
Rama to Dumpa Gompa, 4900 m., fls. end June, *Gould* 2271.

Saxifraga tangutica *Engl.* [Saxifragaceae] (Sikkim).
Melong Gompa, 4900–5230 m., fls. early July, *Gould* 2244.

Saxifraga tentaculata *C. E. C. Fischer*, sp. nov. [Saxifragaceae]; *S. flagellari* Willd. affinis sed caulibus glabris, foliis ad basin et apicem aggregatis, petalis multo brevioribus 5-nerviis distat.

A stoloniferous *herb*; rootstock not seen; stem solitary, slender, 2·5–6 cm. high, usually narrowly winged below the leaves, glabrous, reddish-purple (when dry). *Stolons* axillary, several from each stem, mostly from above its middle, filiform, up to 22 cm long, purplish, glabrous. *Leaves* aggregated at the base and apex of the stem, scattered along the intervening space, oblong or elliptic-oblong or spathulate, obtuse or subacute, sessile, basal and median 4–8 mm. long, glabrous, the apical usually longer, up to 1·2 cm. long and 3–4 mm. wide, purplish and increasingly ciliate with short gland-tipped hairs as they ascend the stem. *Flowers* either one only terminating the stem or with a second terminating a short lateral shoot; pedicels 1·5–8 mm. long, that of the lateral the shorter, terete, purplish, bearing short purple-gland-tipped hairs. *Hypanthium* widely campanulate, 1·5 mm. long, sparingly glandular-hairy like the pedicel. *Sepals* 5, oblong to broadly triangular-ovate, obtuse, unequal, 2·5–3 mm. long, 1·5–2·8 mm. wide, dark green with narrow purplish margins, minutely ciliolate, the ciliola sometimes purple-gland-tipped, 3-nerved. *Petals* 5, broadly obovate, rounded, 3–3·2 mm. long, 2–2·6 mm. wide, 5-nerved, yellow. *Stamens* 10; filaments linear-ensiform, 1·8 mm. long; anthers subglobose, 1 mm. diam. *Ovary* broadly conical above the hypanthium, 2 mm. long; carpels free for about half that length; style very short. *Capsules* not seen.

Tibet-Bhutan frontier, Phari to Tsethanka, 4600 m., fls. July, *Gould* 2384.

Saxifraga tsangchanensis *Franch.* [Saxifragaceae] (Yunnan).
Tibet-Bhutan frontier, above Tsethanka, 4600 m., fls. July, *Gould* 2395.

In the tips of the leaves and of the sepals there is a single round gland sunk in the tissue of the upper surface. This is not mentioned in published descriptions. I have not seen the type, but these glands are present in specimens in the Kew Herbarium identified as this species.

Epilobium sikkimense *Hausskn.* [Onagraceae] (Sikkim).
Khambu, 4300 m., fls. July, *Gould* 2357.

Cavea tanguensis (*Drumm.*) *W. W. Sm. et J. Small* [Compositae] (Sikkim).

Rama to Melong Gompa, 4600 m., fls. early July, *Gould* 2326; Melong Gompa, 4900–5200 m., *Gould* 2233.

Lactuca macrantha *C. B. Clarke* [Compositae] (Sikkim).
Gautsa to Yatung, 3700 m., fls. July, *Gould* 2417.

Saussurea gossypiphora *Don* [Compositae] (Garhwal to Sikkim).
Linji La, 5200 m., fls. early July, *Gould* 2297.

Primula atrodentata *W. W. Sm.* [Primulaceae] (Sikkim).
Rama to Dumpa Gompa, 4900 m., fls. end June, *Gould* 2248.

Primula capitata *Hook.* [Primulaceae] (Sikkim, Bhutan).
Khambu, 4300 m., fls. July, *Gould* 2354.

Primula concinna *Watt* [Primulaceae] (Sikkim).
Above Gautsa, 4000 m., fls. June, *Gould* 2113.

Primula elongata *Watt* [Primulaceae] (Sikkim).
Tatung to Lachung La, 3700 m., fls. early June, *Gould* 2051; East of Yatung, 3700 m., fls. June, *Gould* 2073.

Primula muscoides *Hook. f. ex Watt* [Primulaceae] (Sikkim).
Linji La, 5200 m., fls. early July, *Gould* 2282.

Primula obliqua *W. W. Sm.* [Primulaceae] (Sikkim).
East of Yatung, 3700 m., fls. June, *Gould* 2074.

Primula pusilla *Wall.* [Primulaceae] (Kumaon to Sikkim).
Linji La, 5200 m., fls. early July, *Gould* 2283.

Primula Roylei *Balf. f. et W. W. Sm.* [Primulaceae] (Nepal, Sikkim).
Yatung to Lachung La, 3700 m., fls. early June, *Gould* 2036, 2050; Yatung, 3200 m., fls. June, *Gould* 2067, 2069.

Primula sapphirina *Hook. f. et Thoms.* [Primulaceae] (Sikkim).
Above Gautsa, 4000 m., fls. June, *Gould* 2112.

Primula sikkimensis *Hook.* [Primulaceae] (Sikkim, W. China).
Yatung to Gautsa, 3550 m., fls. June, *Gould* 2099; Tuna to Khambu, 4900 m., fls. & frt. July, *Gould* 2339; Tremo La, 4750 m., fls. July, *Gould* 2376.

Primula tenuiloba (*Hook. f.*) *Pax* [Primulaceae] (Sikkim).
Linji La, 5200 m., fls. early July, *Gould* 2280.

Gentiana depressa *D. Don* [Gentianaceae] (Garhwal, Nepal, Sikkim).
Near Phari, 4450 m., fls. Sept., *Gould* 1631.
As practically no dimensions have been given in the published descriptions it is thought advisable to give them here: *Surculi* up to 10 cm. long, the leaves on them ovate, up to 5 mm. long. *Leaves* on flowering stems up to 1·7 cm. long and 1·2 cm. wide.

Calyx-tube [illegible]·2 cm. long; lobes 7·5–9 mm. long, 8·5–9·5 mm. wide, overlapping, margins shortly decurrent on the tube, keel decurrent. *Corolla-tube* 3 cm. long, 1·6 cm. wide at the mouth; lobes 5 mm. long, 6 mm. wide; folds about half as long. *Stamens* inserted 1–1·2 cm. above the base of the corolla-tube; filaments 9–12 mm. long; anthers 4 mm. long, versatile. *Stipe* of ovary 6–8 mm. long. *Ovary* 1–1·2 cm. long; style 5·5–6·5 mm. long; stigmas linear-lanceolate, 3·5 mm. long, puberulous on the upper half.

Swertia multicaulis *D. Don* [Gentianaceae] (Nepal, Sikkim).
Phari to Tremo La, 4600 m., fls. and frt. June, *Gould* 2166; Linji La, 5200 m., fls. early July, *Gould* 2304.

Chionocharis Hookeri (*C. B. Clarke*) *I. M. Johnst.* [Boraginaceae] (Sikkim).
Linji La, 5200 m., fls. early July, *Gould* 2284.

Pedicularis Bietii *Franch.* [Scrophulariaceae] (W. China).
Melong Gompa, 4900–5200 m., fls. early July, *Gould* 2241; Rama to Dumpa Gompa, 4900 m., fls. end June, *Gould* 2279.

Pedicularis Oederi *Vahl* [Scrophulariaceae] (Kashmir to Sikkim).
Phari to Tremo La, 4600 m., fls. June, *Gould* 2157.

Picrorhiza Kurrooa *Benth.* [Scrophulariaceae] (Kashmir to Sikkim).
Rhamme, 4600 m., frt. early July, *Gould* 2337.

Salix Lindleyana *Wall. ex Hook. f.* [Salicaceae] (Sikkim).
Phari to Tremo La, 4600 m., fls. June, *Gould* 2167.

Salix Serpyllum *Anderss.* [Salicaceae] (Sikkim).
Khambu, 4300 m., fls. July, *Gould* 2362.

Smilacina purpurea *Wall.* [Liliaceae] (Garhwal to Sikkim).
East of Yatung, 3700 m., fls. June, *Gould* 2180.

XXXIX—PLANTS NEW TO ASSAM: XIII.*

C. E. C. Fischer.

Lobelia deleiensis *C. E. C. Fischer*, sp. nov. [Lobeliaceae]; a *L. erecta* Hook. f. et Thoms. foliis acuminatis, inflorescentia haud racemosa, pedicellis elongatis, calycis segmentis linearibus multo longioribus differt. A *L. longipedicellata* C. E. C. Fischer foliorum nervis numerosioribus, calycis segmentis linearibus, antheris hispidis distat. A *L. Wardii* C. E. C. Fischer foliis majoribus ellipticis nervis numerosioribus, calycis segmentis multo longioribus, corolla breviore latiore distincta.

A lolling herbaceous plant up to 1 m. high, branched above, rootstock not seen; branchlets fistular, sulcate, glabrous. *Leaves* elliptic or elliptic-lanceolate, caudate or caudate-acuminate, base

* Continued from K.B. 1940, 198.

tapering, 6·5–15 cm. long, 1·6–4 cm. wide, primary nerves 9–11 pairs, ultimate network small, margins crenate-denticulate, uppermost small but not bracteiform; petioles 4–10 mm. long. *Flowers* axillary, solitary; pedicels slender, 2–4 cm. long, curving. *Ovary* cupular, 4–6 mm. long. *Calyx-tube* very short; segments linear, slender, spreading, 1·6–2 cm. long. *Corolla* cream-coloured; 3 median lobes lanceolate, caudate, 8 mm. long, 2 lateral linear-ensiform, caudate, 1·2 cm. long. *Stamens* a little shorter; filaments glabrous; 3 upper anthers slightly hispid, 2 lower bearded at the tip. *Style* columnar, villous round the shortly 2-fid stigma. *Ripe fruit* not seen.

Delei Valley, 28° 21′ N., 96° 37′ E., 1850–2150 m., fls. July, *F. Kingdon Ward* 8460. "Forms clumps in open glades in the temperate rain forest."

Lobelia longipedicellata *C. E. C. Fischer*, sp. nov. [Lobeliaceae]; a *L. erecta* Hook. f. et Thoms. foliis glabris, inflorescentia haud racemosa, pedicellis elongatis, calycis segmentis multo longioribus, antheris glabris distat.

A *herb* up to 1 m. high; rootlets rather thick, tomentose; stem simple, fistular, striate, 5 mm. diam. *Leaves* (radical not present) narrowly lanceolate or oblanceolate, acuminate, the lowest sometimes rounded, base cuneate or tapering, 5–15 cm. long, 1·3–3·5 cm. wide, one or two basal and a few apical shorter than the rest, primary nerves 5–7 pairs, indistinct, forming a sharp angle with the midrib, much reticulated, glabrous, minutely translucent-dotted, margins glandular-denticulate; petioles very short, one or two basal up to 1 cm. long, semiamplexicaul. *Flowers* solitary, axillary, but absent from the uppermost leaves which do not become bracteiform; pedicels up to 8 cm. long, sigmoidally curved, usually bearing 2 caducous bracts near the base or above, but below the middle, linear, 2–15 mm. long. *Ovary* turbinate; 6–7 mm. long. *Calyx-tube* short; lobes 5, linear-lanceolate, obtuse or subacute, 1–3 cm. long, 3·5–5·5 mm. wide, margins often with a few small glandular teeth. *Corolla* 1·5–1·8 cm. long, dark magenta-purple, puberulous below; 3 median lobes subequal, lanceolate, acute, 7–8 mm. long, 2 lateral linear, 1·1 cm. long. *Stamens* 1·4 cm. long; filaments minutely ciliolate; anthers glabrous. *Style* nearly as long as the stamens, stout, pubescent below the subacutely 2-fid stigma. *Capsule* subglobose, 8–9 mm. diam.

Delei Valley, 28° 21′ N., 96° 37′ E., 1850–2450 m., fls. & frt. July, *Ward* 8443. "On south-facing scarped bracken-clad slopes where it grows in clumps."

Lobelia Wardii *C. E. C. Fischer*, sp. nov. [Lobeliaceae]; a *L. erecta* Hook. f. et Thoms. foliis acuminatis, floribus haud racemosis, pedicellis multo longioribus, calycis segmentis linearibus distincta; a *L. longipedicellata* C. E. C. Fischer calycis segmentis brevioribus linearibus, corolla graciliore, antheris pilosis distat.

A perennial *herb*; rootstock not seen; shoots long, trailing or arching, fistular, puberulous upwards. *Leaves* lanceolate, acuminate or caudate-acuminate, base cuneate, sometimes inequilateral, 4–8 cm. long, 1–2 cm. wide, upper reduced but not bracteiform, primary nerves 5–6 pairs, ultimate network fine, hispidulous on the nerves above, paler and glabrescent below, margins denticulate; petioles 4–8 mm. long. *Flowers* solitary, axillary; pedicels slender, up to 3·7 cm. long. *Ovary* cupular, 4–6 mm. long. *Calyx* tube very shallow; segments linear, 4–5·5 cm. long, usually recurved at the apex. *Corolla* pure violet, 2·2 cm. long; 3 median lobes broadly ovate, apiculate, 6·5 mm. long, 5·5 mm. wide, pilose within, lateral lobes ensiform, acuminate, 1–1·2 cm. long. *Staminal column* glabrous; anthers pubescent, the 2 lower bearded at the apex. *Style* columnar, shorter than the stamens, pubescent around the dome-shaped, 2-fid stigma. *Fruit* not seen.

Delei Valley, 28° 21′ N., 96° 37′ E., fls. July, *Ward* 8445. "On the edge of thickets in the undergrowth."

Cassiope Wardii *Marq.* [Ericaceae].

Previously known only from S.E. Tibet.

Delei Valley, 28° 21′ N., 96° 37′ E., 3400–3700 m., fls. early June, *Ward* 8285. "On an outcrop of granite rock along the bamboo-clad ridge, in moss. Erect undershrub; fls. scarcely open, milk-white."

Clerodendrum lasiocephalum *C. B. Clarke* [Verbenaceae].

This species was described by Clarke (Fl. Brit. Ind. **4**, 594) on a single sheet collected by Griffith in the Mishmi country. The specimen is in fruit and Clarke had not seen the plant in flower, consequently the description is brief and hardly adequate. Further specimens having been received at the Kew Herbarium a fuller description is thought to be desirable. Curiously enough two of these later collections were made by Clarke himself in May and July 1885, apparently after he had composed his account of the *Verbenaceae*, which was published in August of the same year. The following description has been compiled from all the sheets available, including 3 from Upper Burma which are not again referred to here.

A *shrub* up to 2 m. high; flowering twigs (lower parts not seen) terete, at first brown-tomentose, becoming merely pubescent by fruiting time. *Leaves* from broadly elliptic-ovate with a rounded or cuneate base to broadly ovate-cordate with a nearly truncate to distinctly cordate base, acute or acuminate, 6–25 cm. long, 5–21 cm. wide, at first greyish-brown tomentose on both faces, later only pubescent, primary nerves 5–8 pairs, looped and joining close to the margins, with the midrib prominent below, margins shortly ciliate, from slightly sinuate to finely or coarsely and irregularly sharply-dentate; petioles 2–15 cm. long, indumentum as of the leaves. *Panicle* sessile or on a stout peduncle up to 4 cm. long, up to 7 cm. across and as long, congested; bracts narrowly elliptic-lanceolate

to oblanceolate, finely acuminate, shortly petioled, tomentose to pubescent, up to 3 cm. long; pedicels 5–12 mm. long. *Calyx* narrowly funnel-shaped, pubescent; tube 7·5–8 mm. long; lobes 5, ensiform, finely acuminate, 1–1·5 cm. long. *Corolla* narrowly cylindric, wider at the base, suddenly much expanded at the apex; tube 2·5–3 cm. long; lobes 4, broadly obovate, rounded, 9–10 mm. long, 7 mm. wide. *Stamens* 4, inserted above the middle of the corolla-tube, long exserted; filaments filiform, 3·5–4 cm. long; anthers linear, cells acute and divaricate at the base, 3–4 mm. long. *Disk* narrowly turbinate, 1·5 mm. long, 4-ribbed and very shortly 4-toothed, forming a pediment to the ovary. *Ovary* oblong, depressed, slightly compressed, 1·5–2 mm. long; style filiform, shortly exserted, apex acutely 2-fid. *Drupe* 6 mm. diam., red.

Mishmi, *Griffith* Kew Dist. No. 6055. Dupla, *Booth* (without no. or details). Khasia Hills, Nungpo, 460 m., fls. May, *C. B. Clarke* 38106A, "shrub 5 ft.; corolla white; bracts and head purple-red." Shillong, 1300 m., fls. July, *Clarke* 44144A. Naga Hills, Khonoma, 1540 m., fls. April, *N. L. Bor* 2724, "very foetid."

XL—NEW OR LITTLE-KNOWN PLANTS FROM SOUTHERN INDIA: XIII.*

Salacia Gambleana *M. M. Whiting et K. N. Kaul*, nom. nov. [Celastraceae].

Gamble gave the name *Salacia Talbotii* (K.B. 1916, 133) to a plant of North Kanara collected by W. A. Talbot in 1886 and 1888 (Anishi Ghat—nos. 1217 and 1361 in Herb. Kew.), overlooking E. G. Baker's *Salacia Talbotii* published in his Catalogue of Nigerian Plants 1913, p. 19, collected by P. A. Talbot, no. 1687. The North Kanara plant has therefore been re-named *Salacia Gambleana*.

Ruellia Beddomei *C. B. Clarke* [Acanthaceae].

This species has hitherto been found only in the Central Provinces of India.

Billigirirangan Hills, 4th mile on Punjur Ghat, 1150 m., fls. and frt. Sept., *E. Barnes* 2189, 2190. "Under the shade of bamboo on rocky slope. Corolla white."

Chlorophytum acaule *Baker* [Liliaceae].

This species was founded on a single sheet, holding 3 plants with capsules only, collected by Jerdon in the "East Indies" without precise location (see Journ. Linn. Soc. **15**, 327). No further specimens being available when vol. VI of the Fl. Brit. Ind. was published, Hooker placed it (p. 336) among the "doubtful and imperfectly known species." Professor E. Barnes has now sent a specimen of this plant to Kew, collected in the Elagiri Hills of the North Arcot District at 1075 m., fruiting in Dec. (*E. Barnes* 2210).

* Continued from K.B. 1939, 662.

This plant also bears only capsules, but, fortunately, Prof. Barnes has plants growing at Tambaram and has seen flowers though somewhat imperfect ones. A fuller description has therefore been drawn up from these two collections and from Prof. Barnes's notes to replace the incomplete published descriptions.

A stemless *herb*; root-fibres slender, puberulous, up to 16 cm. long (not including the tuber), mostly (all?) bearing a cylindric tuber up to 3 cm. long by 5 mm. diam., near its apex. (These tubers are not mentioned by Baker and Hooker though one plant on Jerdon's sheet exhibits 3 of them.). *Leaves* linear, up to 49 cm. long and 1 cm. wide (on the Jerdon sheet). *Flowers* few, 1–3 together in the axils below ground level, developing one at a time; pedicels slender, inarticulate, up to 5 cm. long in fruit. In addition 2 of Jerdon's plants bear what appear to be 2 or 3 slender scapes up to 11 cm. long, but devoid of flower or fruit, and one of these shows a short lateral branch (pedicel?). Barnes notes that the flowers are deep in the axils underground, so probably the pedicels lengthen after flowering to push the capsule above ground. *Tepals* very narrow, concave, white or colourless, with 5 very close nerves forming a median channel, margins narrowly membranous. *Stamens* in the groove of the tepals; filaments very slender, 4 mm. long; anthers yellow, 2-celled, 5 mm. long. *Style* 1·5 mm. long, stigma reddish. *Capsules* oblong, obtuse, slightly emarginate, 7–9 mm. long; seeds 4–5 in each cell, 2·5–3 mm. diam., black, shining, minutely muriculate.

Professor Barnes thinks that the flowers may be cleistogamous; this is very probable, but it is also possible that they may be fertilised by crawling insects.

Dipcadi madrasicum *E. Barnes et C. E. C. Fischer*, sp. nov. [Liliaceae]; *D. montano* (Dalz.) Baker peraffinis, scapo foliisque longioribus, tepalis apice haud glandulosis, antheris filamentis multo brevioribus distinctum.

A scapigerous *herb*; bulb spherical to conical, up to 2·5 cm. diam., axis yellow, inner coats white, outer buff and membranous at first, later dark- or greyish-brown and loosely fitting; rootlets fibrous, white. *Leaves* few, radical, under dry conditions more or less terete, narrowly channelled above, 10–15 cm. long, 2–3 mm. diam., in moister localities linear, more or less flat with involute margins, tapering to a slender conical tip, narrowed to a tubular base, up to 33 cm. long and 5·5 cm. wide, subglossy, darkish-green upwards; brownish-red at ground level and white below ground. *Scape* erect, terete, smooth, glaucous green with a waxy lustre, usually longer than the leaves, up to 75 cm. long, 7–12-flowered, flowers pendent; bracts broadly ovate with a claw-like acuminate tip, base slightly auricled, lower margin erose or irregularly denticulate, greenish and membranous in bud, in flower brown and shrivelled, longer than the rather stout, curved, green, 3–5 mm. long pedicels. *Perianth* narrowly campanulate, 1–1·15 cm. long; the 3 outer tepals oblong,

attached for ⅓–½ their length, pale-green, upper half reflexed, apex bluntly triangular with a thickened tip and a tuft of hairs within, eglandular; inner tepals slightly shorter, erect, yellowish-green with a thickened greenish rib, tip directed outwards with or without a tuft of hairs. *Stamens* attached to the upper part of the perianth-tube; filaments linear-ensiform, 4–5 mm. long; anthers linear, 2·7–3 mm. long, dorsifixed; pollen-grains ovoid, subacute at both ends, longitudinally grooved, 1 mm. long, 0·5 mm. wide. *Ovary* shortly stipitate, ellipsoid to obovate-ellipsoid, 4–5 mm. long; style stout, terete, 3–3·5 mm. long; stigma subglobose, obscurely 6-lobed. *Capsules* erect, straw-coloured, oblate, deeply 3-lobed, lobes spreading, vertically compressed, 7 mm. long, 1·2 cm. wide, margins irregularly thickened. *Seeds* numerous, irregularly discoid, thin, 5 mm. diam., black, subglossy, surfaces papillose, margins often thickened.

Chingleput District: Tambaram, 70 m., fls. Nov., *E. Barnes* 1801 (type in Kew Herb.), 2085. Also at Guduvancheri. Common in both localities in dry stream-beds and other sandy and marshy places in scrub jungle, flowering and fruiting Sept. to Nov. Tamil name *Katuvengaim*, a name which appears to be applied also to other bulbous plants; the bulb is eaten in times of scarcity.

XLI—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XLIV.* FURTHER NOTES ON TROPICAL AMERICAN BIGNONIACEAE.

N. Y. SANDWITH.

Phryganocydia phellosperma (*Hemsl.*) *Sandwith*, comb. nov.—*Macfadyena phellosperma* Hemsl. in Biol. Centr. Amer. Bot. ii. 492 (1882).

PANAMA CANAL ZONE. Swamp, Rio Grande, June 1861, *Sutton Hayes* 81 (type in Herb. Kew.). Near Balboa, behind mangrove swamp, June 1939, *A. H. G. Alston* 8830 (Herb. Mus. Brit., Herb. Kew.); flowers pale purple with darker spot on lip.

No reference was made to this very distinct plant by Standley in his Flora of the Panama Canal Zone (1928), and it has apparently awaited rediscovery until last year when Mr. Alston collected flowering material agreeing with the type and growing in a similar habitat. The peculiar character of the calyx, the simple tendril, flower-colour and other characters leave no doubt of the generic relationship of the species, and it is surprising that the necessary combination has not been made sooner. Apart from the very remarkable characters of the fruit—short and ovoid, with thick and corky, almost wingless seeds—which so little resembles the linear capsule and transversely oblong thin seeds with broad membranous wings of *P. corymbosa* (Vent.) Bur. ex K. Schum., *P. phellosperma* also differs from its ally in the more conspicuously and narrowly cuspidate apex of the leaflets which are more intricately

* Continued from K.B. 1939, 563.

reticulate beneath, and in the strongly pilose anterior side of the corolla within the tube above the insertion of the filaments. The calyx, moreover, appears to be more broadly and shortly horned.

The following note written by Sutton Hayes on the sheet bearing the fruit in the Kew Herbarium is of interest: "This is the fruit of no. 81, which was named *Spathodea corymbosa* Vent. but, if *Macfadyena corymbosa* of Grisebach's Flora is the same, my plant must be wrongly named, for the capsule is very different. My plant is found in swamps near Panama, and I never have seen it growing on high land, but my no. 222 named *Macfadyena corymbosa* Griseb. [this is correctly referred to *Phryganocydia corymbosa*] is always found on high land and never in swamps. The fruit of this plant [no. 81] is thick and fleshy like that of many other plants peculiar to swampy places." One may add the observation that parallel instances occur in *Bignoniaceae*, for instance in the genus *Tabebuia*, one species of which occurring on river-banks produces short capsules with corky more or less wingless seeds adapted for water-borne distribution.

Several perplexing collections of *Schlegelia* from Central and S. America have recently occupied the writer's attention. All of them resemble each other closely in general characters of the inflorescence, and are allied to the Brazilian *S. Ramizii*, a species of the section *Paratanaecium* with small white flowers. They differ from it, and most of them from each other, in small details which the writer prefers to treat as of varietal significance until there is far more evidence to the contrary. The following three varieties are therefore provisionally proposed:

Schlegelia (§ *Paratanaecium*) **Ramizii** *Sandwith* var. **macrandra** *Sandwith*, var. nov.; a typo inflorescentiis glabrescentibus, corollae lobis majoribus ad 7·5 mm. longis, filamentis longioribus circiter 5 mm. longis glabris basi tantum breviter piloso-papillosis, antheris exsertis differt.

AMAZONIAN PERU. Dept. Loreto; Florida, Rio Putumayo, at mouth of Rio Zubinata, c. 180 m., in forest, fl. May–July 1931, *Klug* 2191; *ibid.*, fl. Oct.–Dec. 1931, *Klug* 2340 (typus). "Flowers white."

COSTA RICA. Vara Blanca de Sarapiqui, north slope of Central Cordillera, 1500–1750 m., fl. July–Sept. 1937, *Skutch* 3324. This collection has somewhat smaller corolla lobes and the filaments vary in length from 3–5 mm. "Flowers white."

S. Ramizii *Sandwith* var. **costaricensis** *Sandwith*, var. nov.; a typo foliis majoribus ad 14 cm. latis, inflorescentiis dense furfuraceo-puberulis (haud pilosulis), filamentis longioribus 3 mm. longis basi albo-villosis ceterum glabris differt.

COSTA RICA. Prov. San José; El General, 700 m., fl. Feb. 1939, *Skutch* 4125 (typus). "Flowers white."

The following Colombian collections agree with this variety in characters of the leaves and stamens but differ in the pilosulous inflorescence:

COLOMBIA. State of Boyacá: Caviche region, 140 m. N. of Bogotá, in high forest, 1300 m., April 1933, *Lawrance* 756; El Humbo region, 130 m. N. of Bogotá, in high forest, 1300 m., May 1933, *Lawrance* 803. The corolla lobes of both these collections were noted as white, tinted at the base with purple or maroon.

S. Ramizii *Sandwith* var. **trichandra** *Sandwith*, var. nov.; a typo inflorescentiis dense furfuraceo-puberulis (ut in var. *costaricensi*), filamentis ut in typo brevissimis 1·2 mm. longis sed per totam longitudinem dense albo-villosis, staminodio etiam praesertim apicem versus albo-villoso differt.

BRITISH HONDURAS. Ann. 1906–7, *Peck* 666 (typus).

XLII.—STUDIES IN THE ERICALES: III.* A NEW SPECIES OF GAULTHERIA FROM THE MALAY PENINSULA.

H. K. AIRY-SHAW.

Gaultheria malayana *Airy-Shaw*, sp. nov.; ab affini *G. punctata* Bl. ramis subteretibus nec angulato-alatis, foliis crassioribus rigidioribus plerumque latioribus brevioribusque, bracteis sepalisque minoribus minus acuminatis facile distinguenda.—*G. fragrantissima* Wall. *sec.* Ridley in Journ. F.M.S. Mus. **6**, 49 (1915) et Fl. Mal. Penins. **2**, 212 (1923), *non* Wall.; cf. J. J. Smith in Koord. et Val. Bijdr. Booms. Java **13** (Meded. Dep. Landb. **18**), 123 (1914), in obs.

Frutex vel *arbuscula*, statura ignota. *Rami* teretes vel obscurissime angulati, 2–3 mm. crassi, subrecti, glabri vel juniores minutissime papilloso-puberuli. *Folia* elliptica (rarius suboblonga) usque latissime suborbiculari-elliptica, 3·5–6·5 cm. longa, 1·5–4·7 cm. lata, apicem rami versus valde decrescentia, minima 1 cm. longa et 3 mm. lata, basi in maximis latissime subcuneata in mediocribus rotundata, apice rotundata vel obtusa, minute sed distinctissime (1 mm.) cuspidata, margine crebre subcrenato-serrulata, basin versus subintegra, crasse et rigide coriacea, utrinque glabra sed supra sparse subtus dense cicatricibus foveoliformibus brunneis setularum delapsarum conspicue punctata, folia juniora minima subtus setulis brevibus brunneis dense conspersa et setuloso-ciliata, siccitate supra brunneo-olivacea, subtus castanea; costa supra leviter impressa, subtus modice elevata, glabra; nervi laterales 5–7-jugi, immersi, subtus inconspicue prominuli, patuli, primum recti, deinde marginem versus arcuato-anastomosantes, reticulationibus laxis subtus valde obscuris; petioli usque 1 cm. longi, supra subplani, sulcati, subtus teretes, glabri. *Racemi* axillares vel in paniculam terminalem fere aphyllam dispositi, 2·5–5·5 cm. longi, graciles, suberecti usque patuli, rarius patentes, 10–16-flori, minute puberuli. *Bracteae* minutae, ovatae, 1 usque vix 2 mm. longae, patentes, ciliolatae, ceterum glabrae, persistentes. *Pedicelli* graciles, patentes vel deflexi, 4–5 mm. longi, minute puberuli. *Bracteolae* binae, oppositae, imo apice pedicelli sitae, late ovatae, 1 mm. longae, ciliolatae, ceterum glabrae, persistentes. *Calyx* late cupularis, 4–5 mm. latus, 2–3 mm. longus, extra glaber, intus breviter pubescens, segmentis 5 ovatis 1–1·5 mm. longis acute cuspidatis minute ciliolatis. *Corolla* ovoïdeo-urceolata, circiter 4 mm. longa et 3 mm. lata, rosea et alba (teste *Symington*), lobis 5 late deltoïdeo-ovatis 1 mm. longis revolutis margine minute eroso-denticulatis. *Stamina* 10, fere 2·5 mm. longa: filamenta plana, obovata, 1 mm. longa, superne in connectivum abrupte attenuata, dense papillosa, longiuscule ciliolata; antherae oblongo-ovoïdeae, 1 mm. longae, thecis in caudas 2 graciles reflexas fere 1 mm. longas desinentibus. *Disci glandulae* staminibus alternantes, anguste triangulares, 0·5 mm. longae, ovario adpressae. *Ovarium* late depresso-ovoïdeum, 1·5 mm. longum, 2 mm. diametro, pubescens; stylus 1·8 mm. longus, inferne puberulus, superne glaber. *Capsula* in calyce nigro carnoso 4–5 mm. longo inclusa, 2–3 mm. longa, pubescens, pedicello usque 6–7 mm. elongato. *Semina* numerosa, irregulariter ovoïdea, 0·5 mm. longa, reticulata, laete castanea.

PERAK. Gunong Korbu, 1800 m., Feb.–March 1913, *H. C. Robinson's Dyak Collectors* (typus, Herb. Kew.); ibid., ridges above 1650 m., 22 July 1933, *Symington* 32117 (Kep.): "shrub or treelet; flowers pink and white;" C. H. Gunong Terbakar, summit, 12 Apr. 1934, *Symington* 36233 (Kep.); C. H. Gunong Batu Brinchang, 14 Apr. 1934, *Ja'amat & Yalip* 36505 (Kep.).

Dr. J. J. Smith (l.c.) regarded this plant as combining the inflorescence characters of *Gaultheria fragrantissima* Wall. and *G. punctata* Bl., since the racemes are both axillary (as in the former) and terminally panicled (as in the latter). But, while this is true so far as it goes, the subterete stems and thick rigidly coriaceous leaves of the Perak plant are very different from those of the Himalayan and of the Sumatran-Javanese species. The leaves are also shorter and broader than either, in their common forms, but I have not seen Miquel's *G. punctata* var. β 'foliis multo minoribus ovatis vel ellipticis,' based on a Korthals specimen from Mt. Papandayang, Java (Ann. Mus. Bot. Lugd. Bat. **1**, 41: 1863). Provisionally, therefore, at least, I regard these as three distinct species.

I am indebted to Mr. C. F. Symington for the loan of material from the herbarium of the Forest Research Institute, Kepong, F.M.S. (indicated above by the abbreviation Kep.).

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* Continued from K.B. 1935, 156.

XLIII—STUDIES IN THE ERICALES: IV.*

CLASSIFICATION OF THE ASIATIC SPECIES OF GAULTHERIA. H. K. AIRY-SHAW.

The subdivision of the genus *Gaultheria* into natural groups has never been seriously undertaken. G. Don (Gen. Syst. **3**, 839: 1834) seems to have been the first to deal with all the species known in his day; these numbered 29. He made only two divisions: "Flowers axillary, solitary. Peduncles or pedicels beset with some imbricated bracteas at the base;" and, "Racemes axillary and terminal at the tops of the branches. Pedicels bibracteate." He included *G. procumbens* L., the type species of the genus, in the first division, though actually it would require a separate division ("Flowers axillary, solitary. Pedicels bibracte[ol]ate.").

A. P. de Candolle (Prodr. **7** (2), 592: 1869) enumerated 43 species, of which five were "non satis notae." The remaining 38 were arranged in three groups: "Pedicellis axillaribus 1-floris solitariis bibracteolatis, bracteolis immediatè sub flore sitis;" "Pedicellis axillaribus 1-floris solitariis bibracteolatis, bracteolis à *flore remotis*;" and, "Floribus racemosis, bracteis amplis sicco-membranaceis, bracteolis in medio aut basi pedicelli." The first of these groups, in which he placed all the known Asiatic species, was surprisingly heterogeneous. Although *G. procumbens* L. and *G. trichophylla* Royle were correctly included therein, with them were associated *G. Myrsinites* Hook. (i.e. *G. humifusa* [Grah.] Rydb.), *G. Nummulariae* DC. (i.e. *G. nummularioïdes* D. Don) and *G. repens* Bl., in none of which are the pedicels bibracteolate nor are the bracteoles immediately beneath the flower; and even more remarkable was the inclusion of the racemose-flowered *G. fragrantissima* Wall., *G. Leschenaultii* DC., *G. punctata* Bl. and *G. leucocarpa* Bl., in defiance of de Candolle's definition of the group.

C. B. Clarke's treatment of the Indian species (Fl. Brit. Ind. **3**, 456: 1882) added little to the knowledge of the genus. *G. nummularioïdes* and *G. trichophylla* were separated from the remainder on account of their procumbent habit and solitary flowers, whilst *G. discolor* Nutt. and *G. semi-infera* (C. B. Cl.)† were placed (the latter provisionally) in the genus *Diplycosia*.

A tentative arrangement of the Malayan species was published by H. F. Copeland in the third of his series of papers on Philippine *Ericaceae* (Philipp. Journ. Sci. **47**, 57–63: 1931)—incidentally a valuable and suggestive contribution to the study of the whole family. (Copeland's arrangement is adopted by van Steenis in Bull. Jard. Bot. Buitenz. sér. 3, **13**, 204: 1934.) He recognizes three groups of species, designated as allies of *Gaultheria nummularioïdes*, of *G. fragrantissima*, and of *G. leucocarpa*, respectively. The second and third groups are undoubtedly natural; the first,

* Continued from previous page.

† **Gaultheria semi-infera** (*C. B. Cl.*) *Airy-Shaw*, comb. nov.—*Diplycosia? semi-infera* C. B. Clarke in Hook. fil. Fl. Brit. Ind. **3**, 459 (1882).

however, is unfortunately heterogeneous and involves some definitely erroneous statements. Thus, in the key to the species (*l.c.*, p. 58), *G. nummularioïdes* is stated to have "a definite pair of bracteoles immediately below the calyx": this is true of *G. trichophylla* Royle (included by Copeland in this group) and its allies, but *not* of *G. nummularioïdes*. In fact, none of the other species, mentioned by Copeland as "allies" of the latter, are such in reality.* It is clear, therefore, that this group, characterized by "leaves generally under 2 cm. long" (*l.c.*, p. 57), is a purely artificial one.

The Asiatic species of *Gaultheria* can be arranged in natural groups by the use of the following characters:

A. Leaves broadest below or above middle (±ovate or ±obovate).
B. Inflorescence perulate or eperulate at base.
C. Flowers racemose or solitary.
D. Pedicels bibracteolate at base, middle or apex, or bracteoles several, scattered.
E. Corolla capanulate or urceolate.

By taking these characters in various combinations, it is possible to establish five major groups of species. It must be clearly stated that the groups here proposed are based solely upon the species of continental and insular Asia (together with four from North America whose affinities are evidently Asiatic). No attempt has been made to correlate with them the numerous Australasian and Central and South American species†, on which other workers both in this country and in America are already engaged. It is hoped, however, that the arrangement here sketched may suggest a basis upon which a satisfactory natural classification of the whole genus may ultimately be founded. The shape and nervation of the leaves, and the structure of the inflorescence, appear to give the best characters for groups, the position and number of the bracteoles being particularly important.

CONSPECTUS SECTIONUM ET SERIERUM.

Sect. i. **Brossaeopsis,** sect. nov. Pedicelli ima basi bibracteolati, bracteolis suboppositis; folia infra medium latiora (plus minus ovata); nervi praecipui pauci (utrinque 1–3), basales vel sub-basales (nervatio "melastomacea").

Series 1. DUMICOLAE *Airy-Shaw* in Hook. Ic. Plant. **33**, sub t. 3207 (1933). Flores in racemos breves subcorymbosos basi perulatos dispositi; corolla campanulata, intus glabra; filamenta glabra; ovarium glabrum vel pilosum.—Typus: *G. dumicola* W. W. Sm.

Series 2. ATJEHENSES, ser. nov. Flores in racemos breves subcorymbosos basi pauciperulatos dispositi; corolla urceolata, intus puberula; filamenta longe pilosa; ovarium pilosum.—Species unica: *G. atjehensis* J. J. Sm.

* *G. mundula* F. Muell., *G. novaguineënsis* J. J. Sm., *G. borneënsis* Stapf and *G. benguetensis* Copel. are "allies of *G. fragrantissima*."

† Compare, however, the remarks on p. 310, below, on Sect. *Brossaeopsis*.

Series 3. NUMMULARIOÏDEAE, ser. nov. Flores solitarii, bracteae et bracteolae similes, complures, stramineo-submembranaceae; corolla campanulata usque urceolata, intus pilosa; filamenta margine pilosa; ovarium glabrum. Suffrutices prostrati, longe repentes.—Species unica: *G. nummularioïdes* D. Don.

Sect. ii. **Amblyandra,** sect. nov. Pedicelli pluribracteolati, bracteolis sparsis alternis; folia infra medium latiora (plus minus ovata), penninervia usque subquintuplinervia; flores solitarii (raro in pseudo-racemos terminales, ut videtur, dispositi); corolla campanulata, intus glabra; filamenta glabra; antherae exaristatae. Suffrutices parvi, saepe repentes.—Typus: *G. humifusa* (Grah.) Rydb.

Sect. iii. **Leucothoïdes,** sect. nov. Pedicelli prope basin, medium vel apicem bibracteolati, bracteolis alternis vel suboppositis; folia plerumque supra medium latiora (plus minus obovata), penninervia; flores in racemos basi perulatos plerumque adscendentes dispositi, interdum tetrameri; corolla plerumque manifeste urceolata.—Typus: *G. fragrantissima* Wall.

Sect. iv. **Eugaultheria,** sect. nov. Pedicelli imo apice bibracteolati, bracteolis oppositis; flores solitarii; folia plerumque parva, penninervia.—Typus: *G. procumbens* L.

Series PROCUMBENTES, ser. nov. Flores pentameri; corolla suburceolata, intus cum filamentis dense villosa; ovarium omnino superum; folia majuscula, usque 6 cm. longa et 1–3 cm. lata; pedicelli usque 1 cm. longi. Suffrutex repens, ramis erectis apicem versus paucifoliatis.—Species unica: *G. procumbens* L.

Series TRICHOPHYLLAE, ser. nov. Flores pentameri; corolla campanulata, raro urceolata, intus cum filamentis glabra; ovarium omnino superum; folia minuscula, usque 1·7 cm. longa et 0·8 cm. lata; pedicelli 2–4 (raro 5–10) mm. longi. Suffrutices humiles, caespitosi, ramulis erectis vel subprostratis dense foliatis.—Typus: *G. trichophylla* Royle.

Series HISPIDULAE, ser. nov. Flores tetrameri; corolla brevissime campanulata, intus cum filamentis glabra; ovarium spurie semi-inferum; folia parva, brevissime ovata usque obovata; pedicelli brevissimi. Suffrutices omnino prostrati, ramulis gracillimis longe repentibus distiche foliosis.—Typus: *G. hispidula* (L.) Muhlenb.

Sect. v. **Gymnobotrys**, sect. nov. Pedicelli imo apice bibracteolati, bracteolis oppositis; flores racemosi; racemi basi eperulati; folia infra medium latiora (ovata usque lanceolata); flores in racemos axillares saepe deflexos vel in racemos vel paniculas terminales dispositi; corolla plerumque campanulata.—Typus: *G. leucocarpa* Blume.

ARTIFICIAL KEY TO THE SECTIONS AND SERIES.

Flowers solitary; dwarf undershrubs with mostly small leaves:
  Bracteoles 2, opposite, immediately beneath the calyx..... **Eugaultheria**

  Leaves over 1 cm. wide; *filaments and inside of corolla* hairy ..... PROCUMBENTES
  Leaves less than 1 cm. wide; filaments and corolla glabrous:
    Flowers pentamerous; plants more or less caespitose..... TRICHOPHYLLAE
    Flowers *tetramerous; plants very slender, quite* prostrate HISPIDULAE
Bracteoles (bracts) several, alternate, not immediately beneath the calyx:
  Corolla pilose within; filaments pilose on the margin; anthers 4-aristate; *fruiting calyx* blue..... **Brossaeopsis**—NUMMULARIOÏDEAE
  Corolla glabrous within; filaments glabrous; anthers exaristate; fruiting calyx scarlet..... **Amblyandra**
Flowers racemose or paniculate; bracteoles 2; shrubs with mostly broad leaves:
  Inflorescence eperulate; bracteoles opposite, immediately beneath the calyx..... **Gymnobotrys**
  Inflorescence perulate:
    Bracteoles alternate or subopposite, at about middle of pedicel (more rarely near base or apex); pedicels much shorter than axis of inflorescence; corolla urceolate (very rarely campanulate); leaves mostly obovate or oblanceolate **Leucothoïdes**
    Bracteoles subopposite, at *extreme* base of pedicel; pedicels as long as axis of inflorescence, or nearly so:
      Corolla campanulate, glabrous within; *filaments* glabrous **Brossaeopsis**—DUMICOLAE
      Corolla urceolate, puberulous within; filaments long-pilose **Brossaeopsis**—ATJEHENSES

Of these groups, Sect. *Leucothoïdes* corresponds to Copeland's second group, "allies of *G. fragrantissima*," Sect. *Gymnobotrys* to his third group, "allies of *G. leucocarpa*," and Series *Nummularioïdeae*, of course, to his first group, "allies of *G. nummularioïdes*." Sect. *Eugaultheria* would also be included in his first group, in so far as he includes in the latter *G. trichophylla* Royle. Series *Dumicolae* and *Atjehenses* and Sect. *Amblyandra* are not accounted for in his arrangement, no Malayan species being then known; the Japanese *G. adenothrix* (Miq.) Maxim. is not mentioned by him.

In the present paper, only Sections *Brossaeopsis*, *Amblyandra* and *Eugaultheria* are dealt with in detail. *It is hoped to treat* the remaining Sections *Leucothoïdes* and *Gymnobotrys* in a future paper in this series. Their general characteristics are, however, outlined below in their appropriate places (pp. 316, 329).

Section i. **Brossaeopsis.**

A group of very distinct species, the only ones in the Old World in which the bracteoles are situated at the extreme base of the

pedicel, more or less enclosed by the bract. The short axis of the racemes and the proportionately rather long pedicels give the inflorescences a fasciculate appearance.

The species occur in two distinct geographical areas. The more northerly one includes practically the whole range of the Himalaya and the mountains of south-west China. *G. nummularioïdes* covers the whole of this region, and three isolated species occur in the eastern part. The more southerly area includes Java and Sumatra, where *G. nummularioïdes* again occurs, in the mountains, whilst two isolated species, clearly related to the other three, are known from the mountains of Sumatra.

These facts of distribution would seem to indicate an ancient type, in the past probably occurring over a wide area and represented by numerous species, but now limited to a few species on the verge of extinction in their few remaining localities.

A large group of American species of *Gaultheria*, including the well-known *G. Shallon* Pursh, are closely related to the Asiatic section now represented by these few relicts. This is especially true of the West Indian species, *G. cordifolia* (Sw.) Raeusch. (*Brossaea coccinea* L.; *Gaultheria coccinea* (L.) Urb. [1902], *non* H. B. K. [1819]) and *G. domingensis* Urb., in which the inflorescence is much contracted. The name *Brossaeopsis* has accordingly been adopted for the present group. The American species agree in leaf-shape and to a less extent in nervation, and the bracteoles are well below the middle of the pedicel. In the majority of the American group the bracts tend to be developed at the expense of the bracteoles, but in the two West Indies species they are more equal. The chaffy texture of these organs in *G. nummularioïdes* is very similar to that of many of the American species, except that in the latter they are usually conspicuously parallel-veined. Whereas, however, in Sect. *Brossaeopsis* the corolla is usually widely campanulate, in *Brossaea* it is definitely urceolate, showing in this respect an advance on the more primitive Asiatic group.

Series i. Dumicolae.

The four species of this series represent the most primitive type of *Gaultheria* surviving in the Old World. This is suggested both by the basal position of the bracteoles and also by the type of geographical distribution outlined above. The short, congested racemes, the campanulate corollas, the leaf-shape and peculiarly characteristic nervation and also (except in *G. dumicola*) the indumentum, call to mind certain species of *Diplycosia*, from which circumstance it might plausibly be inferred that that genus and the *Dumicolae* originated from a common, not far distant stock. The truly racemose inflorescence, however, the position of the bracteoles and the structure of the anthers exhibit a wide divergence from *Diplycosia*, a specialised and essentially uniform type, which must

have arisen very anciently, since no direct connecting links with *Gaultheria* now remain.

The inflorescence is comparable with that found in the American sections *Eulyonia* Rehd. and *Maria* Rehd., of the genus *Lyonia* Nutt. (*non* Ellis), and carried to its extreme state—the fascicle—in *Zenobia*, to the flowers of which those of *Gaultheria codonantha* Airy-Shaw (*vide infra*) bear a considerable resemblance. This resemblance is not confined to the superficial structure of the inflorescence, but is enhanced by close agreement in the morphology of the calyx, corolla, filaments, anthers and seeds, and perhaps indicates a closer relationship between these three genera than has hitherto been suspected.

Clavis Specierum.

Folia parva, usque 3·5 cm. longa; ramuli graciles, usque 1 mm. crassi; corolla circiter 5 mm. longa; ovarium glabrum (Yunnan).....4. *notabilis*

Folia majora, 5–15 cm. longa; ramuli robusti, 1–5 mm. crassi:

Rami et folia glaberrima; corolla circiter 5 mm. longa; stamina plerumque valde redacta, antheris saepe deficientibus; ovarium pilosum (Yunnan).....3. *dumicola*

Rami et folia (saltem subtus) setosa vel hispido-pubescentia:

Folia plana, usque 15 cm. longa; corolla circiter 15 mm. longa; ovarium glabrum (Assam).....1. *codonantha*

Folia plana, usque 10 cm. longa; corolla circiter 5 mm. longa; ovarium pilosum (Burma super.)...3. *dumicola* var. *aspera*

Folia matura valde bullata, usque 7·5 cm. longa; corolla circiter 5 mm. longa; ovarium pilosum (Sumatra)..... 2. *abbreviata*

1. **G. codonantha** *Airy-Shaw* in Hook. Ic. Plant. **33,** t. 3207 (1933); Journ. Roy. Hort. Soc. **59,** 305, Proc. p. cxxxi (1934); Bot. Mag. **159,** t. 9456 (1936).

Gaultheria sp., Gard. Chron. **94,** 424, 428 (fig. 182), 445 (1933).

G. codonantha may probably be regarded as the nearest known species to the prototype of the genus, for, apart from the contraction of the inflorescence-axis, it exhibits very little specialisation in any direction by comparison with its congeners. Whereas the majority of the species are adapted to life at considerable altitudes, *G. codonantha* occurs at an elevation of only 1,500 metres in Assam. The unrestrained development of all parts—leaves, flowers and general habit—suggests a relatively primitive species with little or no adaptation to special conditions.

2. **G. abbreviata** *J. J. Sm.* in Fedde, Rep. Spec. Nov. **35,** 292 (1934); van Steenis in Bull. Jard. Bot. Buitenz. ser. 3, **13,** 204 (1934).

Additional record:

Sumatra. Resid. Padangsche Bovenlanden: Gunong Singgalan, 2100 m., 16 Jan. 1913, *C. G. Matthew* sine numero (Herb. Kew.).

The occurrence of a member of this otherwise East-Himalayan group as an outlier in the Malay archipelago is interesting and rather unexpected. In its robust habit and large bracteate inflorescences it is somewhat reminiscent of *Diplycosia sumatrensis* Merrill, also collected on Mt. Singgalan by Beccari (no. 328). The older leaves are remarkable for the bullate elevation of the tissue between the principal nerves. It may be noted that *G. abbreviata*, though the latest of this group to be described, was actually the first to be discovered, for Beccari's specimens (cited by J. J. Smith, *l.c.*; duplicate in Herb. Kew.) were obtained as long ago as 1878.

3. **G. dumicola** *W. W. Sm.* in Notes Roy. Bot. Gard. Edinb. **9,** 106 (1916).

G. dumicola was first collected by Forrest in May, 1912. The specimen, however, bore only old fruit. C. K. Schneider next obtained it in October, 1914 (*Schneider* 2561, Herb. Kew.). It was again gathered by Forrest on several occasions during later expeditions. All these collections came from the immediate neighbourhood of Tengyueh (25°15′ to 25°20′N.) (the only known locality for *G. notabilis* also), at elevations of from 1800 to 2100 metres, where Forrest noted it as sometimes forming bushes 8–10 feet in height.

A greater contrast in allied species could scarcely be imagined than that obtaining between the diminutive, dingy flowers of *G. dumicola*, with its reduced androecium, and the large, handsome, white bells of *G. codonantha*, fully developed in all parts. It is evident that there are vast *lacunae* in this group, from consideration both of the morphology of its surviving representatives and also of their geographical distribution.

var. **petanoneuron** *Airy-Shaw* in Hook. Ic. Plant. **33,** t. 3206 (1933).

Gaultheria dumicola Auctt. Edin. in Notes Roy. Bot. Gard. Edinb. **17,** 158, 286, 360 (1930).

The variety *petanoneuron* was found by Forrest somewhat further north (25°30′ to 26°N.) and at somewhat greater altitudes (2400–3000 metres) than the species, on the high divides on either side of the Salwin river.

var. **aspera** *Airy-Shaw*, var. nov., a typo foliis subtus brevissime et sparsiuscule subhispido-pubescentibus distincta.

Upper Burma. Adung valley, 1800 m., 17 Feb. 1931, *F. Kingdon Ward* 9425 (Herb. Mus. Brit.): "A shrub, common in thickets. Leaves coriaceous, harsh. Berries with bluish-white bloom."

The discovery of this pubescent-leaved plant brings *G. dumicola* more into line with the remaining species of the series, all of which have more or less stiffly pubescent foliage.

4. **G. notabilis** *Anth.* in Notes Roy. Bot. Gard. Edinb. **18,** 18 (1933), descr. hic amplif.

Suffrutex a basi ramosus, 0·3–0·4 m. altus. *Caules* erecti vel arcuato-adscendentes, circiter 1 mm. crassi, teretes, subtiliter striati, longe (maxime juniores) ferrugineo-setosi, internodiis circiter 1–1·5 cm. longis. *Folia* plerumque ovata, rarius oblongo- vel elliptico-ovata usque latissime ovata, usque 3·5 cm. longa et 2 cm. lata, basi rotundata vel subtruncata (juniora leviter angustata), apice brevissime et abrupte calloso-apiculata vel -cuspidata, margine subintegra vel obscurissime serrulata, longe ciliata, supra glabra, olivacea, subtus (maxime secus nervos) sparse setulosa vel glabrescentia, pallide castanea, chartacea; nervi primarii laterales utrinque 2, saepe alterni, prope basin orti (sed e pari superiore alter saepe prope mediam costam ortus), late arcuati, laminam usque ad apicem percurrentes, venulis reticulatis, supra impressi, infra prominentes; petioli 1–3 mm. longi, setulosi. *Inflorescentiae* brevissime corymboso-racemosae, 3–8-florae, glaberrimae, rhachi 2–6 mm. longa. *Bracteae* ovatae, 1–2 mm. longae, cucullatae, dorso carinatae, acutae, fimbriato-ciliolatae; bracteolae bracteis similes, sed minores, nonnunquam paullo supra basin pedicelli ortae. *Pedicelli* usque 6 mm. longi, patuli. *Calyx* cupularis, 2–3 mm. longus et latus, explanatus 6–7 mm. latus, ultra medium fissus, segmentis triangularibus vel ovato-triangularibus acutis. *Corolla* campanulata, 5–6 mm. longa, 4–5 mm. lata, alba, lobis late deltoïdeis 2–3 mm. longis et latis apice obtusiusculis recurvis. *Staminum* filamenta subulata, ima basi attenuata, plana, 2 mm. longa, valde (maxime dorso) papillosa, margine basin versus parce longe ciliata; antherae lanceolato-ovoïdeae, circiter 1 mm. longae, apice deflexae, thecis breviter bicornibus. *Ovarium* depresso-globosum, 2 mm. diametro, 1·5 mm. altum, glabrum, basi disco obscuro brevissime 10-lobo cinctum. *Stylus* corollam subaequans, columnaris, teres, stigmate subcapitato lobato. *Capsula* non visa; calyce fructifero (teste *Forrest*) atro-purpureo.

The above description was prepared for publication before the appearance of Anthony's description of *G. notabilis* (*l.c. supra*); it is published here as being in some respects fuller than the latter.

This apparently very rare species, herbarium specimens of which bear a superficial resemblance to *Diplycosia pilosa* Blume, from Java, is at present known only from the vicinity of Tengyueh, Yunnan, growing "in dry thickets and amongst scrub, on dry stony slopes," at an altitude of 2400 metres (*Forrest* 26722). It provides a link, morphologically, with the series immediately following.

Series Atjehenses.

5. **G. atjehensis** *J. J. Sm.* in Fedde, Rep. Spec. Nov. **35,** 293 (1934); van Steenis in Bull. Jard. Bot. Buitenz. sér. 3, **13,** 205 (1934).

This species, at present known with certainty only from a single locality in Sumatra, forms an intermediate between the Series

Dumicolae and *Nummularioïdeae*. It is certainly allied to *G. nummularioïdes*, but not to *G. benguetensis* as suggested by van Steenis (*l.c.*). The urceolate corolla, paralleled also in certain forms of the next species, recalls that of the American species of *Brossaea*.

Series NUMMULARIOÏDEAE.

It is possibly overrating the distinctness of *G. nummularioïdes* to separate it serially from the remaining species of the section; this course has, however, the advantage of affording parallel treatment to that provided by the segregation of the solitary-flowered section *Eugaultheria* (p. 318) from the racemose section *Leucothoïdes* (p. 316). *G. nummularioïdes* is interesting as representing a highly successful reduced type derived from the apparently unsuccessful *Dumicolae*. Whereas the latter seem at the present day to be dying out, their offshoot already occupies a wider area than any other Asiatic species of the genus, and shows signs of eventually resolving itself into a multiplicity of forms or even species in much the same way as the similarly reduced and successful *Trichophyllae*.

6. **G. nummularioïdes** *D. Don*, Prodr. Fl. Nep. 150 (1825); Royle, Ill. Bot. Himal. t. 63, fig. 2 a–e (Aug. 1835) et p. 260 (Dec. 1835); C. B. Clarke in Hook. fil. Fl. Brit. Ind. **3**, 457 (1882); Franch. in Nouv. Arch. Mus. (Paris), sér. 2, **10**, 44 (1887); reimpr.: Pl. David. **2**, 82 (1888); Koord. Exk.-fl. Java, **3**, 10 (1912); J. J. Sm. apud Koord. et Valeton, Bijdr. Kenn. Boomsoort. v. Java, **13**, 114 (1914), descr. opt.

Gaultheria repens Bl. Bijdr. Fl. Nederl. Ind. 857 (1826); DC. Prodr. **7** (2), 593 (1839).

Gaultheria Nummulariae DC. Prodr. **7** (2), 592 (1839).

Gaultheria sp., Griffith, Ic. Pl. As. **4**, t. 518, fig. 2 (1854).

Pernettya repens (Bl.) Zoll. et Mor. in Mor. Syst. Verz. v. Zoll. a. Java gesamm. Pfl. 42 (1846), et in Zoll. Syst. Verz. Ind. Archip. gesamm. Pfl. **2**, 138 (1854).

Gaultheria trichophylla Hassk. Retzia [ed. 1], **1**, 108–110 (1855); ed. nov. (Hort. Bog. Descr.), **1**, 148–150 (1858), descr. opt.; *non* Royle.

Gaultheria nummularia Hassk. *ll. cc.* (1855 et 1858), pro synon. dub. *G. trichophyllae* Hassk. non Royle.

Brossea nummulariodes [sic] O. Kuntze, Rev. Gen. Pl. **2**, 388 (1891).

var. **elliptica** *Rehd. et Wils.* in Sargent, Pl. Wils. **1**, 555 (1913).

The species exhibits a considerable amount of variation throughout its range, in leaf-size (and, to a less extent, in leaf-shape), in indumentum and in size and shape of corolla, but it has not been found possible to recognize any form as distinct except the variety *elliptica*. In Sumatra and Java the leaves tend to be of a uniformly small type, and the corolla is apparently urceolate or

at least cylindric; this form can, however, be almost exactly matched by specimens from the Himalaya, which are in turn connected by numerous intermediates with large-leaved, campanulate-flowered forms from western China. Otto Kuntze's proposed varieties *normalis* and *glauca* appear quite untenable.

Section ii. **Amblyandra.**

A small isolated group of three closely allied species from the temperate regions on either side of the North Pacific, showing a simplified type of anther structure. The solitary flowers probably represent the terminal flower of a raceme, the numerous apparent bracteoles being in reality the bracts of the suppressed lateral flowers. As already noted, *G. nummularioïdes* exhibits the same phenomenon and may perhaps be regarded as a connecting link between the sections *Brossaeopsis* and *Amblyandra*.

CLAVIS SPECIERUM.

Pedunculi valde elongati, usque 3 cm. longi, glanduloso-pilosi, ex axillis foliorum summorum saepe valde redactorum orti; bracteae numerosae, dissitae (Japonia).....1. *adenothrix*

Pedunculi breves, corolla breviores usque vix dupio longiores, glabri vel apicem versus pilosi; bracteae paucae (circiter 4), plus minus confertae (America bor.-occ.):

Corolla calyce hirsuto plus duplo longior; folia acuta...2. *ovatifolia*

Corolla calyce glabro vix longior; folia subobtusa...3. *humifusa*

1. **G. adenothrix** (*Miq.*) *Maxim.* in Mél. Biol. **8**, 610 (1872) et in Bull. Imp. Acad. Sci. St. Pétersb. **18**, 44 (1873); Franch. et Sav. Enum. Pl. Jap. **1**, 283 (1875); Miyoshi et Makino, Pocket Atl. Alp. Pl. Jap. **1**, 10, t.v. fig. 30 (1906); Rehd. Man. Cult. Tr. & Shr. 717 (1927).

Andromeda (§*Lyonia*) *adenothrix* Miq. in Ann. Mus. Bot. Lugd.-Bat. **1**, 31 (1863).

Brossea adenothrix (Miq.) O. Kuntze, Rev. Gen. Pl. **2**, 388 (1891).

Diplycosia adenothrix (Miq.) Nakai in Bot. Mag. Tok. **35**, 135 (1921); Nak. et Koidz. Trees and Shrubs Jap. Prop. ed. 1, **1**, 164 (1922); ed. 2, **1**, 225 (1927); Makino et Nemoto, Nipp.-Shokub.-Sôran (Fl. Jap.), ed. 1, 865 (1931); Terasaki, Nipp.-Shokub.-Zufu (Jap. Bot. Ill. Alb.) 744 (1933).

Nakai's transference of this plant to *Diplycosia*, made presumably on the basis of its exappendiculate anthers, shows a failure to grasp the essential characters of that genus, which are the fascicled flowers, pedicels with two connate apical bracteoles, and anther-thecae produced into unappendaged tubules; the genus is, moreover, a definitely tropical and subtropical one, not extending north of the Philippines. *Gaultheria adenothrix* shows none of these features.

The relationship of this species to the next two has already been indicated by Rehder (*l.c.*, 1927).

2. **G. ovatifolia** *A. Gray* in Proc. Amer. Acad. **19,** 85 (1883) ; S. Brown, Alp. Fl. Can. Rocky Mount. 213, t. 58, fig. *b* (1907) ; Small in North Amer. Fl. **29** (1), 75 (1914) ; Armstr. et Thornb. Field Book West. Wild Flow. 342, fig. ad 343 (1915) ; Rydb. Fl. Rocky Mount. 642 (1917) ; Bean, Trees and Shrubs, **3,** 174 (1933).

G. Myrsinites forma, A. Gray, Synopt. Fl. North Amer. ed. 2, **2** (1), 26 (1886).

Intermediate in most of its characters between the two other species of the group. The indumentum is very similar to that of *G. adenothrix.*

3. **G. humifusa** (*Grah.*) *Rydb.* in Mem. New York Bot. Gard. **1,** 300 (1900) ; F. E. et E. S. Clements, Rocky Mount. Flow. 86, t. 15, fig. 6 (1914) ; Small in North Amer. Fl. **29** (1), 75 (1914) ; Rydb. Fl. Rocky Mount. 642 (1917) ; Jepson, Man. Flow. Pl. Calif. 744 (1925) ; Rehd. Man. Cult. Tr. & Shr. 716 (1927).

Vaccinium humifusum Grah. in Edinb. New Philos. Journ. **11,** 193 (1831).

Gaultheria Myrsinites Hook. Fl. Bor.-Amer. **2,** 35, t.129 (1834) ; DC. Prodr. **7** (2), 592 (1839).

Brossea myrsinites (Hook.) O. Kuntze, Rev. Gen. Pl. **2,** 388 (1891).

Occasionally develops a sparse straggling indumentum on the stems, similar to that of *G. ovatifolia*, and is also sometimes very minutely whitish-puberulous.

Section iii. **Leucothoïdes.**

This section, characterized by the subopposite or alternate bracteoles at about the middle of the pedicel (more rarely near the base or close to the calyx), and by usually obovate to oblanceolate leaves, contains the largest number of Asiatic species and is certainly capable of further subdivision. It is hoped to attempt this on a future occasion. The group has its centre of distribution in the eastern Himalaya and south-western China, with extensions into southern India and Ceylon, the Malay Peninsula, Sumatra, Java, Celebes and New Guinea.

The group appears to be a natural one, but the species are recognizable more by a combination of characters than by any one infallible criterion. Thus the corolla is almost always decidedly urceolate, but a conspicuous exception is *G. Griffithiana* Wight, in which the corolla is shortly campanulate with rather large triangular lobes ; the species is, however, clearly related to other more typical members of the group. The flower is normally

pentamerous, but tetramerous flowers are frequent in *G. tetramera* W. W. Sm. The leaves are usually broadest above the middle, with a more or less cuneate base, but in *G. Hookeri* C. B. Cl. (*G. Veitchiana* Craib) and a few others the leaves are often more ovate in outline, with a distinctly rounded, truncate or even subcordate base. In *G. semi-infera* (C. B. Cl.) Airy-Shaw, the ovary tends to become inferior. The anthers of *G. discolor* Nutt. are almost exappendiculate. A wide range is found in the position of the bracteoles, which may occur, in different species, anywhere from the base to the apex of the pedicel ; in *G. Forrestii* Diels, and in all the Malayan species, they are apical.

Most workers on this group have probably been impressed by the remarkable similarity in general outward morphology between *Gaultheria Griffithiana* and *Leucothoë Griffithiana* C. B. Clarke. There seems little doubt that this is no mere coincidence. *G. Griffithiana*, though unquestionably a species of *Gaultheria*, provides an almost perfect link between that genus and *Leucothoë* Sect. *Euleucothoë* and is certainly one of the more primitive members of Sect. *Leucothoïdes.* It will be recalled that the principal differences between *Leucothoë* and *Gaultheria* lie in the staminal structure, the fruiting calyx and the seeds. The latter genus may be regarded as an advanced type of the former, adapted for seed-dispersal by the agency of birds. *Leucothoë*, doubtless relying mainly on the wind to scatter its light, winged seeds, is evidently, judging by its present geographical distribution, a less successful type than *Gaultheria*, whose fleshy and often brightly coloured " fruits " must be a strong attraction to birds. The smooth, hard, unwinged testa of *Gaultheria* seeds may well be a concomitant adaptation, enabling them to withstand digestion by the birds which feed upon them and so to pass through unaffected. (*Cf.* van Steenis in Bull. Jard. Bot. Buitenz. sér. 3, **13,** 405 : 1935).

The following described species are referable to this section : *G. fragrantissima* Wall., *G. Griffithiana* Wight, *G. Forrestii* Diels, *G. caudata* Stapf, *G. Wardii* Marq. et Airy-Shaw, *G. Hookeri* C. B. Cl. (*G. Veitchiana* Craib), *G. discolor* Nutt., *G. semi-infera* (C. B. Cl.) Airy-Shaw and *G. tetramera* W. W. Sm. (all from the Himalaya and South-West China) ; *G. Leschenaultii* DC. (South India) and *G. rudis* Stapf (Ceylon). Several undescribed species remain to be segregated from Chinese and Indian material. In the Malayan region there is a closely allied group in which the flowers are borne in leafless terminal panicles or in leafy racemes, and the bracteoles are consistently apical : this includes *G. malayana* Airy-Shaw (Perak), *G. punctata* Bl. (Sumatra & Java), *G. celebica* J. J. Sm. (Celebes), *G. novaguineënsis* J. J. Sm., *G. Pullei* J. J. Sm., *G. calyculata* Wernh., and *G. mundula* F. Muell. (New Guinea). In addition to the species listed, the following form a small related group characterized by the more or less sympodial relation of the inflorescence to the main vegetative axis : *G. pyrolifolia* Hook. f.

et Thoms. (E. Himalaya) ; *G. pyroloïdes** Miq. (Japan) ; *G. cuneata* (Rehd. et Wils.) Bean and *G. prostrata* W. W. Sm. (S.W. China) ; *G. Itoana* Hay. (Formosa) ; *G. benguetensis* Copel. (Philippines) ; *G. borneënsis* Stapf (Borneo).

Section iv. **Eugaultheria.**

The type species of the genus *Gaultheria* is the widespread North American species, *G. procumbens* L., characterized by solitary flowers bibracteolate at the apex of the pedicel. Those species which agree with *G. procumbens* in these essentials are therefore here assembled to form what must be considered the type section of the genus. *Eugaultheria*, however, containing, as it does, the most reduced species known in the genus, cannot be considered " typical " of *Gaultheria*. These reduced species nevertheless represent a highly successful type—successful, that is, under present conditions. The majority are microphyllous plants adapted to life in an alpine environment at considerable altitudes, their headquarters being in the high mountains of the Sino-Himalayan ranges, where they have split up into a large number of closely allied forms, a process which may indeed still be taking place. *G. procumbens*, however, representing a distinct series within the section, is a broad-leaved type, suited to more lowland conditions, and as such occupies a large area in the woodlands of temperate North America, where its remarkable uniformity practically throughout its range contrasts strongly with the protean variety of the Sino-Himalayan group. The discontinuous distribution of the small series *Hispidulae* is interesting, for in this case it cannot well be argued (as was done, above, for the series *Dumicolae*) that a primitive and unsuccessful type is concerned. The two species of this series, *G. hispidula* (L.) Muhlenb. and *G. suborbicularis* W. W. Sm., represent the last word in reduction within the genus. The former, occurring in Japan and temperate North America, frequents (at least in the latter country) woods and sphagnum bogs—habitats similar to those favoured by a plant of very similar habit, *Oxycoccus Oxycoccos* (L.) MacM.—, whilst *G. suborbicularis* is one of the high alpine plants of western Yunnan.

The opposite apical position of the bracteoles is a character towards the acquisition of which evolution in *Gaultheria* has not

* This name was ascribed by Miquel (Ann. Mus. Bot. Lugd.-Bat. **1**, 30 : 1863) to " Hook. fil. et Th. herb. Ind. or." There is, however, no evidence that this name was ever used or even proposed by the latter authors. The type sheet from Herb. Hook., seen by Miquel, is written up " G. pyrolaefolia H. f. et T." in Hooker's handwriting. Miquel erroneously identified the Japanese plant with the Himalayan species which he had seen in Hooker's herbarium and which was later described by C. B. Clarke (Fl. Brit. Ind. **3**, 457 : 1882) as " *G. pyrolaefolia* Hook. f. ms." The epithet *pyroloïdes*, therefore, though evidently a mistake for *pyrolifolia*, should be credited to Miquel and, since it was accompanied by a description, can legitimately be used for the Japanese species, Takeda's proposed alteration to *Miqueliana* (Bot. Mag. Tok. **32**, 195 : 1918) being consequently superfluous.

infrequently tended. Compare also *Diplycosia* and *Pernettyopsis*, in which they constantly occupy this position, and the related *Theaceae-Ternstroemioïdeae* (*Ternstroemia*, *Annesleya*, etc.), in which their position and form are very similar, though here they are often deciduous (*cf.* Hook. Ic. Pl. **34**, t. 3342, p. 3 : 1937). Apical bracteoles appear to represent a kind of evolutionary climax.

A parallel may perhaps be traced in the form of the corolla. As sympetaly is commonly derived from polypetaly, so, surely, " stenostomy " may be regarded as a development from " eurystomy," or (lest this be Greek to some) an " urceolate " or pinched-at-the-mouth corolla as derived from a " campanulate " or wide-mouthed type, an adaptation for restricting the type of insect visitor that can effect cross-fertilisation. As mentioned already (p. 316), the section *Leucothoïdes* is almost uniformly characterized by the urceolate type ; but *Gaultheria Griffithiana* Wight has lagged behind in this respect and has retained the earlier campanulate type, appearing somewhat anomalous among its near relatives. In *Eugaultheria*, on the other hand, although bracteolar evolution has apparently proceeded as far as it can (or at any rate probably *will*), the corolla generally conforms to the more primitive campanulate type ; in *G. procumbens*, however, the corolla is subcylindric with a leaning towards the urceolate form, while *G. cardiosepala* Hand.-Mazz. (series *Trichophyllae*) has a definitely urceolate corolla. The urceolate type of corolla may be regarded as another evolutionary climax in the *Ericaceae*.

Series 1. Procumbentes.

1. **G. procumbens** *L.* Sp. Pl. ed. **1**, 395 (1753) ; G. Don, Gen. Syst. **3**, 839 (1834) ; DC. Prodr. **7** (2), 592 (1839) ; Britton et Brown, Ill. Fl. North. States & Can. **2**, 693 (1913) ; Small in North Amer. Fl. **29** (1), 75 (1914) ; Alexander in Addisonia, **12**, 53, t. 411 (1927).

G. humilis Salisb. Prodr. Stirp. Hort. Chap. Allert. 289 (1796).

G. repens Raf. Med. Fl. **1**, 202, t. 40 (1828), non Blume.

Brossea procumbens (L.) O. Kuntze, Rev. Gen. Pl. **2**, 388 (1891).

forma **suborbiculata** *Fernald* in Rhodora, **22**, 155 (1920) ; Deane in Rhodora, **24**, 153 (1922).

forma **elongata** *Svenson* in Rhodora, **25**, 184 (1923).

forma **accrescens** *Fernald et Hodgdon* in Rhodora, **36**, 129, t. 283 (1934).

The type species of the genus *Gaultheria*, *G. procumbens* is morphologically one of the most isolated species known. Possibly its nearest living relative is *G. pyroloïdes* Miq., from Japan, the shape, texture and venation of whose leaves are not very dissimilar, though in characters of inflorescence the two species differ widely. If this be the case, the section *Eugaultheria* must be regarded as at least diphyletic, since it is difficult not to trace the origin of the

Trichophyllae to species, allied to *G. pyroloïdes*, such as *G. cuneata* (Rehd. et Wils.) Bean and *G. prostrata* W. W. Sm., or their ancestors. This at least seems more natural than to imagine *G. procumbens* as the ancestral type of the *Trichophyllae*, not only on morphological but on phytogeographical grounds.

Reduction in leaf-dimensions and shortening of internodes and of pedicels have been the general accompaniments of the solitary flowers of *Eugaultheria*, but *G. procumbens* provides the exception to this. No other species of the section has such large leaves and only *G. dolichopoda* (described below) equally long pedicels.

While, therefore, the association of *G. procumbens* with the other members of the section may mean the juxtaposition of at any rate two independent lines of descent within the genus, it is perhaps the best scheme that can be devised, having regard to the exigencies of a linear arrangement.

Series 2. Trichophyllae.

The very closely allied species of this series constitute as it were the nucleus of the section *Eugaultheria*. Our knowledge of these critical forms is certainly far from complete, since every fresh collection from Upper Burma and Western Yunnan brings to light something new. The present treatment must therefore be regarded as at best provisional and probably unsatisfactory: full descriptions of the new forms here given the rank of species have not been supplied, since short diagnoses seem for the present to serve equally well. Further material may indicate the necessity for raising or lowering the rank of several of these forms.

G. dolichopoda (described below) may be recognised by its long pedicels; *G cardiosepala* Hand-Mazz. has a conspicuously urceolate corolla; *G. trichophylla* Royle has (normally) only two horns per anther; and *G. nivea* (Anth.) Airy-Shaw has minutely puberulous stems. The key below may help to determine the remaining species, but it is only tentative; comparison with authentic specimens is essential in this critical group.

A possible derivation of the *Trichophyllae* would seem to be from Sect. *Leucothoïdes*, *via* the sympodial group mentioned above (p. 317–8), particularly species such as *G. cuneata* (Rehd. et Wils.) Bean and *G. prostrata* W. W. Sm. It is not, of course, suggested that these actually are their ancestors, but they are probably phylogenetically connected.

I am much indebted to the Regius Keeper, Royal Botanic Garden, Edinburgh, and to the Keeper, Dept. of Botany, British Museum, for the loan of material of this group.

Clavis Specierum.

Pedicelli 5–9 mm. longi; folia oblongo-oblanceolata, usque 15 mm. longa, 2–4 mm. lata, apicem versus regulariter et remotiuscule serrulata, rigide coriacea, glaberrima, costa subtus albida valida prominente; planta satis robusta, usque 25 cm. alta ..... 2. *dolichopoda*

Pedicelli usque 3 (raro vix 4) mm. longi; plantae graciliores, humiliores:

Ramuli dense minutissime albido-tomentelli, setulis ferrugineis sparsis; folia oblonga, 5–8 mm. longa et 2–3 mm. lata, eciliata; fructus albus ..... 8. *nivea*

Ramuli praeter setulas ferrugineas sparsas vel densas glabri, raro sparse minute albo-puberuli; fructus caeruleus vel roseus vel albus:

Folia matura longe setuloso-ciliata, elliptico-oblonga, rarius obovata vel ovata; ramuli patenti-setulosi; disci glandulae parvae, deltoïdeo-subulatae; thecae plerumque uniaristatae ..... 5. *trichophylla*

Folia matura eciliata; ramuli breviter adpresso-setulosi vel minute verruculosi vel subnudi; disci glandulae majores, late depresso-ovatae:

Folia linearia usque oblanceolato-linearia, 1·5–2·5 mm. lata:

Folia 5–9 mm. longa; sepala lanceolata; corolla breviter campanulata ..... 3. *thymifolia*

Folia majora, 7–14 mm. longa; sepala ovata; corolla oblongo-urceolata ..... 4. *cardiosepala*

Folia elliptico-oblonga usque obovata, 3–8 mm. lata:

Folia plus minus chartaceo-coriacea, obovata, basi cuneata, apice rotundata, subtus pallide et saepe laete viridia, usque 15 mm. longa et 8 mm. lata, nervis subtus prominulis ..... 6. *hypochlora*

Folia rigide et crassius coriacea, elliptico-oblonga usque obovata, multo minus conspicue discoloria, usque 17 mm. longa et 5 mm. lata, plerumque acuta, nervis obscuris ..... 7. *sinensis*

2. **G. dolichopoda** *Airy-Shaw*, sp. nov., *G. thymifoliae* Stapf et *G. cardiosepalae* Hand.-Mazz. affinis sed omnibus partibus major, foliis conspicue serrulato-dentatis obtusioribus crassioribus, costa validiore, pedicello elongato usque 1·9 cm. longo distinctissima.

Gaultheria sp.n.? Marquand [et Airy-Shaw] in Journ. Linn. Soc. Bot. **48**, 199 (1929).

S.E. Tibet. Tsangpo Gorge, near Sechen La, 3000-3300 m., along the open ridge in thick *Abies-Rhododendron* forest, 1 Dec. 1924, *Kingdon Ward* 6331 (typus, Herb. Kew.): "Undershrub of 6–9 in. growing in clumps. Berries pendent, bright blue." Burmese frontier, lat. 28°25'N., long. 97°55'E., 3000–3300 m., 21 Oct. 1931, *Kingdon Ward* 10,130 (Herb. Mus. Brit.): "A gregarious almost prostrate plant, plastering the smooth steep rock faces, or growing in moss under scrub *Rhododendron* and *Arundinaria*. Flowering shoots ascending erect, the Prussian blue berries pendent on half-inch pedicels. Grows in the precipitous gullies which, facing north, were choked with snow till July."

Clearly allied to the next two species, but the elongate pedicels are paralleled only by those of *G. procumbens* L. Unfortunately the flowers are unknown.

3. **G. thymifolia** *Stapf* MS., sp. nov., *G. cardiosepalae* Hand.-Mazz. arcte affinis, foliis minoribus 5–9 mm. longis, sepalis magis lanceolatis obtusioribus, imprimis corolla breviter aperte campanulata interdum purpureo-rubra, calyce fructifero laete roseo-rubro distincta.

UPPER BURMA. Chawchi Pass, among cool mossy granite boulders in the high-alpine zone, nearing the top of the pass, 3540 m., 3 July 1920, *Farrer* 1667 (Herb. Edin.) : " Flowers white." On humus-covered boulders and as an undershrub in dwarf scrub in side valleys, 26°24′N., 98°48′E., 3300 m., June 1925, *Forrest* 26,867 (typus, Herb. Kew.) : " Matted dwarf shrub of 2–4 inches. Flowers white." Advance Base, Seinghku Wang, 3000–3300 m., on precipitous earth and stone slopes in gullies which face south and are now clear of snow, 5 June 1926, *Kingdon Ward* 6849 (Herb. Kew.) : " Creeping plant forming mats. Flowers maroon." " Berries bright rosy red (28 Sept. 1926)." (Also in ASSAM ; vide *Kingdon Ward* 8605, sub *G. sinensis* Anth., infra, p. 325.)

Reddish flowers and fruit are noted by collectors as sometimes occurring also in *G. trichophylla* Royle.

4. **G. cardiosepala** *Hand.-Mazz.* in Anz. Akad. Wiss. Wien, Math.-Nat. Kl. 1923, **60,** 185 (1924) ; reimpr : Pl. Nov. Sin., Forts. **23,** 6 (1924) ; Naturb. Südw.-China 129 (1927) ; Symb. Sin. **7,** 792 (1936).

In addition to the two specimens collected and cited by Handel-Mazzetti, the following appear referable to this species :—

YUNNAN. Humus-covered ledges of cliffs on the eastern flank of the Tali range, 25°40′N., 3300–3600 m., Aug.–Sept. 1906, *Forrest* 4188 (Herb. Edin.) : " Shrub of 3–6 inches. Flowers white." Dry ledges of cliffs on the eastern flank of the Tali range, 25°40′N., 3300–3600 m., July 1906, *Forrest* 4190A (Herb. Edin.) : " Tufted shrub of 3–6 inches. Fruit pale purple. Flowers white ?" Dry situations in pine forests on the Shweli-Salwin divide, 24°40′N., 2100–2400 m., March 1906, *Forrest* 5003 (Herb. Edin.) : " Undershrub of 10–12 inches. Flowers white, tinged rose." Moist rocky banks on the margins of scrub on the eastern flank of the Tali range, 25°40′N., 3000–3600 m., July 1910, *Forrest* 6784 : " Procumbent shrub of 6–12 inches. Flowers white, fruits blue." Open stony pasture and on humus-covered boulders in *Rhododendron* forest on the western flank of the Shweli-Salwin divide, 25°20′N., 3000–3300 m., Aug. 1912, *Forrest* 8931 : " Dwarf shrub of 3–6 inches. In fruit, fruit pinkish white." On rocks and stony pasture, Shweli-Salwin divide, 25°20′N., 3000 m., Sept. 1913, *Forrest* 12,021 (Herb. Edin.). On banks amongst scrub and on alpine moorland on the Chien-chuan-Mekong divide, 26°30′N., 99°40′E., 3600–3900 m., Sept. 1922, *Forrest* 22,333 : " Shrub of 4–7 inches. In fruit, fruits white." Tali range, Sept. 1929, *Forrest* 28,077 (Herb. Edin.). Sine loc., *Forrest* 30,879 (Herb. Edin.). Mountains of the Yangpi River drainage basin, Aug. 1922, *Rock* 6272 (Herb. Edin.). Lotue-shan, mountains of Labako, west of the Yangtze bend at Shiku, 3600 m., June 1923, *Rock* 9517 (Herb. Edin.) : " Height 10 inches ; flowers white."

UPPER BURMA. On open granite rocky hillsides facing south, Hpimaw, 3000–3300 m., 20 June 1914, *Kingdon Ward* 1691 (Herb. Edin.) : " Dwarf undershrub forming carpets and patches. Flowers white." Like heather on the open slopes of the lower high-alpine zone, Hpimaw Hill, 3240 m., 10 May 1919, *Farrer* 895 (Herb. Edin.) : " Foliage bronzed, flowers pinky white. Fruit snow white." N'Maikha-Salwin divide, 26°30′N., 3300 m., June 1931, *Forrest* 29,668 (Herb. Edin.). Hpimaw Pass, above 3300 m., 8 June 1929, *Sukoe* 10,080 : " Herb ; fl. pinkish white ; stem hard, grows in patch."

The shape of the corolla immediately distinguishes this species from its allies. The fruiting calyx is evidently even more variable in colour than that of *G. trichophylla*. The leaves of *Rock* 9517 reach a length of 2 cm.

5. **G. trichophylla** *Royle*, Ill. Pl. Himal. t. 63, fig. 3, a–e (Aug. 1835)* et p. 260 (Dec. 1835) ; DC. Prodr. **7** (2), 592 (1839) ; C. B. Clarke in Hook. fil. Fl. Brit. Ind. **3,** 457 (1882).

Brossea trichophylla (Royle) O. Kuntze, Rev. Gen. Pl. **2,** 388 (1891).

Apart from the two Szechuan specimens cited below under var. *tetracme*, the only Chinese specimen seen that can be certainly referred to this species is the following :

W. YUNNAN. Moist, open, rocky situations on the eastern flank of the Tali Range, 25°40′N., 3600 m., Aug.–Sept. 1906, *Forrest* 4190 (Herb. Kew. ; mixed with 4190A, *G. cardiosepala* Hand.-Mazz., in Herb. Edin.) : " Shrub of 3–6 inches. Flowers white ; fruit large, bright indigo blue, edible."

var. **tetracme** *Airy-Shaw*, var. nov. thecis biaristatis aristis longioribus fere 1 mm. longis, foliis potius ovatis vel ovato-oblongis quam oblongo-ellipticis.

G. trichophylla Royle *sec* Hook. fil. in Bot. Mag. **125,** sub t. 7635 (1899), quoad plantam sinensem ; Dunn in Journ. Linn. Soc. Bot. **39,** 451 (1911) ; Rehd. et Wils. in Sargent, Pl. Wils. **1,** 556 (1913) ; *non* Royle.

SZECHUAN. Near Tachienlu, 2700-4100 m., *Pratt* 833 (Herb. Kew.) ; sine loc. exact, 4200 m., July 1904, *Wilson* (Exped. Veitch.) 3915 (typus, Herb. Kew.) : " Fls. white, fruit blue."

S. TIBET. Samchung La (Kharta), in stony soil, facing north, 4650 m., 20 June 1922, *Norton* (Exped. Mt. Everest) 172 : " Flowers pink."

* *Vide* Sprague in Bull. Misc. Inf. Kew, 1933, 383, 386.

Dr. O. Stapf's manuscript notes show that he—at any rate provisionally—regarded this form with 4-horned anthers as specifically distinct. It does not, however, seem possible to correlate with this character any other really tangible differences (the leaf character mentioned being very slight), and I am therefore unwilling to accord these specimens more than varietal rank.

var. **obovata** *Airy-Shaw*, var. nov. foliis majoribus usque 1·3 cm. longis et 0·65 cm. latis obovatis rarius oblongo-obovatis.

UPPER BURMA. Seinghku Wang, 28°8′N., 97°24′E., on mossy boulders in the open valley, intertwined with dwarf *Salix* and forming a mat, 3300 m., 17 June 1926, *Kingdon Ward* 6944 (Herb. Kew.): "Corolla white, stigma crimson, anthers yellow, calyx tinged purple."

A specimen showing an approach to this variety in the size of the leaves, but retaining the oblong-elliptic shape typical of the species, is *Watt* 5219, collected May 1881 in SIKKIM at 4500 m. (Herb. Kew.).

6. **G. hypochlora** *Airy-Shaw*, sp. nov., *G. sinensi* Anth. affinis, foliis tenuiter chartaceo-coriaceis obovatis basi cuneatis apice rotundatis usque 8 mm. latis subtus (siccitate) pallide et saepe laete viridibus, nervis subtus prominulis, corolla ut videtur latius campanulata, bene distincta.

G. trichophylla Royle, vel aff., Auctt. Edin. in Notes Roy. Bot. Gard. Edinb. **17,** 92 (1929).

G. sinensis Anth. in Notes Roy. Bot. Gard. Edinb. **18,** 19 (1933), *p.p.*, quoad *Forrest* 13,428 et 14,735.

SZECHUAN. Hung-ya-hsien, 14 Aug. 1930, *W. P. Fang* 8221.

YUNNAN. On cliffs and humus-covered boulders on the Mekong-Salwin divide, 28°10′N., 3600 m., Oct. 1914, *Forrest* 13,428: "Prostrate shrub of 2–6 inches. In fruit, fruits deep blue." Open peaty pasture and on banks in *Rhododendron* thickets on the Mekong-Salwin divide, 28°12′N., 3600–3900 m., Aug. 1917, *Forrest* 14,735: "Matted shrub of 4–6 inches. Fruit deep clear blue."

UPPER BURMA. Chawchi Pass, common among rocks, etc., in cool shady places of the upper alpine woodland, 3300 m., 2 July 1920, *Farrer* 1676 (Herb. Edin.): "Flowers white. F.1737 is the same, from much higher up." Chawchi Pass, among mossy boulders and in silt, 3750 m., 18 July 1920, *Farrer* 1737 (Herb. Edin.): "See F. 1676. This is a higher-alpine state." Chimili woods, 3240 m., 4 Aug. 1919, *Farrer* 1191 (Herb. Edin.): "A prostrate trailer in moss, on boulders and silty banks of gullies in the upper woodland zone. Flower unknown, but the calyx round the Pyroloid capsule develops (from dull brown purple) to a most glorious white-lined 5-lobed 'flower' of brilliant lapis-lazuli blue." (The leaves in this specimen are smaller and less green below than usual).

ASSAM. Delei valley, in the *Abies-Rhododendron* forest, 3000 m., 31 May 1928, *Kingdon Ward* 8266 (typus, Herb. Kew.): "A creeping

plant, crawling over slabs of rock. Flowers few, solitary, snow white." Delei valley, 28°15′N., 96°35′E., in the *Tsuga-Rhododendron* forest, 3000–3300 m., 23 Aug. 1928, *Kingdon Ward* 8562 (Herb. Kew.): "A creeping plant, growing on rocky outcrops with north exposure. 'Berries' bright blue." Sources of the Irrawaddy, Adung valley, 28°20′N., 97°40′E., 3000–3300 m., 10 June 1931, *Kingdon Ward* 9628 (Herb. Mus. Brit.); "Flowers pure white. The long thread-like stems form a carpet amongst moss under the *Rhododendron* bushes in open places, *Abies* forest. (Shoots and midrib of leaf setose.) See no. 9885.*"

One of the numerous species detected as new by the late Dr. Stapf, who had used the epithet "myrtilloides" in manuscript: this name is, however, already preoccupied for a South American species. The present plant was included by Anthony under his very inclusive *G. sinensis*, but it is evident that this group requires somewhat more critical treatment. *G. hypochlora* can be readily distinguished from the plant which Anthony has designated as the type of *G. sinensis* by the thinner texture of the markedly obovate leaves, which frequently dry a very characteristic light clear green on the underside. The stems are occasionally sparsely and minutely white-puberulous when young.

7. **G. sinensis** *Anth.* in Notes Roy. Bot. Gard. Edinb. **18,** 19 (1933) *pro parte*; Hand.-Mazz. Symb. Sin. **7,** 793 (1936).

G. trichophylla Royle, var., Auctt. Edin. in Notes Roy. Bot. Gard. Edinb. **17,** 51 (1929).

The following collections are an excellent match of the type specimen (*Forrest* 14,216) from the Tibeto-Yunnan frontier:

UPPER BURMA. Seinghku Wang, 28°18′N., 97°24′E., 3900 m., on limestone gravel or grassy slopes amongst dwarf *Rhododendron*, 10 July 1926, *Kingdon Ward* 7094 (Herb. Kew.): "Flowers cream, with red calyx. Stigma crimson."

ASSAM. Delei valley, 28°15′N., 96°35′E., 3300–3600 m., growing on steep earth screes and rocky faces, amongst scrub *Rhododendron*, 28 Aug. 1928, *Kingdon Ward* 8605 (Herb. Kew.): "Creeping plant, in fruit, berries dark rose." (Apparently growing in association with *G. thymifolia*, since sterile specimens of the latter were found mixed with this gathering.)

As indicated above, under *G. hypochlora*, I believe Anthony's conception of the present species to be heterogeneous. The following varieties are therefore proposed:

var. **maior** *Airy-Shaw*, var. nov. foliis subduplo majoribus plerumque oblanceolatis nec oblongo-obovatis usque 16 mm. (nec 8 mm.) longis et 5·5 mm. (nec 4 mm.) latis acutioribus nervis supra minus conspicue impresso-reticulatis.

G. trichophylla Royle, var., Auctt. Edin. in Notes Roy. Bot. Gard. Edinb. **14,** 136 (1924).

* No. 9885 is not this species, but is *G. sinensis* var. *crassifolia* (p. 326).

G. sinensis Anth. *l.c., p.p.*, quoad *Forrest* 12,938 et 20,040.

YUNNAN. In regione frigide temperata jugi Schöndsu-la inter fluvios Landsang-djiang (Mekong) et Lu-djiang (Salween), 28°4′, sub fruticibus, substr. micoschistaceo, 3850 m., 22 Sept. 1915, *Handel-Mazzetti 8243 (Herb. Edin.)* : " *Fr. caerulei.*" Open sandy moist situations on the Kari pass, Mekong-Yangtze divide, 27°40′N., 3300 m., Aug. 1914, *Forrest* 12,938 (typus, Herb. Kew.) : " Prostrate shrub of 10–12 inches. In fruit, fruits bright blue." Sine loc., *Forrest* 30,556 (Herb. Edin.). A smaller form of this variety, somewhat approaching the type of the species, is *Forrest* 28,035 (Herb. Edin.) from the Tali range, Oct. 1929.

S.E. TIBET. Tsarong : moist alpine pasture on the Salwin-Kiu-chiang divide, 28°24′N., 98°24′E., 3900 m., Aug. 1921, *Forrest 20,040* : " Prostrate or semi-prostrate shrub of a few inches. In fruit, fruits blue." (Also in UPPER BURMA ; vide *Kingdon Ward* 6845, sub var. *crassifolia*, infra.)

var. **crassifolia** *Airy-Shaw*, var. nov. foliis nitidulis magnitudinis var. *maioris* sed crassioribus et manifeste obovatis, iis *G. hypochlorae* forma similibus sed minoribus saepe deflexo-apiculatis.

G. sinensis Anth. in Notes Roy. Bot. Gard. Edinb. **18,** 19 (1933), *p.p.*, quoad *Forrest* 19,286.

S.E. TIBET. On ledges of cliffs and humus-covered boulders on the Salwin-Kiu-chiang divide, 28°40′N., 98°15′E., alt. . . . , Oct. 1919, *Forrest* 19,286 (typus, Herb. Kew.) : " Prostrate shrub of 1–2 inches. In fruit, fruits indigo blue."

UPPER BURMA. Advance Base, Seinghku Wang, 3000 m., on rocks in open meadows, 4 June 1926, *Kingdon Ward* 6845 (Herb. Kew.) : " Dwarf prostrate undershrub with ascending stems. Flowers white, nodding, anthers bright yellow. Berries blue." (Flowering specimens of var. *maior* were found mixed with this gathering). Sources of the Irrawaddy, Adung valley, 28°20′N., 97°40′E., 3900 m., 29 June 1931, *Kingdon Ward* 9628*A* (Herb. Mus. Brit.) : " Same as no. 9628?* " Ibid., 3900 m., 31 July 1931, *Kingdon Ward* 9885 (Herb. Mus. Brit.) : " A minute prostrate creeping plant, freely branched and forming an extensive and close film-like mat over the thick beds of moss in the Fir forest. Fruits globular, green at first, bright scarlet when ripe. Leaves, when young, with short bristles on the margin ; mature leaves leathery, shining, dark green above, paler below, glabrous, margin minutely serrate. Young shoots with short adpressed crimson bristles or hairs. (Same as no. 9628.*) "

Ward's notes to his no. 9885 evidently refer in part to *G. suborbicularis* W. W. Sm., a small piece of which was found with the *G. sinensis* var. *crassifolia*. The latter is said to have blue fruits.

8. **G. nivea** (*Anth.*) *Airy-Shaw*, sp. nov., ab omnibus congeneribus Seriei *Trichophyllarum* ramulis dense minutissime albido-tomentellis facile distinguenda ; *G. sinensi* Anth. (typicae) proxima, sed folia angustiora et acutiora.

G. sinensis var. *nivea* Anth. in Notes Roy. Bot. Gard. Edinb. **18,** 20 (1933) ; Hand.-Mazz. Symb. Sin. **7,** 793 (1936).

S.E. TIBET. Tsarong : peaty, stony meadows on the Salwin-Kiu-chiang divide, 28°40′N., 98°15′E., alt. . . . , July 1919, *Forrest* 19,269 (typus, Herb. Edin.) : " Plant of 1–2 inches. Flowers white."

YUNNAN. Open ledges of cliffs, humus-covered boulders and stony slopes on the Mekong-Salwin divide, 28°10′N., 3900 m., Sept. 1914, *Forrest* 13,310 : " Prostrate shrub of 2–4 inches. In fruit, fruits white."

Quite distinct in its minute tomentum from all the other species of this group. The small leaves are about the same length as those of typical *G. sinensis*.

Series HISPIDULAE.

Folia subacuta, basi subcuneata ; thecae breviter biaristatae ; fructus albus (Japonia ; America bor.).....9. *hispidula*
Folia plerumque utrinque rotundata vel vix apiculata ; thecae exaristatae ; fructus ruber (China mer.-occ.)...10. *suborbicularis*

9. **G. hispidula** (*L.*) *Muhlenb.* Cat. Pl. Amer. Sept. ed. 1, 44 (1813), ed. 2, p. ? (1818) ; Bigel. Fl. Bost. ed. 2, 165 (1824) ; ed. 3, 175 (1840) ; L. C. Beck, Bot. N. & Middle States, ed. 1, 216 (1833) ; Hook. Fl. Bor.-Am. **2,** 36 (1834).

Vaccinium hispidulum L. Sp. Pl. ed. 1, 352 (1753), excl. syn. ; Michx. Fl. Bor.-Am. **1,** 228, t. 23 (1803).

Arbutus filiformis Lam. Encycl. Méth., Bot. **1,** 228 (1784).

Arbutus thymifolia Ait. Hort. Kew., ed. 1, **2,** 72 (1789).

Oxycoccus hispidula (L.) Pers. Syn. Pl. **1,** 419 (1805).

Gaultheria serpyllifolia Pursh, Fl. Amer. Sept. **1,** 283 (1814).

Chiogenes serpyllifolia (Pursh) Salisb. in Trans. Hort. Soc. **2,** 94 (1817).

Glyciphylla hispidula (L.) Raf. in Amer. Monthly Mag. 192 (1819).

Schollera hispidula (L.) Steud. Nomencl. Bot. ed. 1, 746 (1821) ; Roth ex Steud. op. cit. ed. 2, **2,** 534 (1841).

Phalerocarpus serpyllifolius (Pursh) G. Don, Gen. Syst. **3,** 841 (1834) ; Dunal in DC. Prodr. **7,** (2), 577 (1839) ; Klotzsch in Linnaea, **24,** 68, (1851).

Lasierpa hispidula (L.) *Torr. in Geol.* Rep. New York, 152 (1839).

Phalerocarpus hispidula (L.) Heynh. Nomencl. **1,** 612 (1840–41).

Chiogenes hispidula (L.) Torr. et Gray ex Torr. Fl. New York, **1,** 450. t. 68 (1843) ; Niedenzu in Engl. Bot. Jahrb. **11,** 216 (1889) ; Britton et Brown, Ill. Fl. North. States & Can. **2,** 704 (1913).

var. **japonica** (*A. Gray*) *Makino* in Bot. Mag. Tok. **18,** 19 (1904) ; Miyoshi et Makino, Pocket-Atl. Alp. Pl. Jap. **2,** 104, t. lii. fig. 301 (1907).

* No ; no. 9628 is *G. hypochlora* (p. 324–5)

Chiogenes hispidula Miq. in Ann. Mus. Bot. Lugd.-Bat. **1,** 29 (1863); Maxim. in Mél. Biol. **8,** 609 (1872) et in Bull. Acad. Imp. Sci. St. Pétersb. **18,** 43 (1873); Franch. et Sav. Enum. Pl. Jap. **1,** 282 (1875).

Chiogenes japonica A. Gray, Synopt. Fl. North Amer. **2,** 26 (1886); Drude in Engl. u. Prantl, Nat. Pflanzenfam. IV. **1,** 47 (1889); Nakai in Nak. et Koidz. Trees & Shrubs Jap. Prop. ed. 2, **1,** 220 (1927); Makino et Nemoto, Nipp.-Shokub.-Sôran (Fl. Jap.) ed. 2, 864 (1931); Terasaki, Nipp. Shokub. Zufu (Jap. Bot. Ill. Alb.) 907 (1933).

Differs from the American plant in the somewhat more obovate leaves with more cuneate base and in the shorter and less deeply bifid prolongations of the anther-thecae.

The slight tendency of the ovary to become inferior is apparently responsible for the chequered nomenclatural career of this species. An observation of Lamarck's (1784, *l.c.*), however, shows that this tendency is really very slight: " Les fleurs . . . ont . . . leur ovaire situé dans la corolle, & non au-dessous, comme je l'ai vu bien distinctement." Torrey (1843, *l.c.*) remarks that the calyx becomes more adnate to the ovary as the fruit ripens. It is clear, however, that too much importance should not be attached to this character in *Gaultheria*. The same tendency is seen in *G. semi-infera* (C. B. Clarke) Airy-Shaw (Sect. *Leucothoïdes*), a species closely related to *G. discolor* Nutt. whose status as a *Gaultheria* is beyond question. It is strange that Niedenzu, apparently the first botanist* to place *Chiogenes* in the *Gaultherieae* (1889, *l.c.*), did not attach more importance to the close morphological resemblance between *Ch. hispidula* and *Gaultheria trichophylla*. He observed (*l.c.* 190) a similarly 1-layered upper epidermis in these two species, but found on the whole a closer general agreement in the leaf-anatomy of *Chiogenes* with *Pernettya* than with other species of *Gaultheria*. Torrey,† Hooker and others comment on the similarity in the aromatic flavour of the fruits and leaves of *Chiogenes* to that of *Gaultheria procumbens*, placed in the present arrangement, on morphological grounds, at the opposite end of Sect. *Eugaultheria*.

* Asa Gray, though placing *Chiogenes* in *Vacciniaceae*, remarked that it was a genus " naturally related rather to *Gaultheria* and *Pernettya* than to *Vaccinium* " (Synopt. Fl. N. Amer. ed. 2, **2** (1), 26: 1886). Bentham and Hooker were mistaken in stating (Gen. Pl. **2** (2), 564: 1876) that *Chiogenes* formed a connecting link between *Vacciniaceae* and *Ericaceae*, since it is in no way related to any species that has ever been referred to the former group.

† Dr. Torrey was evidently much puzzled by the structure of the fruit of this species. The following notes in his handwriting are attached to two specimens labelled " *Oxycoccus hispidulus* Pers." from Hooker's Herbarium at Kew: " I have made a mistake in describing the fruit of this plant. It is certainly a *berry* and is nothing like *Gaultheria*. 'Tis nearer *Oxycoccus* than any other genus." " The fruit is incorrectly described in my Flora. It is by no means a *Gaultheria*—neither does it agree in all respects with *Oxycoccus*."

10. **G. suborbicularis** *W. W. Sm.* in Notes Roy. Bot. Gard. Edinb. **8,** 186 (1914) et *l.c.* **14,** 125, 157, 212, 362 (1924); Hand.-Mazz. in Anz. Akad. Wiss. Wien, Math.-Nat. Kl. 1923, **60,** 185 (1924); reimpr.: Pl. Nov. Sin., Forts. **23,** 6 (1924); Hand.-Mazz. Naturb. Südw.-China, 191 (1927), et Symb. Sin. **7,** 793 (1936).

Forrest collected this species a year after Kingdon Ward's original discovery, as well as after 1918; the notes to Forrest's earlier expedition have, however, not yet been published, and are therefore given here.

YUNNAN. Bei Ma Shan, Mekong-Yangtze divide, 28°20'N., 3900 m., on cliffs and boulders, rare, Aug. 1914, *Forrest* 13,283 (Herb. Edin.): " Trailing shrubby plant of 6–10 inches. In fruit, fruits bright crimson."

This interesting species bears a close resemblance to small slender specimens of *G. nummularioïdes* D. Don, but a glance at the bracteoles immediately discloses its true affinity. Both Smith and Handel-Mazzetti refer to the flowers as pentamerous, but I have been unable to detect any but tetramerous ones on the specimens available, and Dr. Stapf has also noted them as such on the three Forrest sheets in Herb. Kew. In view of the close relationship of this species with *G. hispidula* (L.) Muhlenb., in which the flowers are regularly tetramerous, it is probable that the occurrence of pentamerous flowers in *G. suborbicularis* is at least rare.

Handel-Mazzetti (1927, *l.c.*) speaks of the *fleshy lobes* of the red fruiting calyx. This is undoubtedly true of the " sky-blue " fruits of *G. trichophylla*,* referred to in the same passage; but, if it is safe to judge from dried specimens, the calyx-*lobes* in *G. suborbicularis* appear *not* to become fleshy, or only slightly so, while the calyx-*tube* enlarges very considerably into a berry-like structure, with the small almost unchanged calyx-segments persisting at the apex. A similar process occurs in *G. hispidula*, the capsule being almost completely surrounded and hidden, in which state the " fruit " has much the appearance of an inferior berry.

Gaultheria hispidula and *G. suborbicularis* represent at once the most reduced and the most advanced type within the genus. The completely prostrate habit, small size of all parts, tetramerous flowers, reduced anther-appendages, and tendency to perigyny are all evidences of this. A rather similar habit has been adopted in the series *Nummularioïdeae*, but reduction has not proceeded so far, since there is no observable leaning in the direction either of tetramery or of perigyny.

Section v. **Gymnobotrys.**

An essentially Malayan group, species being known from South-west China, Formosa, the Philippines, Indo-China, the Malay

* Probably the plant was not *G. trichophylla* itself, which appears to be rare in Yunnan, but one of its close allies.

Peninsula, Sumatra, Java and New Guinea. The branches are usually somewhat zig-zag; the leaves of a very uniform type, ovate to lanceolate, the base cordate or at least rounded (rarely subcuneate), the apex more or less caudate-attenuate. Except in *G. hirta* Ridley, from Perak, the indumentum is scanty, giving the plants a characteristically clean, smooth, bare appearance, which is enhanced by the rather small size of the bracts and the absence of perulae at the base of the inflorescence. The racemes are often almost as long as their subtending leaves, and the long, loosely spaced pedicels contribute towards the lanky aspect of these species.

Copeland (*l.c.* 60) has provided a tentative key to the group, and has included therein *G. celebica* J. J. Sm. (Celebes), *G. Pullei* J. J. Sm. and *G. calyculata* Wernh. (New Guinea); but, although the bracteoles are opposite and apical, the inflorescences are terminal, more or less *leafy* racemes, or panicles, and the leaves much smaller and of a different type, and the true affinity is evidently with *Leucothoïdes* through *G. celebica* and *G. punctata*. It is not clear why Copeland has separated *G. novaguineënsis* J. J. Sm. from *G. Pullei* and *G. calyculata* and placed it with the "allies of *G. nummularioïdes*": from the key to his three series (*l.c.* 57) it is apparently because *G. novaguineënsis* has "leaves generally under 2 cm. long"; but in other respects it seems closely allied to the two species mentioned.

Copeland is no doubt right in including *G. intermedia* J. J. Sm. in this group. I do not believe it is a hybrid between *G. leucocarpa* Bl. and *G. punctata* Bl., as suggested by Dr. J. J. Smith.

The origin of this section is probably to be sought in the same stock as that from which Sect. *Leucothoïdes* is derived and which is represented at the present day by the genus *Leucothoë* (excluding *Eubotrys* and Sect. *Eubotryoïdes*), the species of which show a markedly discontinuous distribution indicative of an ancient type (*cf.* Sect. *Brossaeopsis*, p. 309–10). The similarity in habit, leaf-shape and inflorescence is apparent even from casual inspection.

The writer wishes to record here his indebtedness to the late Dr. Otto Stapf for the permission, accorded before his death, to make use of a provisional MS. key to many of the Asiatic species of *Gaultheria* which he had drawn up in the course of his work for the Botanical Magazine (*vide* tt. 9174, 9228). It is greatly to be regretted that Dr. Stapf did not live to publish the complete results of his researches, since the genus was one in which he was especially interested, and also one with whose Old World representatives he was particularly well acquainted.

XLIV—MISCELLANEOUS NOTES.

The George Robert White Medal of Honour has been bestowed on the Director, Sir ARTHUR W. HILL, by the Massachusetts Horticultural Society.

Wayside Trees of Malaya.*—Mr. Corner is to be congratulated on having produced this very useful book with its volume of excellent illustrations of over 250 different species of trees. As many as 950 species are described and in addition to the full descriptions a great deal of useful and interesting information is given about the trees and their uses. As a further aid to the student the author has added a large number of very useful text figures, both in the introductory portion and under the genera, to illustrate important characters in flowers, fruits or leaves. The volume of text is divided into four parts. The first consists of a general account of how to name trees, giving details about the various organs—leaves, flowers, fruits, etc.—which are used in classification, followed by a general account of Malayan vegetation and of the trees of local interest in the different States with their localities. The second part of 40 pages is entirely occupied by elaborate and carefully constructed keys to the families and genera, which are constructed on distinctly original lines and should enable the non-botanist to identify any of the trees described without undue difficulty, especially as Mr. Corner has, as far as possible, selected characters which can be readily observed and are available throughout the year. One small criticism of the keys is of the constant use of the words "not so" as the alternative phrase in the couplet of distinguishing characters. In the first place it is not always easy to appreciate to what it applies, and in many cases it certainly does not apply to the whole of the statement with which it is contrasted. No doubt the use of the term has shortened the key, but its usefulness has been somewhat impaired in consequence.

The bulk of the book (pp. 95–726 incl.) consists of descriptions of the various families, genera and species, and the arrangement is alphabetical in all cases. The gymnosperms are placed at the end of the flowering trees, and the volume concludes with indices of the English, Malay and botanical names and of botanical and descriptive terms. The derivation of the generic and specific names which are given under the descriptions is a welcome feature which will be generally appreciated.

The student should have no difficulty in running down any tree he may be examining, as in addition to the Key in Part II, keys to the genera, where necessary, are given under each family and keys to the species, under the genus. In addition to the full descriptions of the genera and species, interesting particulars are given of the various species, whether they are native or introduced, and also many points of biological and morphological importance, as well as information about their economic value.

We are glad to recognise on the cover one of the Berok monkeys, which Mr. Corner has so successfully trained to collect tree specimens for him. The significance of the picture may not be understood

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* Wayside Trees of Malaya, by E. J. H. Corner, M.A., F.L.S., Assistant Director of Gardens, Straits Settlements. Vol. I text, Vol. II plates, printed at Government Printing Office, Singapore, 1940, $10.

outside Malaya, nor the allusion to it on the page facing Plate I in the second volume.

The volumes are a great tribute to the Government Printing Office, Singapore. The printing of the text and the reproduction of the fine photographs leave nothing to be desired.

The Indigenous Trees of Uganda.*—The large number of excellent photographs which adorn the pages of this book is a striking and very welcome feature. There are forty-two of them, and those of *Crataeva Adansonii* facing p. 36, *Albizzia zygia* (p. 122), and *Musanga Smithii* (p. 150) make very pretty landscape pictures. The seventy-six line drawings, however, would have been much improved had they shown more botanical details.

For several years Kew has assisted Mr. Eggeling by supplying determinations of his collections, and for this help, as noted in the foreword, we have been well rewarded, since it has resulted in the production of this important work on the indigenous trees of the Protectorate. Descriptions of the more obvious characters of each species are given, and keys for their determination, whilst their distribution in Uganda is indicated. Considering the excellent format of the book, one is rather surprised and not a little pleased to find that it has been possible to print such a work at a place resting almost on the equator, and the author and Government Printer at Entebbe are to be warmly congratulated on the result.

It is to be hoped that in other books of this kind the recording of tentative herbarium determinations will not be included. Many of them are very ancient and no useful purpose is served by their publication.

Mr. Eggeling has been an assiduous collector of Uganda trees and shrubs, and it is mainly his own specimens which are quoted throughout the book. It seems a pity that those gathered by others could not also have been mentioned, for instance by such pioneers as M. T. Dawe, E. Brown, and E. G. Bagshawe, who all made large collections, and later R. Dümmer and J. D. Snowden, to mention only a few.

With respect to the arrangement of the families, the author of the book, being a forester, should know best which is most suitable for foresters. In my opinion, however, the alphabetical arrangement rather implies a lack of knowledge of taxonomic botany on the part of the forester, which some would perhaps resent, considering the comprehensive training they receive nowadays at the schools of forestry at Oxford, Edinburgh and other places. And if the forester has not the requisite botanical knowledge, he can scarcely think of his trees in the first place in terms of their *families*. He

* The Indigenous Trees of the Uganda Protectorate, by W. J. Eggeling, B.Sc., Ph.D., Senior Assistant Conservator of Forests, Uganda Protectorate, with a Foreword by Sir Arthur Hill, K.C.M.G., F.R.S., etc., being a thesis approved for the Degree of Doctor of Philosophy in the University of Edinburgh; Government Printer, Entebbe, Uganda, 1940, price 15*s.* net.

might know the generic name, and would then turn to the excellent index provided to find it. Or, failing knowledge of the generic name, he will turn to the key. But in this there is a very unfortunate omission. The beginning of the key to the *Dicotyledones* on p. xiv reads as follows :—

" 10. Gynaecium composed of 2 or more separate or nearly separate styles and stigmas.....11
Gynaecium composed of 1 carpel or 2 or more united carpels with free or united styles, or if carpels free below then the styles or stigmas united.....:.....12 "

The first paragraph should read " Composed of 2 or more separate or nearly separate *carpels* with separate styles and stigmas." That is how it is written in Hutchinson's *Families of Flowering Plants*, from which the key has been mainly adapted. As the key stands many of the families included in No. 12 might equally well be referred to No. 11. For example, if we try to run down the *Hypericum* figured opposite p. 85, it will most certainly be considered to belong to No. 11, because there are two or more separate styles and stigmas; and if we follow the key further *Hypericum* will be referred to *Annonaceae*, a family in which it has not hitherto been placed. This mistake is, therefore, particularly regrettable, and those who possess a copy of the book should make the addition as soon as possible; after this the key seems to be quite satisfactory.

J. HUTCHINSON.

Gardening without Soil.*—" If you are relatively inexperienced in growing plants, you may find soil a better medium for germinating certain seeds than the litter seedbed. This is more a question of convenience than anything else." It is rather surprising to find this statement in a book intended to encourage the cultivation of plants for commercial and ornamental purposes with their roots immersed in an aqueous solution of mineral salts rather than in the soil in which we are more accustomed to see them grow. This and other statements are indicative of the author's honesty in acknowledging that soilless cultivation presents difficulties peculiar to itself in spite of advantages such as the elimination of soil pests and diseases. That considerable interest has been aroused in this subject may be seen from the number of books which have recently been written about it, some of which have already been noticed in the Bulletin (K.B. 1938, p. 314, 1940, 139). The author of the book now under review is one of the pioneer workers in the development of soilless cultivation beyond the well-known method of water culture, which has been familiar to all students of plant physiology for many years. When one compares the rather sickly plants in jars of culture solution which are so often associated with water culture experiments with the tanks of flourishing tomatoes, potatoes and other crops

* The Complete Guide to Soilless Gardening, by W. F. Gericke, London, Putnam, 1940, pp. xvi+285, 60 figures. Price 12*s.* 6*d.* net.

which are figured in this book, one must agree that very considerable advances on the older methods have been made. For this reason alone Mr. Gericke's book is worthy of careful study by those engaged in teaching plant physiology. It should also be read by anybody interested in the mineral nutrition of plants, because much of the information which is given will be found useful by those who grow plants in soil in the ordinary way. The practical value of cultivation without soil will vary in different parts of the world, being most useful where high light intensity is accompanied by poor soil or even by desert conditions. In such localities the new technique may eventually play a part of some importance, but elsewhere it seems doubtful whether it will successfully compete with more orthodox methods of cultivation. C. R. METCALFE.

This number completes the issue of the Kew Bulletin for the year 1940. It consists of seven numbers instead of ten, the reduction being due to the shortage of paper and also to the depletion of the scientific staff of Kew in consequence of the war.

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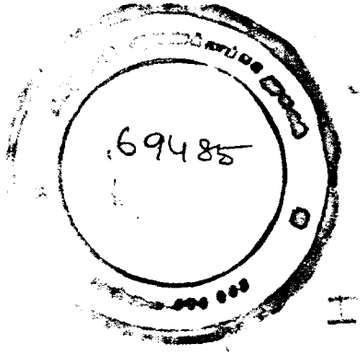

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