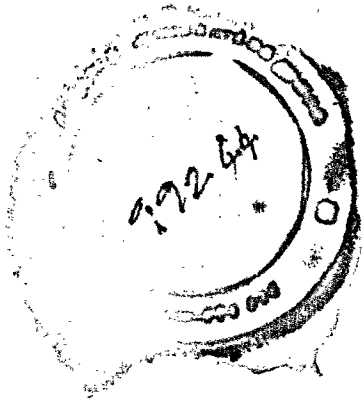


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REFERENCES TO DR. WIGHT'S FIGURES OF *Impatiens*.

1. Plant, natural size.
2. Separate flower.
3. Upper or united sepals—usually petaloid.
4. Lateral sepals.
5. Lower sepal and spur.
6. Four petals united by pairs into two, 2-3 lobed petals.
7. Column of fructification, and stamens separated from the ovary.
8. Ovary entire.
9. ——— cut longitudinally, showing the ovules, usually, pendulous,
but in some instances, when very numerous, transverse or
even ascending—The last, perhaps, an error of the draughts-
man, overlooked at the time of making the drawing.
10. Young capsule cut transversely.
11. Seed—12 Seed cut transversely all more or less magnified.

I have put numbers to all the parts of a few of the drawings. I do not think it necessary to go over the whole, as one set of numbers applies to all.

Erratum.—At Pl. 9, vol. 4, under fig. 7, insert *Xanthochymus pisto-
rius*; and under fig. 8, *X. dulcis*.



I. Albidula.

④

MADRAS JOURNAL

OF

LITERATURE AND SCIENCE.

No. 14.—January, 1837.

I.—Contributions to Indian Botany, No. 1.—By ROBERT WIGHT, M. D., F. L. S., &c. &c. Member of the Imp. Acad. Naturæ Curiosorum. Surgeon on the Madras Establishment.

On the Genus *Impatiens*.

The Genus *Impatiens*, from occupying a prominent place in the Indian Flora, as well as from being in a great measure confined to this country justly claims for itself, in a proportionate degree, the attention of the Indian Botanist.

On this account, I have selected it for the first of a series of papers, to be continued from time to time, under the above title, in which it is my intention to give descriptions and illustrations of such new, or otherwise interesting plants, as I may chance to obtain, whether collected by myself, or communicated by friends, desirous of lending their assistance to the advancement of a highly interesting and useful science. Its selection, for the commencement of the series, is rendered still more appropriate, by the circumstance of its extent, as well as the peculiarities of its structure, being nearly unknown, till within these few years.

Of this genus, now embracing nearly one hundred species, Linnæus only knew seven or eight; and most of these from indifferent figures. In 1805 when Persoon published his Synopsis, ten only were known; to these only six had been added in 1819, when Rœmer and Schultes published the fourth volume of their *Systema Vegetabilium*, and one of the six "sine definitione." In 1824, Professor Decandolle published the first volume of his *Prodromus*, and extended the catalogue from sixteen to thirty-one, excluding the undefined one, thus doubling the former number; of these, twenty-four are Indian, nearly all the new ones being derived from Dr. Wallich's Nepal Collections. In 1830-31, Dr. Wallich

named in his list no fewer than forty-seven Indian species. Since that time Mr. Royle informs us, (*Illustrations* page 151) that his collection contains several not in Wallich's list, and Mr. Arnott writes me that he has recently described sixteen new ones from Ceylon. To these last, my excursions on the Courtallum and Shevagerry hills have added about as many more. Of the Courtallum ones, those only of which drawings were made, are introduced into this paper; not having, either specimens or sufficiently perfect notes, to enable me to define the rest. This defect I regret the less, as I expect to have yet many more to add to the list, and will avail myself of an opportunity of making them known, and I hope at the same time, to revise the whole of the peninsular portion of the genus.

As already observed, the peculiarities of the flower of the *Baleminia*, were, till lately, as little known as the number of its species. Linnaeus, and subsequently Schreber, in the *Genera Plantarum*, describes the flower of *Impatiens* as being composed of two small lateral sepals, five petals, and a nectary; the petals are said to be one above, two below, forming a lip, and an intermediate pair between these and the upper one, the nectary or spur between the lower pair; thus viewing each of the lateral two-lobed petals as two. Decandolle, following Jussieu, assigns to it two lateral sepals, and four petals—one above, one below, ending in a spur, and two interior, more petaloid ones, alternate with the other two: generally either cleft or furnished with some other appendage. In 1827, Professor Kunth published a memoir on the subject, in which he takes a different view from either of these, assigning to it five sepals and four petals, the fifth petal, required to make up the normal number, being absent from abortion. The following extract from Lindley's Introduction to the Natural System of Botany, will explain how he arrives at this conclusion: "The fact is, that the structure is usually this: the centre of the flower is occupied by an ovary, surmounted by a stigma divided into five acute lobes. Around this stand five hypogynous stamens, placed in a single row at equal distances from each other. Hence the normal number of the parts of the flower should be five. The corolla, however, consists of two bifid petals placed right and left, with a wider space between their upper than lower edges. Upon comparing the position of these with the stamens, it appears that each occupies the place of three stamens, whence it is impossible to doubt, that they consist of two soldered together. On the other hand, the space between them, which answers to two stamens, is an equal proof of the abortion of the fifth petal. And this view of the structure is confirmed by the sepals. Thus on the outside of each pair of petals, at their base, is found a leaflet, the situation of which is opposite a stamen; and opposite the space left by the abortion of the fifth petal, is a large broad leaflet, made up by the union of two sepals. The position of the fifth

sepal, which is that which is spurred, is between two petals and opposite a stamen." It is only necessary to add, that the correctness of the deductions obtained from this most masterly analysis of the flower of the common Balsam, is now completely proved by the structure of the genus *Hydrocera*, the only other genus of the order, which enjoys the full complement of parts, namely, five sepals, five petals, five stamens and five stigmas, with a truly five-celled fruit, not like *Impatiens* opening with elasticity.

I have thought it necessary to introduce this explanation of the structure of the flower of *Impatiens*, partly with the view of exhibiting an excellent example of botanical analysis, but principally, to enable such of my readers as may not have had an opportunity of becoming acquainted with it, more readily to accompany me, when perusing the following descriptions. I do not, however, intend to adopt the language which it points out as strictly correct, but shall continue to employ nearly the same terms as those used in my *Prodromus*, in which the two united petaloid sepals are called the posterior or upper sepal; the lower one, the spur, in all cases where that organ is so much developed, as to leave no evident foliaceous portion, as is the case in nearly all the following species. The united pairs of petals are considered single two-lobed ones, and the lobes indicated by the terms upper and lower. As it is from the relative sizes of these parts that the best specific marks are obtained, and as they will be found introduced into the character of each species, I have been thus particular in explaining the names under which they appear. So numerous, indeed, and at the same time so constant, are the variations in form, which these parts assume in different species, that, with the exception of those taken from the general habit of the plants, no other part need be mentioned in characterizing them. But as most of those now known, are taken up from dried specimens, in which it is always difficult, and often impossible, to make out the characters of the flower, I have added all those procurable from other parts of the plant, as the only inconvenience attendant on their introduction is, the length to which the definitions are thereby extended; a fault, which is more than compensated by the facility of correctly discriminating species in such a large and daily increasing genus; and, by affording those who may possess dried specimens, the means of referring them to their proper species.

It is a curious, and to me an inexplicable fact, that a genus so strikingly Indian, and associating such a host of species, should have been so little known to Roxburgh. He only describes three in his Flora, though I am sure I speak within bounds, when I assert that the countries, whence he derived the materials for his work, will be found to present an assemblage of not fewer than one hundred species. It is no doubt an eminently alpine genus, delighting in a cool and moist climate;

hence it is unknown on the plains of Coromandel, though not unfrequent in Mysore, but, so far as I have seen, only abounding in the peninsula, on the higher hills participating in the western monsoon, which enjoy, during the hot months, a moderate range of temperature, with a very humid atmosphere. Some, how many is not yet known, are found during the monsoon on the Malabar coast, but little elevated above the level of the sea, but, except in Tanjore, I have not seen one of the order on the plains eastward of the ghauts, beyond the influence of that monsoon; and the only one found there, is the *Hydrocera triflora*, which grows, but is not common, in its ditches and swampy grounds, during the cool season, and is the only place where I have yet seen it.

This peculiarity of distribution may account for his not having met with peninsular species, as he was but little in the southern provinces, and perhaps they are not found in the eastern range of the northern ghauts: but, twenty-two of the forty-seven species named by Wallich, are from Silhet, Pundooa and Nepaul; from all of which places Roxburgh procured plants, and one of the three he describes is from Silhet. A moist climate and moderate temperature are the circumstances most favourable, if not indispensable, to their production; hence we find twenty-two, of the remaining twenty-five species named by Wallich, natives of the peninsula, but confined to the ghauts and Mysore where these contingencies meet. This fact was first noticed by Mr. Royle, who, after remarking the nearly equal division of the forty-seven species between the frontier mountains of Bengal and the peninsula, adds, "a singular equality of numbers, seeing that we have hitherto found peninsular and South of India genera confined to the base of the mountains; and if found existing on them, generally only as single species; but here we have them in equal numbers, some of them extending to an elevation of seven thousand feet."

"This anomaly can only be explained, and a stronger fact cannot be adduced in its confirmation, than that the moisture and moderate temperature of the rainy season in the hills (for it is at this season only that they are found) is as favourable to their growth as the heat and moisture of the peninsula. I have never met with any in the plains of India; but have heard from travellers that they are abundant in Central India, whence we may expect some new species, as well as from the Neilgherries."

The facts which I have mentioned regarding the distribution of the peninsular species, go to prove, that heat and moisture are not the circumstances most favourable to their production here, but moisture combined with a moderate but equal temperature. At Coorgallum, for example, whence I have eleven or twelve species, they most abound in shady places on the tops of the hills, with a mean temperature during the

season of their greatest perfection, not exceeding 70°, if so much. At Shevaggerry, about fifty miles north of Coorgallum, I found five, out of seven species, on the highest tops of the mountains; none of the five under 4,000 feet, and three of them above 4,500 feet of elevation; the mean temperature, as deduced from twenty observations, continued through four days, at an elevation of 4,100 feet, being 65° of Fahrenheit's scale. The two found at a lower elevation, were both either growing in the gravelly beds of streams, or immediately on their banks; the temperature of which was ascertained to be 65°, while that of the air at noon was only about 75°, a temperature, I presume, but little above that in which they delight on the Bengal frontiers. There is one other point, respecting the effect of climate on plants of this genus, to which I wish to call attention, as it may ultimately prove useful to any one who may again attempt to subdivide it, and is, in the mean time, in a physiological point of view, exceedingly curious. It is, that most of the species from the colder regions of the Himalaya mountains, correspond with the European *I. noli tangere*, in the form and dehiscence of their capsule, that is, they split from the base, rolling the segments towards the apex, while those of the warmer regions split from the apex and roll their segments towards the base. This difference of habit between those of India proper and the Himalayan forms, is well worthy of notice, as it shows, that the affinity which exists between the flora of the latter and that of Europe, is stronger than between it and the Indian, and extends to even this most purely tropical genus.

The innate power which plants enjoy of selecting the soil and climate in different countries, however remote, most suitable to their perfect development, and which the preceding remarks have shown to be so eminently possessed by those of this order, may, when the subject has been more studied and is better understood, prove of immense benefit to the scientific cultivator.

Taking for an example the genus *Impatiens*, we may at once infer, that herbaceous plants growing where its species abounds, and arriving at maturity about the same time, may be transferred to any other locality, where they are equally prevalent. Thus the associates of *I. noli tangere*, *insignis*, *racemosa* and *bicolor*, might be mutually interchanged; while the neighbours of *I. reticulata*, *puberula*, &c. might be made to change places with those of *I. fasciculata*, *grandis*, and many more, with every prospect of success. The limits to which this rule may be extended are as yet totally unknown, and cannot be estimated, until plants are studied not as insulated individuals, but in connexion with the soil, climate, aspect, exposure, &c. in which they are observed to arrive at the greatest perfection. This is a study which the scientific botanist pursues in its relations to the physiological peculiarities of plants, but to the cultivator, it becomes one of much deeper and more

engrossing interest, as the success or failure of vast speculations may depend on his acquaintance with, or ignorance of, the external agents which act on the objects of his culture—whether for their benefit or their injury.

Should any one doubt the correctness of this statement, I would refer him to the *too short*, but luminous paper of Mr. Piddington* on the analysis of soils suitable for cotton, tobacco, &c. where he will find most ample and irrefragable proofs of their truth—a paper, that, in my opinion, cannot be too extensively made known, and one, my ignorance of which, when I wrote my desultory remarks on the culture of cotton, published in No. 12 of the Madras Journal, I now greatly regret. The study of plants, in relation to the agents that either promote or impede the attainment of their greatest perfection, is necessarily a difficult and tedious one, from the diversified attainments which the enquirer must bring to his aid, and from the prolonged meteorological investigations which are indispensable to its completion; but it is one, which, there is every reason to believe, will much more than repay the cost.

SYNOPTICAL ARRANGEMENT OF SPECIES.

- § 1. *Leaves alternate, pedicels solitary or aggregate, one flowered.*
 - 1. *IMPATIENS albida.*
 - 2. " *dasyperma.*
 - 3. " *floribunda.*
- § 2. *Leaves alternate, peduncles two flowered, upper sepals herbaceous (green).*
 - 4. *IMPATIENS auriculata.*
 - 5. " *viridiflora.*
- § 3. *Leaves alternate, peduncles several flowered, upper sepals petaloid.*
 - 6. *IMPATIENS umbellata.*
 - 7. " *grandis.*
 - 8. " *cordata.*
 - 9. " *uncinata.*
 - 10. " *complanata.*
 - 11. " *viscida.*
- § 4. *Leaves alternate, flowers racemose.*
- 12. *IMPATIENS maculata.*
- § 5. *Leaves radical, scape racemose.*
- 13. *IMPATIENS modesta.*
- 14. " *rivalis.*
- § 6. *Leaves opposite, pedicels one flowered.*
- 15. *IMPATIENS fasciculata.*
- 16. " *rosmarinifolia.*
- § 7. *Leaves opposite or verticelled, pedicels several flowered.*
- 17. *IMPATIENS verticellata.*

* Reprinted in the last No. of this Journal.—Ed.



I. Umbellata.

1. Leaves alternate, pedicels solitary or aggregate, one flowered.

1.—*IMPATIENS albida*. (R. W.)

Suffrutescent, erect, ramous. Branches terete, marked with numerous scars of fallen leaves. Leaves ovato-lanceolate, pointed, slightly serrated, attenuated at the base, tomentose. Pedicels solitary, as long as the leaves, glabrous. Sepals, upper large, broadly emarginate, villous above; lower one tomentose: spur slender, tapering, curved, nearly twice the length of the flower: lateral sepals cordate, acuminate. Petals deeply 2-lobed, the upper lobes larger. Ovary hairy; ovules few.

Habitat. Courtallum, at an elevation of between 2,500 and 3,000 feet, but rare, growing on clefts of rock in exposed situations.

This is a very beautiful species, distinguished on account of the size and beauty of its snow-white flowers, which contrast agreeably with the foliage, which has a fine silky appearance, from being thickly clothed with close-pressed white hairs. I gathered it in flower, both in September and February, but on neither occasion found ripe fruit. It appears to be a small shrub, so far as I have yet seen, not exceeding 2½ to 3 feet in height, with the leaves and flowers congested on the extremities of the branches.

2.—*IMPATIENS dasysperma*. (R. W.)

Herbaceous, erect, unbranched. Leaves petioled, alternate, ovato-lanceolate, acuminate, hairy above, glabrous beneath, crenato-serrated. Petioles glanduliferous. Pedicels axillary, solitary or paired, erect, scarcely half the length of the leaves. Flower rather small. Sepals, upper obcordate, cuneate, cuspidate; lateral ones minute, lobes of the petals nearly equal, scarcely half the length of the slender, curved, slightly hairy spur. Capsule glabrous, ovate, many seeded; seeds hairy.

Hab. Courtallum, in alpine jungles; flowering in August and September.

This species appears nearly allied to *I. Leschenaultii*, but differs in habit, this being herbaceous and branchless, while that is suffrutescent and branched. In this the leaves are hairy, and the petioles glanduliferous; in that glabrous and eglandular; in this the capsule is many seeded, in that few.

The name I have adopted is expressive of the hairiness of the seeds.

3.—*IMPATIENS floribunda*.

Suffrutescent, erect, ramous, every where glabrous. Leaves alternate, congested near the ends of the branches, on long glanduliferous petioles, lanceolate, acuminate, with incurved bristle serratures, glands of the petioles subulate, hooked at the apex. Peduncles axillary, 2-3 together, equalling the leaves. Sepals, upper large, petaloid, two-lobed, with a subulate point between, lateral ones minute subulate. Spurs slender.

der, about twice the length of the petals, straight. *Petals*, smaller than the upper sepal, the upper lobe much smaller than the lower. *Capsule* oblong, attenuated at both ends, glabrous.

Hab. Shevagherry hills, in dense forests, at an elevation of about 4,500 feet.

This is a large, very ramous, bushy plant, from four to six feet high, the larger branches naked, but the young terminal shoots bearing numerous, closely congested, rather small leaves, the largest rarely exceeding 2 or 2½ inches long in its whole length; by ½ broad. Sometimes the petiole has only one pair of glands, but oftener more, and the bristles of the lower serratures of the leaves are often glandular. The peduncles are usually three together, and about the length of the adjoining half. The flowers are conspicuous on account of the large upper very petaloid sepal, nearly equaling in size both the petals, and the much greater size of the upper than the lower lobes of the petals. It is nearly allied to *I. arcuata*, but is readily distinguished by being every where glabrous, in place of all more or less clothed with pubescence as in that species. It is distinguished from *I. Balsaminia* by its glabrous capsules, and from *Leschenaultii* by its glandular petioles, and aggregated pedicels.

§ 2. *Leaves alternate, peduncles two flowered, upper sepals herbaceous (green).*

4.—*IMPATIENS auriculata*. (R. W.)

Herbaceous, procumbent, glabrous, rooting along the stem. *Leaves* congested on the ends of the shoots, petioled, alternate, broadly ovate, lanceolate, bristle serrated. *Peduncles* about the length of the petioles, two flowered. *Pedicels* erect, many times longer than the peduncle. *Flowers* large. *Sepals*, upper vaulted, crowned with a foliaceous crest; lateral ones very large, pendulous, obliquely ovate, acute; lower, conical, including the inferior half of the lower petals, and ending in a hooked spur. Upper lobes of the petals smaller, opposed to the superior dilated half of the lower. *Capsule* ovate, many seeded.

Hab. Courtallum on branches of trees, flowering in August and September.

This species differs so much in the general form of its flowers, and in the relative size of their parts, that I at first proposed separating it from the genus. The discovery of a second very nearly allied species, but agreeing better in these respects with the other members of the genus, renders such a step inadmissible. The specific name is in allusion to the side sepals hanging down on each side like dog's ears. The general appearance of the flower, from the mixture of colours which it presents, is very unusual. The upper sepal or helmet, which, it greatly resembles, both in form and situation, is bright green, the

lateral sepals and spur, deep scarlet, while the upper projecting portion of the petals is dark purple.

It grows on branches of trees, on the top of some hills, much exposed to rain and mists, in large tufts, covered with flowers, when I gathered it forming an object not less curious than beautiful. The distance and intricacy of the way to the station prevented my visiting it more than once, though rewarded with a very large collection of new plants, from having lost my way home, and being forced to spend the night as I best could in the jungles.

5. *IMPATIENS viridiflora*. (R. W.)

Herbaceous, erect, ramous. *Leaves* succulent, congested near the ends of the branches, petioled, ovate, lanceolate, acute, incurved bristle serrated, glabrous. *Peduncles* axillary, two, rarely one, flowered, longer than the petiol, and shorter than the pedicels, when two. *Sepals*, upper vaulted, and crowned with an erect, foliaceous crest; lateral ones subulate, reflexed. *Spur* conical, revolute at the point, twice the length of the thick fleshy petals. *Petals* unequally lobed, upper lobe concealed under the sepal. *Capsule* glabrous.

Hab. Shevagherry on the highest part of the hills, about four thousand five hundred feet of elevation, forming large masses on the branches of trees.

This differs from its congener, in the small size of its lateral sepals, somewhat in the position of its petals, in having all its sepals of a bright herbaceous green, and in its erect ramous tree like habit.

§ 3. *Leaves alternate, peduncles several flowered, upper sepals petaloid.*

6. *IMPATIENS umbellata*. (HEYNE.)

Herbaceous, erect, root tuberous. *Leaves* crowded towards the apex of the stem, broadly ovate, lanceolate, obtuse from crenated to incurved bristle serrated; above, sprinkled with short hairs, below, usually coloured glabrous. *Peduncles* shorter than the leaves, bearing 4-6 rather large pedicelled flowers. *Sepals*, upper orbicular, nearly equaling the petals, not furnished with a herbaceous point. *Spur* slender, tapering, curved upwards, longer than the petals: lobes of the petals about equal, lower one broader, cuneate. *Capsule* glabrous, many seeded; seeds echinate.

Hab. Courtallum, in moist soil in alpine jungles, at a considerable elevation.

As this plant has hitherto been described from dried specimens only, the accompanying figure may serve to make it better known. I have somewhat extended the character, which is the more necessary, now that so many species have recently been added, and are daily adding to

the genus. The leaves are described as "usually coloured below;" they are generally, but not invariably, tinged with a dark brownish purple on the under surface. I have as yet only met with this plant at Courtallum, which is probably Heyne's station, though not mentioned.

7. *IMPATIENS grandis*. (Heyne, Wallich, in Roeb. Fl. Ind. (Ed. Hall.) 2 p. 464. Wight and Arnott Prodrum. Fl. Pen. Ind. Or.)

Hab. Courtallum—Shevageery, in moist woods.

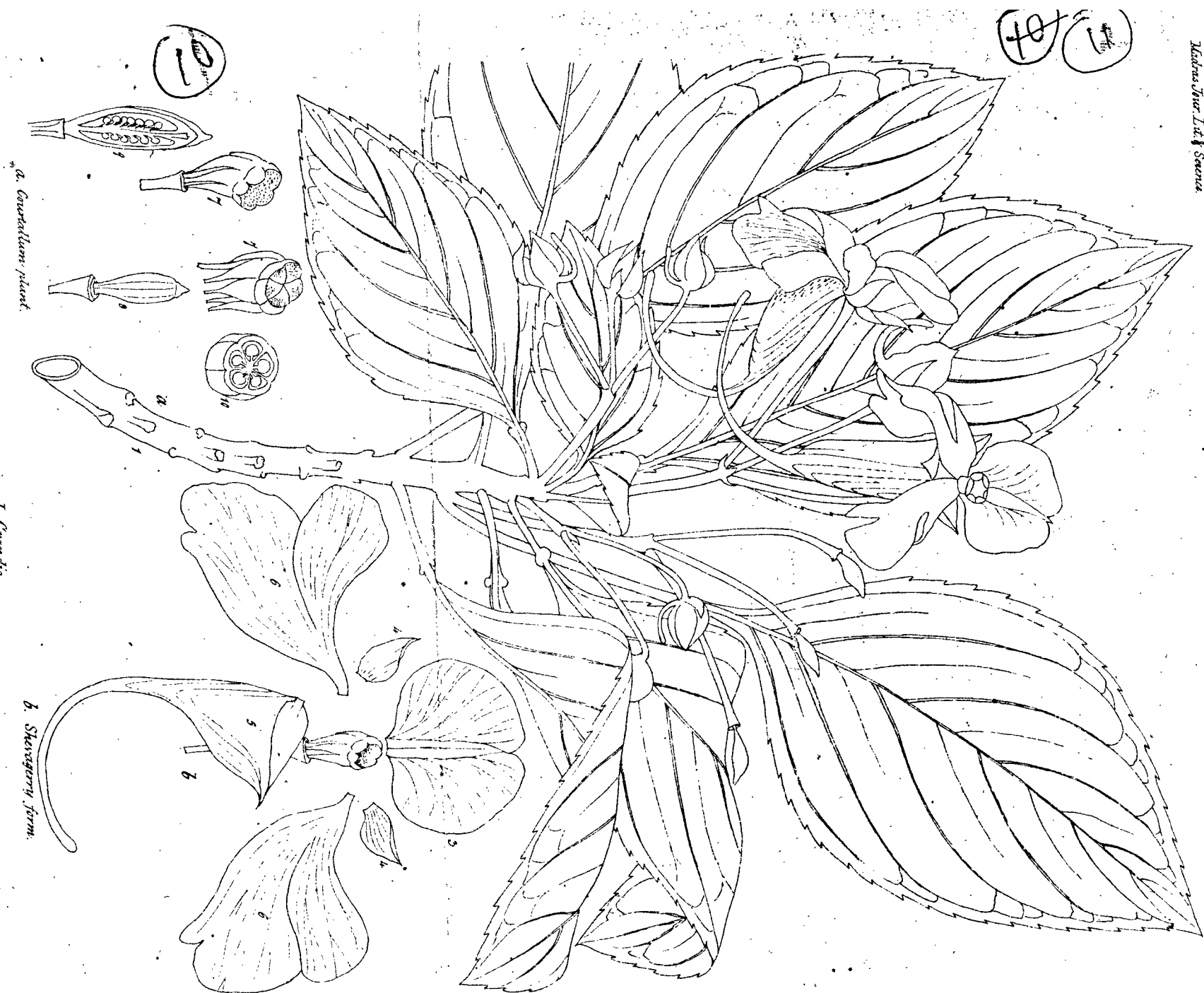
This magnificent species being as yet known to us through descriptions of dried specimens only, the accompanying figure, and following notes taken from growing plants will serve to make us better acquainted with it.

Erect, 4 to 8 feet high, much branched, herbaceous, except near the root, glabrous; branches terate, marked with numerous prominent scars of fallen leaves. Leaves congested near the extremities of the branches, long petioled, prominently veined, glabrous, ovate lanceolate; tapering downwards, till lost in the petiole, acute or prolonged into a short sharp pointed acumens, acutely incurved, bristle serrated. Petioles furnished near the apex with two pedicelled glands. Peduncles axillary, longer than the petioles, erect, bearing 3-4 large, long pedicelled, pale rose coloured flowers. Pedicels nearly the length of the peduncle, with a single bractea at the base of each. Upper sepals large, emarginate, reflected; under, funnel shaped with a tapering, conical spur, from 2 to 3 inches long, slightly curved towards the point. Petals about half the length of the spur, unequally lobed a little longer than the upper, very petaloid, sepal, and with it variegated with deep purple streaks and dots. Capsule glabrous, obsoletely 5 angled. Seeds apparently glabrous, but were still unripe when the description was written.

As the Shevageery plant differs somewhat in the form of the flower from the Courtallum one, I have added a representation of its flower to the figure. The differences are not material, but yet I think it well, to prevent future uncertainties, to show both forms. This part of the figure may not be found strictly correct, as it was made from a flower that had been dried and moistened again; but, if at all incorrect, the error must be inconsiderable, as great care was taken in laying out the different parts.

8. *IMPATIENS cordata*. (R. W.)

Herbaceous, erect, glabrous, except the veins on the upper surface of the leaves. Leaves alternate, cordate, ovate, acuminate, crenated; above glabrous, except a few bristly hairs on the veins; below glaucous. Peduncles axillary, 3-4 flowered, shorter than the leaves, lateral sepals large ovate pointed, a little shorter than the somewhat cuneate,



Report

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L. Anacardium.

*I. Uncinata.*

1837.]

On the Genus *Impatiens*.

11

emarginate upper one. *Spur* slender, much curved, longer than the petals. Lower lobes of the *petals*, very large, expanding; upper ones small, incurved, meeting in the centre and forming a vault over the column of fructification. *Capsule* ovate, glabrous.

Hab. Shevaggerry, top of the hills; frequent.

This species seems allied to *I. umbellata* but is abundantly distinct. The large lateral sepals, a structure rare in the alternate leaved species, combined with the very unequal petal lobes, at once distinguish it from all the other peninsular species. The peculiar arrangement, and firm fleshy structure of the superior lobes of the petals, by which they completely conceal the column of fructification, forms another very distinct mark. The large lilac coloured flowers, contrasted with the darker purplish coloured centre, renders this a very beautiful species.

9. *IMPATIENS uncinata* (R. W.)

Herbaceous, erect. *Leaves* ovate, rarely cordate, acuminate, bristle serrated, hairy on the veins above, glabrous beneath. *Petioles* rather long, glanduliferous at the apex. *Peduncles* axillary, solitary, nearly as long as the leaves, 4—8 flowered. Lateral *sepals*, about half the length of the upper one, ovate, pointed; lower, campanulate. *Spur* shorter than the flower, hooked at the point, contracted above, ventricose in the middle. Lower lobes of the *petals* declining, larger than the upper ones. *Capsule* attenuated below, beaked above, few seeded.

Hab. Courtallum—in moist alpine jungles; flowering in August and September.

A very distinct and handsome species, growing in thick shady jungles, on the tops of the hills moistened with frequent showers and almost constant mists.

* 10. *IMPATIENS campanulata*.

Herbaceous, erect, sparingly branched, glabrous. *Stem* and *branches* terate. *Leaves* alternate, long petioled, very broadly ovate lanceolate, shortly and abruptly acuminate, incurved bristle serrated; beneath glaucous, with the veins very prominent. *Peduncles* axillary, erect, longer than the adjoining petiole, 3 flowered. *Pedicels* about the length of the flower. Upper *sepal* keeled above, lower about equal, ventricose, with a small, short, incurved, spur; lateral ones, large, naviculate, about the length of the others. Upper lobes of the *petals* mucronate, shorter, the lower ones longer, than the upper sepals. *Capsule* ovate, attenuated at both ends, glabrous; *seeds* echinate.

Hab. Pulney hills, at an elevation of above 5,500 feet, in moist woods.

A rather large and handsome plant. The flowers large, cream-white, and speckled within with purple. The keel of the upper sepal green-

ish, ending in a mucronate point; the lateral ones, which are unusually large, very slightly falcate, the lower one speckled within like the petals. Anthers united and opening transversely across the apex.

Owing to the great size and incurving of the edges of the upper sepal over the upper lobes of the petals, they produce as a whole a campanulate form—hence the name.

11. *IMPATIENS viscida*. (R. W.)

Herbaceous, diffuse, rooting at the joints below, above erect; stems angled, a few bristly hairs scattered over it. Leaves alternate, longish petioled; ovate, somewhat acuminate, acutely serrated, veins on both sides, covered with stiff, erect, hairs. Peduncles axillary, 2–4 flowered, sometimes longer, but usually shorter than the adjoining leaf, erect, filiform, viscid. Flowers large; all the sepals about equal, the lower, furnished with a long tapering spur, nearly twice the length of the flower; lateral ones ovate, cordate. Upper lobes of the petals exceeding the sepals, 4 or 5 times shorter than the broad nearly semiorbicular lower ones. Capsules glabrous, tapering at both ends, ventricose. Seeds pendulous, hairy.

Hab. Pulney mountains, in wet swampy ground, at an elevation of about 5,500 feet. Flowers—large, pink. x

§ 4. *Leaves alternate, flowers racemose.*

12. *IMPATIENS maculata*. (R. W.)

Herbaceous, erect, ramous. Stem and branches angled, speckled with brown spots, glabrous, except a few thinly scattered bristle-like hairs. Leaves longish petioled, glanduliferous, alternate, ovate lanceolate, acuminate, incurved, serrated, hairy on both sides. Peduncles axillary racemose, many flowered, longer than the leaves. Pedicels from the axils of small subulate bractees slender declining, pendulous in fruit. Flowers large. Upper sepal vaulted, obtuse, shorter than the ovate acute lateral ones. Spur slender, curved upwards, longer than the petals. Petals 2 lobed, lower lobe, very large suborbicular, upper one, most minute, concealed under the upper sepal. Capsule 5 angled, glabrous.

Hab. Shevaggerry, on the banks of mountain streams; flowering in August.

A large and very handsome plant, some of those which I saw, having attained the height of nearly 6 feet. The racemes, are sometimes very long, nearly a foot; usually they are about the length of the leaves, but have not, then, attained their full growth. Many of the petioles, and occasionally some of the lower serratures of the leaves, have glandular bodies springing from them, spirally involute, like the junior





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fronds of ferns: these I have not introduced into the character owing to their not being constant, though of frequent occurrence.

§ 5. *Leaves radical, scape racemose.*

13. *IMPATIENS modesta*. (R. W.)

Leaves few, radical, broadly cordate, ovate or suborbicular, hairy above, glabrous, and pale shining glaucous beneath. *Scape* erect, racemose, many flowered; *flowers* small, rather long pedicelled, from the axil of a small subulate bractea. Upper *sepal*, broad, obovate; the lateral ones, subulate, incumbent on the upper; lower, shorter than the petals, with a short straight, obtuse spur. *Petals* declining, 3 lobed, (lower petal 2 cleft, upper entire) hairy near the attachment. *Capsule*, glabrous, ovate.

Hab. Shevaggerry on the highest part of the hills, in wet moss on the trunks of trees and large stones; flowering in August.

This beautiful and modestly retiring species, I found in great abundance in the thickest jungles, quite covering the stems of trees and stones, covered with moss. The colour of the flowers is pale pink, but owing to the dark ground against which it grows and the quantities congregated together, becomes very conspicuous. The whole height of the plants rarely exceeds from 8 to 12 inches, and the leaves from an inch and half to two inches in their longest diameter; the number of flowers varies from about 10 to 20 or more. They have an unusual appearance, from the approximation and downward direction of the petals, causing them, till closely examined, to resemble a single petal, simulating in a remarkable manner, the flowers and lip of some of the *Orchideæ*.

14. *IMPATIENS rivalis*. (R. W.)

Herbaceous; root tuberous. *Leaves* all radical, ovate oblong, somewhat oblique at the base, with remote, incurved bristle serratures, hairy above, glabrous, pale shining green below. *Scape* racemose, many flowered. Flowers large, pedicelled, from the axils of small pointed fleshy bracteas. Upper *sepal* obtuse, gibbous above, forming an arch over the column; lateral ones minute; lower, large ovate, ending in a slender, tapering, spur, nearly twice the length of the petals. *Petals* large, spreading, the lower lobe two cleft. *Capsule*, erect, glabrous, many seeded; *seeds* hispid.

Hab. Courtallum, in clefts of rock in streams, where exposed to the spray of water dashing around them.

This very beautiful species is found growing in clumps, and producing abundance of large pale pink flowers. I first met with it on the rocks, at what is called 'Five Falls,' in a situation almost inaccessible,

and afterwards further up the same stream, in similar but more accessible places.

At the date of the publication of my *Prodromus*, only one species of this unusual form was known, the *I. Scapiflora*: since then, I have seen three or four more, namely, the two here described, and one or two, I am uncertain which, in Ceylon.

✕ § 6. *Leaves opposite, pedicels one flowered.*

15. *IMPATIENS fasciculata* ?

Herbaceous, erect, sparingly ramous at the base, glabrous, except the upper surface of the leaves, which is hispid. *Leaves* opposite, linear or lanceolate subsessile, cordate at the base, acutely subspinous, serrated, with two short, reflexed, subulate, interpetiolar stipule-like glands. *Pedicels*, one or two from each axil, shorter than the leaves, erect in flower, afterwards deflexed, pendulous. Flowers large; upper sepal broad cordate, keeled, retuse, mucronate; lower infundibuliform, scarcely half the length of the long linear, curved, slightly bifid, *spur*. Upper lobes of the *petals* triangular, pointed, about half the length of the upper sepal, and considerably shorter than the linear, acute, slightly falcate, lateral ones; lower lobes semiorbicular, notched at the point, 3-4 times larger than the upper sepal, but shorter than the spur. *Capsule* oblong, slightly ventricose.

This plant certainly differs in some respects from *I. fasciculata* as now characterized, but not enough, it appears to me, to admit of my drawing up a separate character for it, the principal points of distinction being in this having two interpetiolar glands, resembling stipules, in the serratures of the leaves, being spinous, and in the lower lobe of the petals being three or four times larger than the upper sepal, in place of only twice, the size according to the character.

There is yet another source of doubt as to their identity, the one grows on the plains of Malabar, the other on the elevated marshes of the Pulney mountains, nearly 6,000 feet above the sea. If now I would propose the name *I. pungens* in allusion to the spinous teeth of the leaves.

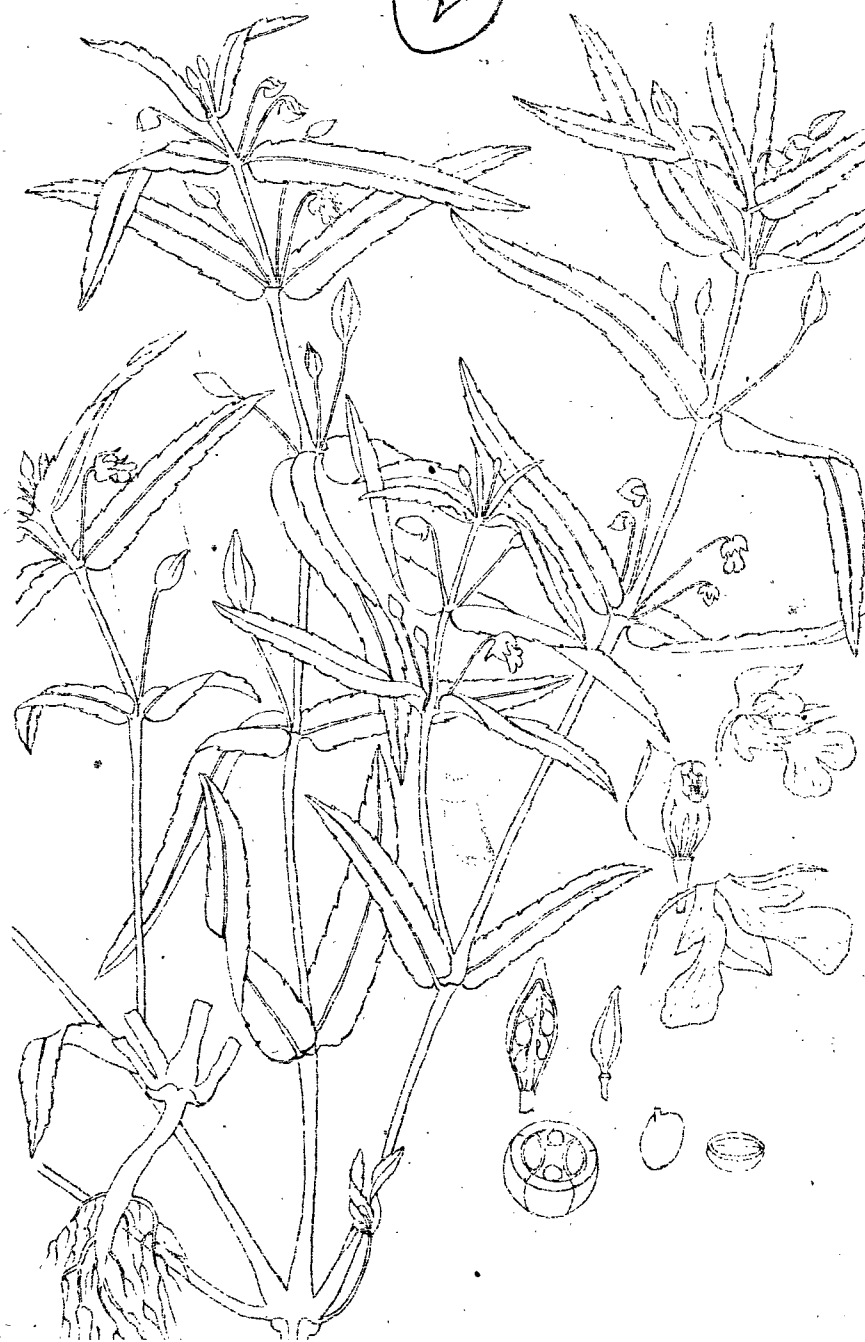
16. *IMPATIENS rosmarinifolia* ? (RETZ.)

"*Pedicels* solitary, shorter than the leaves, *leaves* opposite, linear: *spur* short, somewhat recurved at the apex."—*De Cand. Prod. Syst. Veget. I. p. 636.*

I have adopted Retz's specific name for this plant with a doubt, which however, I believe unnecessary, as the only difference between the plant here figured and the above character translated from Decandolle's *Prodromus*, is in the number of pedicels in that being solitary, in this solitary or paired, in my opinion a distinction of no importance. This species appears exactly intermediate between *I. filiformis* and *I. tenella*;

M. H. as Amer. lit. and science

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differing from the former in having a spur, and from the latter in the spur being almost rudimentary and curved outwards, in place of as long as the flower, and straight. These differences are perhaps too slight, and might, in a considerable number of specimens, be found to pass into one another, in such a way, as to admit of all three being united under one name, but for the present, I do not feel warranted in making the attempt.

§ 7. *Leaves opposite or verticelled, pedicels several flowered.*

17. *IMPATIENS verticellata*. (R. W.)

Herbaceous, diffuse, glabrous. *Leaves* verticelled, long, narrow, lanceolate, remotely bristle serrated. *Peduncles* shorter than the leaves, axillary, solitary, erect, 2—3 flowered. *Pedicels* about half the length of the peduncle. *Flowers* large. Upper *sepal*, oblong, erect, somewhat cuneate at the base; lateral ones, about half its length, subulate, reflexed. *Spur* slender, tapering, curved, much longer than the petals. *Petals*, oblong, lax, longer than the upper sepal, deeply 2 lobed, lower lobe much longer than the upper. *Capsule* oblong, obtusely 5 angled, slightly drooping.

Hab. Shevagerri, in the gravelly beds of mountain streams; flowering in August.

This beautiful species forms large clumps or beds, growing in the stiller parts of mountain streams, where gravel can collect, and is one of the most conspicuous and lively looking of the genus, from its large, deep crimson flowers, contrasting so strongly, with the dark green of its foliage. The whole plant is glabrous, the stems diffuse and jointed, each joint bearing a whorl of 4—6 narrow lanceolate leaves, 4—6 inches long and scarcely ever one broad, much attenuated at both ends, paler beneath, and furnished, contrary to the usual character of the order, with subulate stipules; peduncles erect, about 2 inches long, bearing 2—3 pedicelled flowers; pedicels about half the length of the peduncles, filiform.

II.—*Clavis Analytica of the CONVULVULACEÆ of the Peninsula of India*.—By G. WALKER-ARNOTT, Esq. A. M., F. L. S. and R. S. EDIN.
Communicated, with Observations and Figures, by Dr. WIGHT.

TO THE EDITOR OF THE MADRAS JOURNAL OF LITERATURE AND SCIENCE,

SIR,—The subjoined *Clavis Analytica* of the Peninsular *Convolvulaceæ* (prepared and communicated to me by G. Walker-Arnott, Esq.) I hope may prove as useful to your botanical readers as I have found it, in determining the species of that beautiful, but difficult, and hitherto

to ill-understood, family of plants. In publishing it, I fear I am taking an undue liberty with my friend's manuscript, which he merely intended for my own use, as will appear from the following extract of his letter, but a fellow-feeling for all who have encountered the disheartening uncertainty attending attempts to unravel the species of this order, induce me to incur the risk of his displeasure, rather than deprive them of so valuable an aid. I may here premise, that I have met with one or two errors in the first two genera, two or three species of *Rivea* being referred to *Argyreia*, which, however, is of little consequence, as the precision of the generic characters, will soon lead to their correction. It is proper to add, that these are not chargeable to Mr. Arnott; he having simply reduced to a tabular form the species according to M. Choisy's determination, adding a few new ones in my collection, not seen by that gentleman when elaborating his memoir.

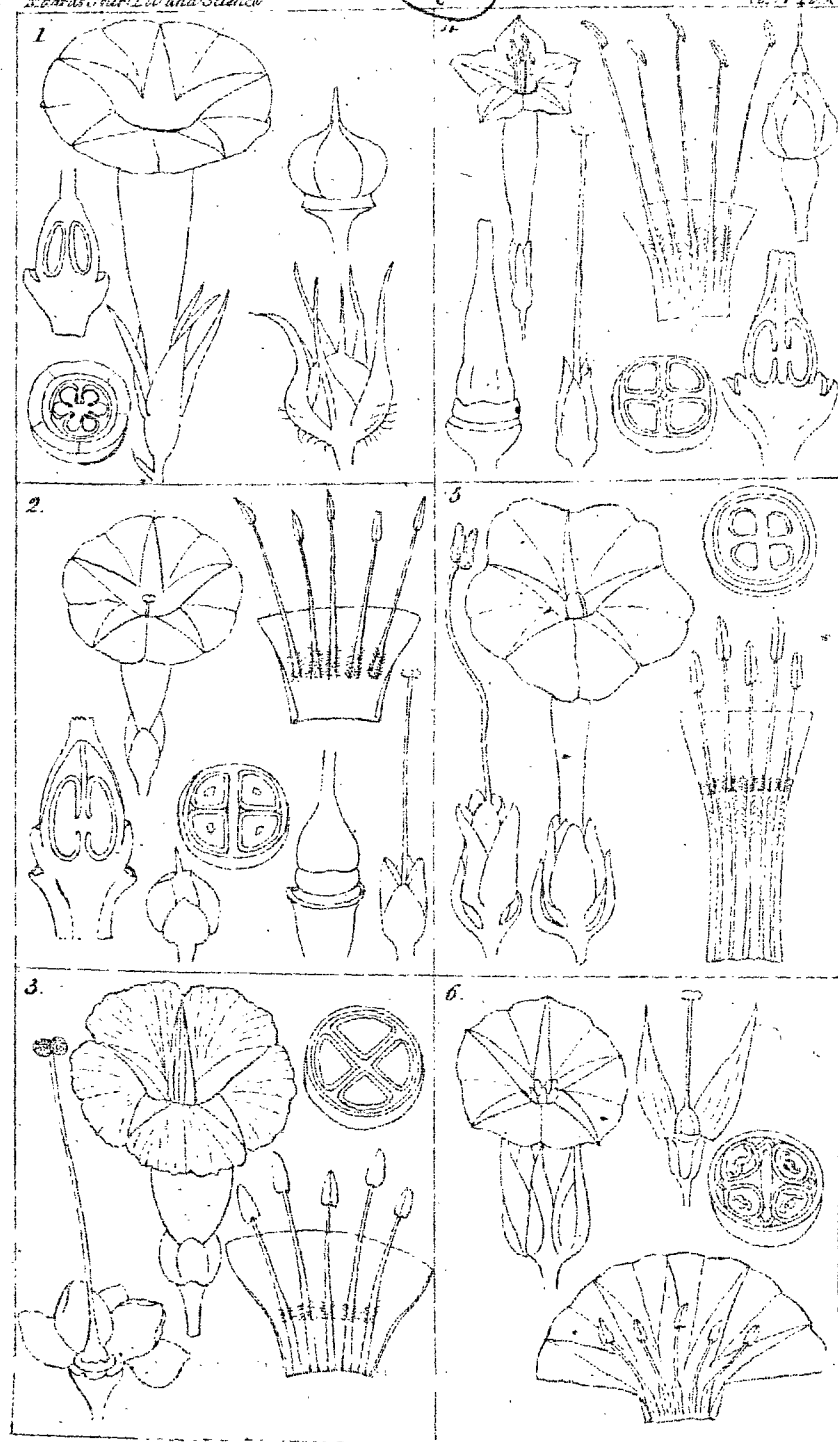
"As M. Choisy's memoir on the Indian *Convolvulaceæ* is inaccessible, (being printed in a foreign Society's transactions) I have got a loan of it from our friend Sir W. J. Hooker, and as *Convolvulaceæ* appears to be a favourite Order of yours, I shall here present you with a Clavis Analytica, adapted solely to the peninsular species, which I have made out from his specific characters for my own use. You of course understand, that in the Clavis I reject all characters (good or bad) that are not essential to your making out the plant: it is possible therefore, that ere this you may have got some new ones, in which case they, by the Clavis, may appear to coincide with what they are really distinct from."

The letters appended to the accompanying figures, show the successive steps of the operation of examining a plant, that at end of first step, refers to the second, the second to the third, &c. The species *Ipomea obscura* has been selected as a favourable example from its going through so many successive steps. These when put together form a very complete character: thus—"a stems twining—g capsules and sepals moderate sized or small—m flowers not capitate—p leaves cordate—q leaves entire—r flowers two or three—u one to three flowered—v leaves cordate acuminate, stems glabrous or softly villous. *I. obscura*."

As it appears not improbable that there are some additional genera, as well as species, not included in this Clavis, natives of the peninsula, I send along with it M. Choisy's own *Conspectus Generum*, published in the *Annales des Sciences Naturelles*, for September 1834, and leave you to determine on the propriety of reprinting it among your selections.

I remain, &c.

ROBERT WIGHT.



Convolvulaceae Fl.

1837.]

of the Peninsula of India.

17

CONVOLVULACEAE.

Clavis of the Genera.

- Embryo, without cotyledons. 15 CUSCUTA.
- with cotyledons. A.
- A { Fruit, a dry berry. B.
- capsular. C.
- B { Ovarium, 4 celled. 1 RIVEA.
- 2 celled. 2 ARGYREIA.
- C { Styles, single undivided. D.
- single and bifid, or 2 styles. K.
- D { Ovarium, 4 celled. E.
- 3 celled. 5 PHARBITIS.
- 2 celled. F
- 1 celled. I.
- E { Corolla infundibuliform: stamens exserted. 3 QUAMOCLIT.
- campanulata: stamens included. 4 BATATAS.
- F { Stamens exserted, coroll. infundibuliform 6 CALONYCTION.
- included. G.
- G { Lobes of stigma, globose. H.
- filiform or terete. 8 CONVULVULUS.
- H { Sepals, verticillate. 7 IPOMEA.
- inserted, some lower down than others. 9 ANISEIA.
- I { Lobes of stigma, flattened—ovate. 10 HEWITTIA (W&A).
- globose, sepals enlarged after flowering. 11 PORANA.
- J { Styles 1. bifid: anthers included. 12 BREWERIA.
- 2, L.
- K { Styles, undivided: stigmas globose, anthers exserted. 13 CRESSA.
- each bifid. 14 EVOLVULUS.

Clavis of the Species.

1. RIVEA. Ch.

- Corolla inflated, cylindrical. 1 R. tiliaefolia, ch.
- with limb spreading. a.
- Corolla hypocraterif., tube equal, narrow, peduncles 1 flowered. 2 R. hypocraterif, Latis.
- infundibulif., tube wider upwards, peduncles 3 flowered or with 2 lateral abortive ones. 3 R. bona-nox.

* 10 BRUTERIA Ch. (not W. & A.)

2. *ANGYREIA*. Lour. Lettson. Roxb.Stamens included. *a*.—— protruded beyond the tube. *p*.*a* { Leaves tomentose, silky, or velvety on the under side. *b*.{ ——— villous, or pubescent, glabrous or hairy on the under side. *h*.*b* { Leaves cordate at the base. *c*.{ ——— elliptical, oblong, or lanceolate. *e*.*c* { Leaves softly tomentose and silky underneath; flowers somewhat umbelled. *d*.{ ——— harshly tomentose, underneath; flowers cymose, stems hairy..... 4 *A. hirsuta* (W & A.)*d* { Stems tomentose; bracteas oval, acuminate waved..... 5 *A. speciosa*.{ ——— pubescent or glabrous; bracts lanceolate or linear..... 6 *A. argentea*.*e* { Leaves glabrous on upper side. *f*.{ ——— clothed on upper side. *g*.*f* { Leaves roundish oblong, acute..... 7 *A. bracteata*, Ch.{ ——— lanceolate acuminate..... 8 *A. fulgens*, Ch.*g* { Leaves subacute, upper side strigosely hirsute, under serices tomentose..... 9 *A. Leschenaultii*, Ch.{ ——— obtuse, both sides velvety..... 10 *A. pomacea*, Ch.*h* { Leaves cordate at the base. *i*.{ ——— not cordate. *o*.*i* { Stem harshly hairy. *k*.{ ——— glabrous, or pubescent or villous. *m*.*k* { Flowers capitate, capitulum surrounded by bracteas..... 11 *A. capitata*.{ ——— umbelliform, bracteas all mingled with the flowers. *l*.*l* { Hairs reddish; sepals ovate, elliptical obtuse..... 12 *A. Neelgherryana*.{ Leaves underneath livid or glaucous, sepals linear lanceolate pointed..... 13 *A. pilosa* (W. & A.).*m* { Exterior sepals equal to, or smaller than the others: leaves with a short broad sinus..... 14 *A. papulifolia*, Ch.{ ——— the largest and with margins revolute. *n*.*n* { Stem and leaves villous or softly pubescent 15 *A. Roxburghii*.{ ——— sprinkled with short adpressed pubescence, or glabrous..... 16 *A. Malabarica*.

*Batatis paniculata.*

1837.]

of the Peninsula of India.

19

- Leaves obovate-cuneate, emarginate; peduncle 3-6 flowered..... 17 *A. cuneata*.
 — elliptical ovate or obovate; panicle lax corymbose..... 18 *A. elliptica*.
 Flowers capitate, leaves tomentose underneath..... 19 *A. aggregata*.
 — corymbose or cymose. *q.*
 Stem and underside of leaves hirsute or strigose with adpressed hairs; peduncles a little longer than the petiole..... 20 *A. setosa*.
 — and leaves more or less pubescent; peduncles the length of the leaves..... 21 *A. cymosa*.

3. QUAMOCUIT. *Ch.*

- Leaves entire, or angled, or 3 lobed..... 22 *Q. phoenicea*.
 — pinnately cut..... 23 *Q. vulgaris*.

4. BATATAS. *Rumph. and Choisy.*

- Leaves entire, angled or cleft—*a.*
 — quinate: stem twining, hirsute.. 24 *B. pentaphylla*.
 Sepals ovate lanceolate, a little unequal: stems usually prostrate; peduncles few flowered..... 25 *B. edulis*.
 — roundish, ovate, equal: stem twining glabrous: peduncles many flowered... 26 *B. paniculata*.

5. PHARBITIS. *Ch.*

- Leaves entire; pedicels longer than the bracts, nearly as long as the sepals.... 27 *P. hispida*.
 — 3 lobed or entire, pedicels usually shorter than the bracts, about $\frac{1}{2}$ of the length of the sepals..... 28 *P. nil*.

6. CALONYCTION. *Ch.*

- Sepals equal, with an awl-like point; flowers, large, white..... 29 *C. speciosum*.
 — flowers smaller, purplish 30 *C. speciosum*.
 — unequal, obtuse, or with a very short point..... 31 *C. asperum*.

7. IPOMÆA. *Linn.*

- Stems not twining—*a.*
 — twining—*g.* (§ *Strophipomæa*.)

28

- Stems creeping, and throwing out roots
- a { —b. (§ Erpipomoea.)
 - a { — prostrate, not creeping—f. (§ Orthipomoea) leaves auricled at base : plants glabrous.
 - b { Leaves sagittate lanceolate, acute..... 32 I. reptans.
 - b { — obtuse or emarginate—c.
 - c { Glabrous ; sepals wrinkled : flowers pretty large—d.
 - c { more or less hirsute : sepals not wrinkled : flowers small—c.
 - d { Leaves emarginate or 2 lobed..... 33 I. pascaprae.
 - d { — cordate reniform obtuse..... 34 I. rugosa.
 - e { Leaves reniform obtuse, sinuately toothed : sepals ovate rounded, ciliate torn..... 35 I. reniformis.
 - e { — cordate, reniform obtuse or emarginate, entire : sepals linear lanceolate, hairy 36 I. venicifolia.
 - f { Leaves usually truncate or 3 toothed..... 37 I. tridentata.
 - f { — linear or linear lanceolate.. 38 I. filicaules.
 - g { Capsules and sepals large and showy—h.
 - g { — moderate size or small—m.
 - h { Leaves cordate, entire or sinuate—i.
 - h { — divided—k.
 - i { Stem angled or winged : sepals unequal, densely pubescent..... 39 I. turpethum.
 - i { — terete : sepals equal, glabrous..... 40 I. campanulata C.
 - k { Leaves palmately 7 partiti—l.
 - k { — cordate, palmately 5 cleft or 5 angled 41 I. vitifolia.
 - l { Lobes of leaves quite entire..... 42 I. tuberosa.
 - l { — sinuately toothed or pinnatifid. 43 I. dissecta.
 - m { Flowers capitate or aggregated—n.
 - m { — not capitate (in I. Wightii approximated)—p.
 - n { Leaves palmate or lobed, peduncles as long as the leaf..... 44 I. pestigrides.
 - n { — cordate acuminate—o.
 - o { Peduncles a little shorter than the petiole : flowers inclosed in a perfoliate involuere 45 I. pileata.
 - o { — very short : flowers not involuere. 46 I. sessiliflora, Rot
 - p { Leaves cordate entirely or slightly lobed—q.
 - p { — digitate or pedate—y.
 - q { Leaves entire—r.
 - q { — toothed, lobed—w.





Convolvulus Rottlerianus.

- Flowers cymose or paniced—s.
 — 2—3, or umbelliform—u.
 Flowers racemosely paniced, leaves ovate
 oblong acuminate, cordate, 3-6 inches
 long..... 47 *I. staphylina*.
 — cymose : peduncles shorter than the
 leaves—t.
 Leaves ovate lanceolate, a little obtuse
 mucronate (a doubtful plant)..... 48 *I. caliginosa*.
 — ovate, oblong, elongated, acute or
 acuminate..... 49 *I. cymosa*.
 Peduncles many flowered, stem usually
 sprinkled with hairs..... 50 *I. sepearia*.
 — 1—3 flowered—v.
 Leaves cordate, acuminate : stem glabrous
 or softly villous..... 51 *I. obscura*.
 — cordate lanceolate with a blunt
 point : whole plant glabrous..... 52 *I. triantha*.
 Flowers yellow ; style exserted ; leaves
 glabrous..... 53 *I. chrysoides*.
 — purple, style included : plant hairy :
 leaves tomentose underneath—x.
 Flowers cymose, distant, numerous..... 54 *I. pilosa*.
 — usually few on each peduncle, ap-
 proximated..... 55 *I. Wightii*.
 Segments of leaves serrated..... 56 *I. coptica*.
 — quite entire—z.
 Leaves tripartite, the segments trifid..... 57 *I. dasysperma*.
 — quinate—§c.....
 Corolla infundibuliform ; seeds villous.... 58 *I. pulchella*.
 — campanulate : seeds glabrous..... 59 *I. tuberculata*.

8. *CONVOLVULUS. L.*

- Stem erect ; peduncles longish..... 60 *C. Rottlerianus*, Ch.
 — twining—a.
 Peduncles few, 1 to 3 flowered—b.
 — umbellately many flowered..... 61 *C. parviflorus*.
 Leaves sagittate, somewhat auricled ; se-
 pals obtuse..... 62 *C. arvensis*.
 — hastate cordate, sinuately toothed :
 sepals ovate acuminate..... 63 *C. refuscens*, Ch.

9. *ANISEIA. Ch.*

- Stem hairy, twining, leaves oblong cordate,
 acuminate, longish petioled..... 64 *A. calycina* Ch.

Stem glabrous or nearly so, rooting, leaves
oblong, linear or cuneate, very shortly
petioled..... 65 *A. uniflora*.

10. HEWITTIA. *W. & A. Shuteria Ch. (not W. & A.)*

1. *H. bicolor* W. & A. (*C. bicolor* Vahl. & *C. bracteatus* Vahl.)

11. PORANA. *Burm.*

1. *P. paniculata* Roxb. (perhaps not indigenous).

12. BREWERIA. *R. Br.*

Stem twining, leaves cordate ovate, acuminate, softly villous, petioled, 2 inches long..... 66 *B. Roxburghii* Ch.

Stem erect: leaves from oblong lanceolate, to oval and obtuse, almost glabrous, subsessile, 1½-2 lines long..... 67 *B.*

13. CRESSA. *L.*

1. *C. indica* Retz.

14. EVOLVULUS. *Linn.*

Leaves almost sessile, hirsute on both sides.. 68 *E. hirsutus* L.

——— shortly petioled (various as to shape and hairiness) 69 *E. alsinoides* L.

15. CUSCUTA.

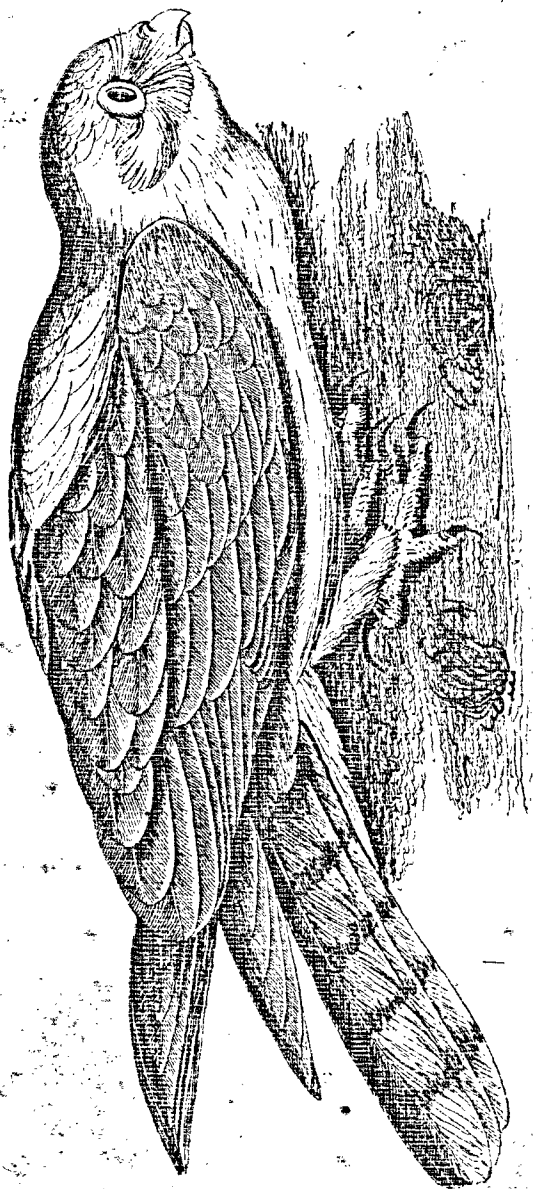
Flowers racemose, 5 cleft: style 1..... 70 *C. reflexa* R.

Peduncles 3 flowered, flowers 4 cleft: styles 2. 71 *C. hyalina* R.

SYNONYMS.

1 *Convol. gangeticus* Roxb. 2 *Letts. uniflora* Roxb. 3 *Letts. bona-nox* Roxb. 5 *L. nervosa* R. 6 *L. argentea* R. 8 *Convol. fulgens* Wall. 10 *Letts. pomacea*. 11 *Letts. strigosa* R. 14 *A. bracteata* Wight in *Comp. Bot. Mag.* t. 3. 15 *Ipom. multiflora* R. 16 *C. malabar.* Linn. 19 *Letts. aggregata*. 20 *L. setosa* R. 21 *L. cymosa* R. 22 *Ipom. phœnicea* R. 23 *Ip. Quamoclit* L. 24 *C. hirsutus* Roxb. *C. munitus* Wall. 25 *Con. Batatas* L. 26 *C. paniculata* L. 27 *C. purpureus* L. 28 *Ip. cœrulea* and *cœrulescens*, *Con. nil* Linn. 29 *Ip. bona-nox* L. *Ip. grandiflora* Roxb. 30 *Ip. muricata* Linn. and Roxb. 31 *C. asper.* Wall. 32 *Convol. repens* Roxb. 33 *Ip. pescaprae* *C. bilobus* R. 34 *C. flagelliformis* Roxb. 35 *C. renif.* Roxb. 36 *C. hirsutus* Wall. 38 *C. medius* R. not Linn. 40 not Linn. the Linn. plant is *Rivea tiliaefolia*. 41 *C. vitifol.* R. 43 *I. diversifolia* Ch. not Br. 46 *C. sphærocephalus* R.

(31)



Ninox Nipalensis,
type of the
Genus *Ninox* (Hodgson)

1837.]

of the Peninsula of India.

23.

47 *C. Kleinii* Sp. 49 *C. blandus* R. and *C. pentagonis* R. 51 *C. obscurus* Willd. 52 perhaps a variety of *Ip. cymosa*. 53 *C. dentatus* R. *C. flavus* Willd. 54 *C. pilosus* R. 55 *C. Wightii* Wall. Pl. As. Rar. 57 *C. pedetus* Roxb. 58 *C. digitatus* R. 61 *Retzio pilosi* Rott. 62 *C. Melcomi* R. 64 *Con. calycinus* R. 65 *C. uniflorus* Burm. *C. emarginatus* Vahl. *C. Rheedii* Wall. 66 *C. Semidigynus*. 67 *Ip. parviflora* Rott. 68 *E. sericus* Wall. *E. angustifolius* R. 69 These two probably the same species.

EXPLANATION OF PLATES.

PLATE I.

Fig. 1. *Pharbitis* A. C. D. ovar. 3 celled.

" 2. *Ipomea* A. C. D. F. G. H. sepals verticillate.

" 3. *Batatas* A. C. D. E. corol. campanulate, stamens included.

" 4. *Quamoclit* A. C. D. E. corol. infundibuliform, stamens exserted.

" 5. *Rivca* A. B. ovar. 4 celled.

" 6. *Aniseia* A. C. D. F. G. H. sepals inserted, some lower down than others.

PLATE II.

Ipomea obscura.—a. g. m. p. q. r. u. v. I. *obscura*.

III.—Indication of a new Genus belonging to the Strigine Family, with Description of the New Species and Type.—By BRIAN HODGSON, Esq. British Resident in Nepal.

Family STRIGIDÆ.

Sub Family NOCTUINÆ.

Genus *Ninox*, nobis (a *Niso* et *Noctua*).Type *Ninox Nipalensis*, nobis.

Character.—Bill, disc, couch, and feet as in *Noctua*.—General contour, with the character of the plumage, strictly falconidine. Wings long and firm, 3d quill longest, 1st and 2d moderately graduated; the primes, pretty strongly emarginated high up from the tips; their edges, entire or nearly so. Tail long, straight and even. *Type*, *Ninox Nipalensis*, nobis. *Habitat*, central region of Nepal. *Habits*, insectivorous and crepuscular.

The experienced *Shikaree* who brought me, recently, a fine male specimen of this bird, asked me, when he put it in my hands, whether it was a *Baáz* (hawk) or an *Ulu* (owl)? And the more I examined its graceful form, its unrelaxed plumage, its strong and ample wings and tail, and even its peculiar colouring, the greater reason did I perceive to admire the man's acuteness of observation. It is an owl, undoubt-

edly, but the most accipitrine of owls; and, much as the peculiar attributes of *Noctua* had prepared me to expect, in or near this group of the Strigidae, the type and symbol of the Accipitrinae, I did not hope that the forests of Nepal would so soon yield that type to my own hands.*

SPECIES new, *Nipalensis nobis*.

Form.—Bill to head as 1 to $1\frac{1}{2}$ inch, short, arched from the base, considerably compressed and feeble rather before the large cere; the tomie entire and very little trenchant; tip of lower mandible very obliquely and slightly truncated. Nares small, round, antecal, furnished with a central pillar, and partially free and apert; the cere behind them swollen semicircularly, and soft. Head very small and accipitrine, void of egrata, almost so of facial disc, and only strigine in the size and position of the eyes. Opening of the ears but $\frac{1}{3}$ of an inch long, nearly round, quite simple, and protected by a cross row of setaceous plumes. Tail equal to the body in length, composed of 12 firm and unbowed feathers, of nearly equal length, but tending to a rounded form at the end. Wings $\frac{1}{2}$ inch less the tail; 3d quill decidedly longest; 1st but two inches, and 2d, only half an inch less the 3d; 1st to 4th inclusive sharply emarginated on the inner web, remotely from the tips; and 2d to 5th on the outer; all firm and nearly or quite void of strigide characteristics; tertiarics nearly two inches less the primaries; scapulars as much shorter again. Tarsi submedial, slender, moderately plumed. Toes rather long, cleft, void of plumes, covered by rigid hairs which become spinous laterally near the soles; lateral toes, equal; central, not elongated; hind, small; all cleft; soles of the toes, depressed, flat and papillose; of the hind, full. Talons long, slender, very acute, subequal; inner and central equal; outer fore, less; hind, least; inner process of the central one entire; soles, flat beneath—the hind, rounded. Plumage, generally, neither lax nor soft.

Colour and size.—Above, a medial earthy brown; beneath, sordid grey from chin to breast, and white from breast downwards. Dors, towards the bill, hoary; towards the head, brown. Superior surface of the bird unmarked save on the tail, which has six, broad, regular bars equal to their paler intervals, and five of them apert; ground colour of the inferior surface, largely picked out with longitudinal central drops of brown, spreading as you descend the body, and changing into hearts on the flanks; tibiae and tarsi sordid rufous, with vague cross bars of

* I regret I have no species of *Surnia* wherewith to compare our bird. *Surnia* might possibly dispute with it the honour of typifying the nobler ideas of the Falconidae; but the thickly plumed toes and wedged tail of *Surnia*, sufficiently indicate that our bird is not of that genus.

brown: vent and under tail coverts, pure white: lining of the wings, impure rufous, like the breast, and bimaculate barwise with brown: the quills internally on the inner webs, barred with pale pure rufous. Feet, bright yellow; bill and nails blackish blue horn; cere greenish; iris golden yellow. Entire length of the bird (male) twelve inches; of the tail, six; of the bill, one; of the tarsus, $1\frac{1}{3}$; of the central toe, $1\frac{1}{2}$; of its nail (straight) $\frac{1}{2}$; of a closed wing, 31. Weight 7oz. Expanse of wings, 27 inches. Intestinal canal 16 inches long, of medial subequal caliber. Two inches from anal end, two caeca, each of $2\frac{1}{2}$ inches in length, and slender, with enlarged globose distal extremities. Stomach soft, large, spheroidal, distinctly solvent, but considerably thickened in the outer coat, and submuscular on the surface. Contents, large black beetles.

Comparing our bird with *Noctua*, to which it has the closest affinity, it may be observed that the accipitrine tendencies of the genus are here much more apparent, particularly in the decreased size of the head, the greatly superior development of the wings and tail, and the greater firmness and still closer set of the whole plumage. The tarsi are rather lower, and the bill is more compressed before the cere, than in *Noctua*; nor have the wings the same technical formula. But these distinctions are trivial in comparison to the high development of the general falconine (family of Diurnal Raptores) structure in our bird; and which structure is, as it were, latent in *Noctua*.

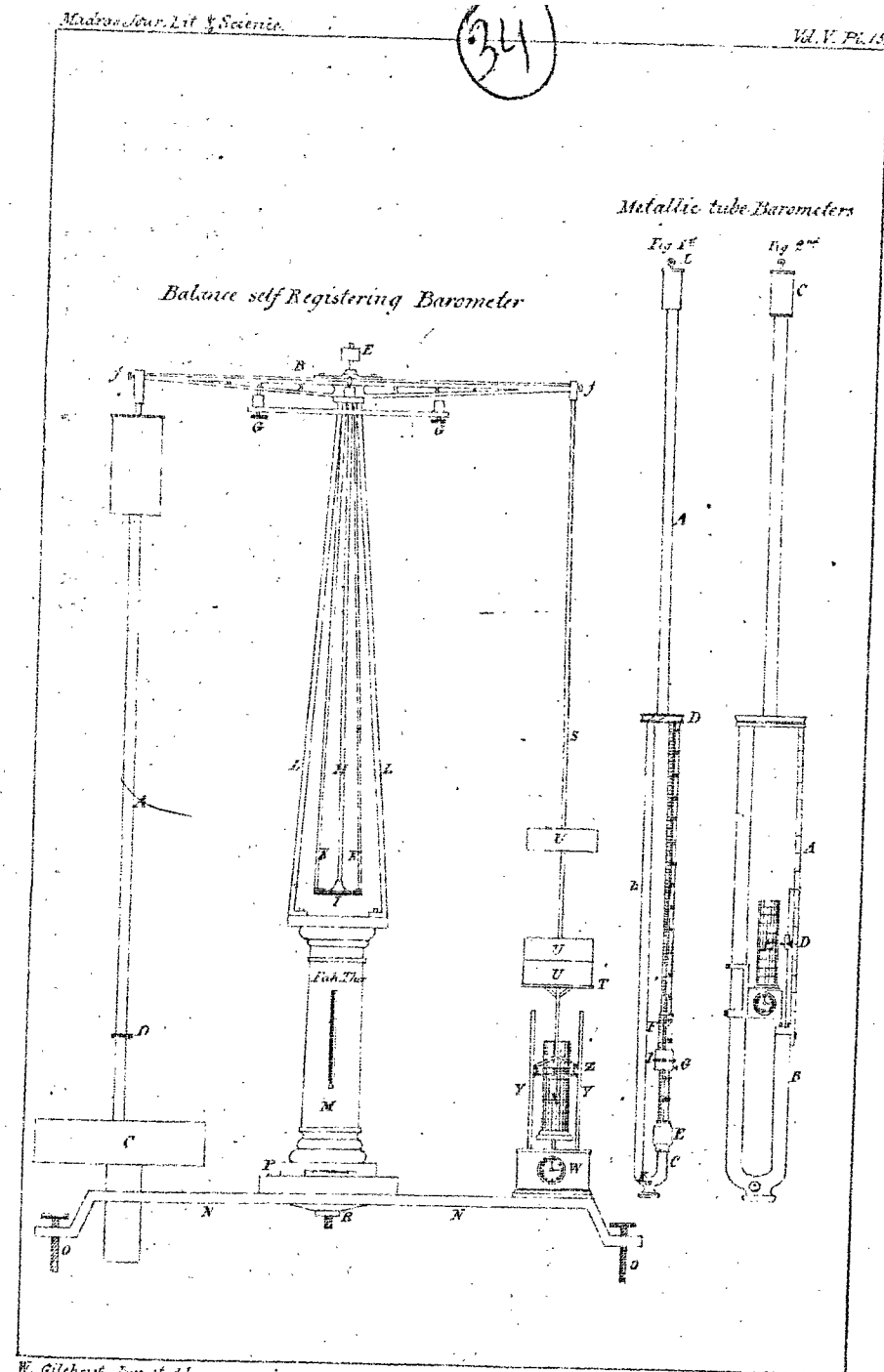
Noctua approaches the Diurnal Raptores by its firm plumage, and the very small development of the ear conch and of the disc, not to mention the absence of egrata, and the small head. Our genus can scarcely be separated from the sub-family of the *Noctuinae*, which latter would appear to include the *Surnia*. Or, if the latter be allowed a sub-family distinctness, I know of no genera fit to be ranged under it, as the analogical equivalent of the Accipitrinae and Falconinae, save *Surnia* and our *Ninox*, the genus *Surnia* of authors being much more strigine than the type of the *Noctuinae*. Our genus has wings less than the tail, but longer in proportion to it than *Accipiter*. It may be a question, therefore, whether *Ninox* symbolizes *Accipiter* or *Falco*. Our bird at ten paces, would pass for a *Tinnunculus*, with which it agrees very much in structure and in habits (insectivorous). But, in *Tinnunculus* there is a wide deviation from the type of *Falco*: and the truth would seem to be the Diurnal as well as Nocturnal Raptores require to be reclassified.

IV.—Description of a Plan for a Self-Registering Barometer, and for the Construction of Metallic-tube Barometers.—By WILLIAM GILCHRIST, Esq. of the Madras Medical Establishment.

A Barometer that will record constantly, and with scientific accuracy, the varying pressure of the atmosphere, is, so far as I know, a desideratum in the study of Meteorology. This important object may, I conceive, be accomplished by suspending a barometer tube from one end of a balance—an apparatus being connected with the other to record the oscillations occasioned by the varying weight of mercury in the tube, or, more correctly, the varying pressure of the atmosphere on the top of the tube, and of which the height of the mercury within is an exact measure.

In principle the barometer is a balance of a very delicate kind, its function being to weigh a given column of the atmosphere, by counterpoising its weight with a column of mercury—like the balance, therefore, this instrument requires simplicity of construction, since a complicated structure would impede its free working, and, of consequence, falsify its indications. The nearer the principle of the balance, therefore, is approached, in a barometer intended to register its own movements, the better is it adapted for the exact purposes of science. In the plan about to be described, this object will be found fully attained, since a balance is made the medium of register.

The accompanying is a sketch of the instrument (Pl. 15. fig. 1.)—A is a tube, suspended from one end of the balance B. The tube is of cast iron, cast in the shape required, thereby avoiding the tediousness of boring. The upper part, it will be observed, is considerably larger than the lower. I purpose making the interior of this part with a uniform area of two square inches. The evident object of this is to gain power, for the larger the area of the bore, the greater is the weight of mercury displaced or added, according to the depression or elevation of the column of mercury, and consequently the apparatus has a proportionally greater power to overcome resistance, which at most can be very small. A cubic inch of distilled mercury weighs 3.434 grains, which divide by 1000 = 3.434, so that an atmospherical alteration that would affect the barometer $\frac{1}{1000}$ of an inch gives nearly 3½ grains of power—two square inches of area, then, will give nearly a power of 7 grains to indicate the third decimal figure, and nearly 70 grains to indicate the second or $\frac{1}{100}$ of an inch; so that it is evident the above power is amply sufficient to overcome all obstacle, and to admit of recording variations of the mercurial column to $\frac{1}{1000}$ of an inch, a degree of minuteness amply sufficient to meet the most exact demands of science. The upper part of this tube must be bored accurately—as on the uniformity of caliber of this portion of the tube the correctness of the instrument essentially depends. This



point must be determined with the greatest nicety. C is the cistern, the broad upper part of which is 12 inches in diameter, while the lower is of such bore as to admit of the tube moving up and down without touching the sides of the former. The cistern consists of cast iron, and, when the apparatus is being conveyed, the screw D is screwed into the top, thereby preventing the escape of the mercury. The balance B is constructed on the usual principles, the weight E on the top adjusts the centre of gravity, while the screws F F, at the end of the beam, adjust the length of each arm; other screws, which cannot be shown, adjust the points of suspension to the plane of the point of support,* the screws G G support the balance when not in use—H is the index of the balance having a vernier at its lower end—I is a plummet, in the shape of an arc, the two radii K K which support it, turn on a pivot which is in the plane of the point of support of the balance—this plummet of course will always preserve the perpendicular: it is graduated into parts corresponding with the $\frac{1}{10}$ th of an inch of elevation or depression of the mercury in the tube, so that, by means of this scale and the vernier on the index, the exact height of mercury at any time may be determined thereby—thus avoiding the necessity of disturbing the registering apparatus.

The inclined arms L L and the pillar M support the balance and its appendages. The stand N N is furnished with screws O O by way of feet, by which it is brought to the horizontal line, as indicated by spirit levels, one of which is seen in front of the bottom of the pillar. The end of another, at right angles to the former, is seen below P—the pillar is, by means of the screw and nut R below the stand, easily attached to, or removed from this.

The registering apparatus is seen attached to the right arm of the balance—S is a rod, on which at T is attached a disc of any metal, by way of scale pan; on this are placed weights U U U, which poise the barometer at different elevations of places of observation. In the box W the clock work is contained, which turns the arbor on which the register cylinder X is fixed, after the manner of the cap of a watch. From the box W two rods Y Y rise up perpendicularly, which are guides to the pencil frame Z—(a) is the pencil which is on the principle of Mordan; it is acted on by a delicate spring which causes the point to press gently against the cylinder. This cylinder consists of ivory, the surface of which is made smooth but not polished—longitudinally are 24 lines—which are hour lines—being numbered 1, 2, 3, &c. on to 24. The horizontal lines correspond to $\frac{1}{10}$ of an inch of the barometrical tube at the other end of the balance. The middle horizontal line is called the zero line. By this I mean that when the instrument is put in

* See Mr. Braddock's plans of the balance—*Madras Journal of Science*, No. 6.

action the pencil is said to touch this line, the balance having been previously poised by weights put in the scale pan. The height of the barometer, as indicated by one of common construction, is then noted, while the cylinder is revolving, the pencil will draw a line either above, on or below this zero line, according to the height of the mercury, at the time indicated by the hour lines. After completing one revolution the cylinder is removed and another replaced; it is then placed between two points and made to revolve, when being read off, against a vernier, so that variations to $\frac{1}{50}$ of an inch, as in the common barometer are distinctly seen. The register may be preserved either in figures or by diagrams, as represented in meteorological works.

That an apparatus, such as the one above described, will fulfil the purpose for which it is intended, there can be no doubt. The principle on which it is founded may easily be illustrated by immersing a common beer bottle in water until filled; it is then to be taken so far out as to leave only the mouth immediately below the surface, and then suspended by a string (previously so applied as will retain the bottom uppermost) from one end of a balance; counter weights are then put into the opposite scale pan, until the bottle is poised. If, now, air be blown up into the bottle by means of a tube, a portion of water will immediately descend, and the bottle end of the balance become as much lighter as the quantity of water displaced. If the above arrangement of apparatus be placed beneath the receiver of an air pump, and the air extracted from the latter, the water will descend without the necessity of blowing in air, and the weights, as in the former case, preponderate. It is a well known law that fluids, whether æriform or liquid, press equally in all directions. The pressure of the atmosphere rises and supports the column of mercury in the common barometer. It is evident, then, with reference to the law in question, that the top of the tube is pressed on with a force equal to the weight of mercury thus supported. So that if an air-tight plug (putting friction out of consideration) were adapted to the top of the tube, this would move downwards to fill the vacuum on the top of the mercury, with as much force as that by which the mercury begins to rise from below. Now as the weight of the mercury varies by the varying length of its column, in the exact same degree does the atmospheric pressure on the top of the tube vary. Suppose now a barometer tube, suspended from one end of a balance, its lower end immersed in mercury, to be exactly balanced by weights placed in an opposite scale pan.

Further, suppose the mercury in this tube to stand at 23 inches. Let now a variation of atmospheric pressure occur as will raise the mercury one inch. It is evident then that the tube is pressed down with a weight equal to this inch of mercury. The heavier end, that to which the barometer tube is attached, will therefore descend, occasioning a

corresponding elevation of the other end of the balance, and of course of the pencil bearing on the register cylinder below.

The indications on the roller may be magnified several times by making the register arm of the balance longer than the other.

Metallic-tube Barometers.—The very great liability of the common barometer to derangement from the entrance of air, and the great danger of destroying the instrument in attempting to expel this by the only efficient mode—viz. boiling the mercury in the tube—has long been the bitter complaint of the scientific traveller and meteorologist. With reference to India, the truth of this remark is abundantly evident. I have met with very few who possess barometers, the uselessness of which, simply from air having entered the tube, did not occasion them to regret their distance from the instrument maker.

Various plans have been invented to prevent, as much as possible, this liability to the entrance of air; amongst which perhaps the best is the walking-stick barometer of Englefield: but all have the common disadvantage of glass tubes, and therefore are subject to be destroyed by fracture when the mercury is attempted to be boiled in them. I consider it practicable to substitute iron for glass, in so much of the barometer as it is necessary to expose to heat to expel air, and consider that the plan, represented by *fig. 2*, of the accompanying sketches, will fulfil that desirable object. A B C represents a tube of malleable iron, which is forged in a straight line, and bent as represented after a hole has been bored through it. The short limb C D consists of a common barometer glass tube, encased in one of brass, the intervening space being filled up with magnesian cement. The lower part of the glass tube passes through a disc of iron, which is convex below to apply exactly to the somewhat hollow expanded end of the metallic tube. On the side of this expanded end is a screw which fits a corresponding one inside of the lower end of the brass tube; by which means the two limbs are firmly connected; also being made to apply exactly, thereby preventing any escape of mercury. In order to ensure the exact adaptation of these two parts, the iron disc and expanded portion of the metallic tube are ground together before the latter is bent.

The part M, or the upper portion of the tube, has a diameter of one inch—the remaining portion is about $\frac{1}{2}$; less would do, but a smaller hole I fear could not be drilled so long. The advantage of having the top of the tube enlarged is twofold—1st, a much shorter portion is required to be ground accurate after boring—and 2dly, the indications in the glass or short limb are greater in the inverse proportion of that of the squares of the diameters of the two parts of the instrument.

It is essential that this enlarged portion of the tube be of uniform diameter or bore—this point must be ascertained before the top L be fixed on. The instrument is to be held perpendicularly, the stop-cock K which cuts off the communication between the two limbs being closed, and the glass limb properly and tightly fixed on, mercury is poured into both limbs. Into the shorter as much mercury is introduced as will bring the top of it within the range of the scale. The longer one is to be filled within a line or two of the top. In this a float carrying a vernier is to be introduced, near the vernier a scale of inches and parts of an inch. This arrangement being made, the stop-cock is turned so as to allow a certain quantity of mercury to flow from the longer into the shorter limb. The descent of the float in the former ought to have a certain proportion to the length of that in the shorter limb—the proportion above stated being inversely as the square of the diameters.

If this proportion (which by means of the respective scales and verniers can easily be known, to $\frac{1}{36}$ of an inch) hold good, the upper part M is perfect as to bore. The lid L is now to be fastened on airtight—it is primarily, however, ground to fit exactly, and has a shoulder all round, corresponding to one on the top of the tube. Moreover it enters this a short way, the exact distance being marked outside by a line or dot.

The brass tube E D has a slit on opposite sides, and extending its whole length—the magnesian cement beneath being removed, the fluctuations of the mercury in the glass tube are seen. The usual scale of inches is affixed to this tube, either on a separate piece of brass, which can be moved to admit of adjustment, or engraved on the tube itself. The vernier G F can be moved up and down the tube, or fixed at any part, by means of the screw G, after which it can be brought to cut the height of the mercury exactly by means of the tangent screw L.

The instrument is now ready to be filled with mercury. The glass limb is first to be removed, then the plug of the stopcock K. Mercury is now poured into the long limb until this is half full, when the whole is placed in a sand bath and the mercury made to boil. When this is effected, more mercury is poured in until the long limb is filled, when the plug K is replaced—turned so as to prevent the escape of mercury, of which the short portion C is next filled and a small funnel, represented by the dotted lines, fixed on the aperture, so that the mouth will be uppermost when the long limb is placed lowermost in the sand bath to which the whole is conveyed, and the mercury boiled, K being previously opened. When cold, the stopcock is turned to cut off communication—the funnel removed, and the glass limb applied. Mercury

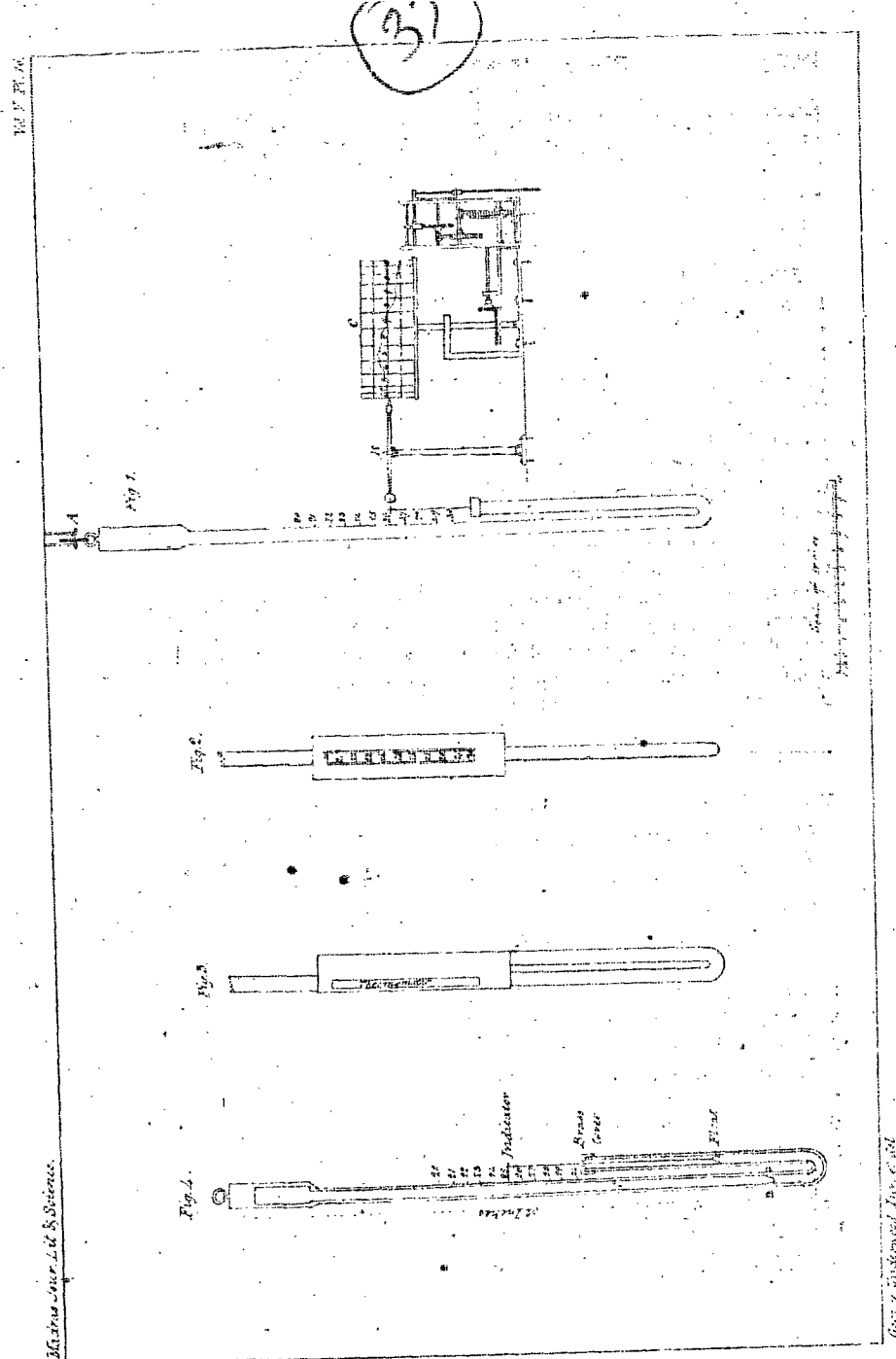
is now poured into this, to stand at the commencement of the scale, or 31 inches. The stopcock being opened puts the instrument in action.

The brass tube surrounding the glass one, forming the short limb, will be a great security to the latter. Nevertheless it would be an advantage to have one or two to apply in the event of accidents.

Fig. 3 is the above form of barometer converted into a self-registering one. The shape of the metallic tube, it will be observed, is the same as in the former one. In place of the glass or short limb, there are two rods A, only one of which is seen. The diameter of the upper portion of the long limb C is two inches—that of B half an inch. In this latter is a float, so constructed that the part immersed in the mercury is of the same specific gravity with that metal, while the part above the surface is as light as possible. The object of this is that when the barometrical column is falling, the light portion of the float will be pushed, as it were, before the mercury; while during descent the heavy portion will be carried along with that fluid. The pencil D is carried on the top of the rod being pressed gently against the register roller E, which, corresponding with X in the balance self-registering barometer, need not be again described. One of the pencil guides is graduated, and the pencil rod furnished with a vernier, so that, the height of the mercurial column being thus ascertained, the pencil is set at zero—as already explained.

V.—*Explanation of the Sketch of a New Indestructible Portable Mountain Barometer.*—By Captain GEORGE UNDERWOOD, of the Madras Engineers.

The tube represented in the sketch is intended to be precisely the same as the glass one used in Gay Lussac's, but constructed of iron, and of the dimensions attached. The projections below marked *aa*, indicate an inverted cone in the tube, to prevent air rising to the vacuum, and also to check the motion of the mercury while travelling. A thin rod of iron, with tight stoppers at each end, is inserted in the short tube while moving, and a brass cap fixed on the top effectually prevents the loss of any mercury. On the surface of the mercury in the short leg, floats a very light wafer of cork, to which is attached a straight upright wire, with an indicator at the upper end, moving along a scale, each division of which is equal to $\frac{1}{4.5}$ th of an inch, the cistern at the end of the long tube being four times the capacity of the short leg. The wire moves through a small hole in a brass cap, screwed on the upper end of the short tube, and which hole will also serve to give



access to the atmosphere to exert its pressure on the mercurial column. It is evident that any fluctuations in the height of the columns of mercury will be immediately communicated to the indicator, either by the float being pushed up if the mercury rise in the short tube, or by its sinking down when it falls. The scale, it is unnecessary to observe, must be graduated downwards, and a properly marked vernier attached. To protect the indicator, scale and attached thermometer, &c. a thin cylinder of brass is fitted round the barometer, as explained in the sketch. Two vertical openings are cut in this, which when the brass cylinder is properly adjusted render the scale and thermometer visible; the indicating wire is thus preserved from wind and accident. The scale here marked allows for a range of ten inches, which is considered sufficient, being equivalent to a difference of level of more than 11,600 feet. For particular purposes, however, this may be easily extended. When packed for travelling, the float and its indicator can be nicely fitted into the brass cover before mentioned, and more than one of these should be kept for use. The diameter of the bore being half an inch, with a cistern at top of one-inch diameter, and three inches long, about five lbs. of mercury will be required to fill it, the weight of the iron tube, and other apparatus connected with this barometer, may probably be about $4\frac{1}{2}$ lbs. more; thus the total weight will be under 10 lbs.

EXPLANATION OF THE FIGURES.

FIG. 1.—*Self-Registering Apparatus.*—A—is the screw for adjusting the height of the instrument relative to the clock work; by this it can be raised or lowered at pleasure.—B—a leveller nicely balanced on a knife-edge centre, with a circular ring at one end, to embrace the indicator of the float; at the other end is an ever pointed pencil on Morand's principle, with a small spiral spring within, which keeps it continually pressed against the revolving barrel.—C—The revolving barrel which may carry covers of paper, ass' skin, ivory, &c. The vertical lines represent the hours and minutes; the horizontal lines are inches divided into the usual number of parts. A fresh cover is fixed on every 24 hours, by stopping the machinery and adjusting it to any particular moment, on attaining which by a watch the machinery is started.

Great wheel 120—Second wheel 120, pinion 10—Pallet wheel 90, pinion 6—Motion wheels 30 and 60—Circumference of barrel 24 inches—one revolution in 24 hours.

FIG. 2.—Front view, shewing the brass cover intended to screen the indicating wire from the wind. This cover is moveable round the barometer, and the opening here discloses the scale, which can be easily read off. When travelling this brass cover is moved round so as to protect entirely the scale Thermometer and the wafer with its indicator.

FIG. 3.—Side view—The opening here in the brass cover (adjusted as above to disclose the scale) exposes the Thermometer attached to the Barometer.

FIG. 4.—Tube of thin iron about 1-8th of an inch thick, total length out and out 21 1-8th inches; the shaded part represents the column of mercury.

VI.—*Suggestions for a New Standard for Indian Weights and Measures.*

TO THE EDITOR OF THE MADRAS JOURNAL OF LITERATURE AND SCIENCE.

SIR,—As the attention of Government seems to be particularly directed to whatever may benefit commerce in India, it is probable that the important advantages likely to result from an assimilation of weights and measures, as well as of coinage, throughout this country, will not be disregarded much longer.

Before standards are fixed, no trouble should be spared in considering the subject in all its bearings; in order that the most convenient possible may be decided on. The more, therefore, it is discussed the better, and, though the following observations may contain nothing new, or the views expressed in them may be incorrect, they may be useful as likely to elicit more valuable remarks, and, on that account, worthy a place in your Journal.

I am, Sir, yours very obediently,

B.

The inconvenience which must follow a change, that may affect every purchase throughout the country, must necessarily be considerable. But, is not the present system, which obliges every merchant, every one who buys or sells, to change his calculation of weights and measures, whenever he changes his residence from one country to another, or, frequently, from one village to another, productive of as great, or even greater, inconvenience, than will be caused by the one change resulting from the Government adopting and enforcing a new standard? Will it not eventually become necessary to adopt one, when the trade of the country is in that flourishing condition, in which the rulers of the country, as well as most others, wish to see it? And is it not desirable, therefore, that it be introduced now, when with less commerce there will be less inconvenience? In England, within a very few years, the measures of liquids and grain have been assimilated; yet very little has been heard of the inconvenience, even in that commercial country; and the advantages of the new decimal system in France, have, long ere this, compensated for the temporary disadvantages and inconvenience that attended its introduction.

The native unit of measure in the Tamul country is the grain of paddy in the husk—1,800 grains of this make one *álakoo*, or *olluck*, eight of which form a measure, *puddi*, *nári* or *seer*: the weight of this quantity of paddy being the unit of weight. Whatever difference there may be in the measures in use in different villages, this is the table of measure taught the children in Tamul schools with their alphabet; and, it is probable, was the universal one, when the country was under one Hindoo government, if it ever were so. The proportions of the measures vary but little, and although the *marcal* or *koorooni* may be

of different size, the *puddi*, or measure, at the same place, is almost always the same aliquot part of it.

The standard of length in Malayalum is a small seed called in the language of that country *yevun*; but, excepting there, the English yard, foot and inch are in general use among the natives of this Presidency. The acre is completely introduced in the Salem district, and the Madras *cawny** is in general use in the measurement of rice fields in every district of the Presidency, notwithstanding the original land measures were as various as the weights or measures of grain. These alterations have taken place quietly and gradually, and show that similar changes may be effected without extreme inconvenience.

The pendulum is a standard of length not easily to be brought into common use in India; but the newly coined rupee is a measure of length and weight furnished and certified by government, easily applicable, constantly at hand—(although not in the abundance one might desire, yet generally sufficient for the verification of weights, &c.)—not liable to vary in dimension, and depending upon the accurate and absolutely unchangeable standards of measurement established in Europe. It is probable that this use of the coin may have been thought of, when its diameter was fixed at one tenth of a foot. It would have been more convenient, had it been made exactly, probably, one inch, and had the ends of the diameter been marked by larger dots in the milling; in which way the subdivisions of the inch into eighths or tenths might also have been shown.†

The *pāgoda* and rupee have been occasionally referred to, in fixing the weights in use at Calcutta and Madras. I would propose the latter as the universal standard; changing not the names but the quantity of the measures and weights at present in use. In lieu of making the relation of the measures to weights depend upon paddy, I would have it depend upon water, as less variable and the principal change would be fixing the *pullum* weight universally at 3 rupees weight = 540 grains, instead of at 10 *pāgoda*s weight = 547 grains.

* The Madras *cawny* is a more convenient measure than the English acre. It is an exact square of 210 feet sides; very nearly half a circle of 400 yards circumference, and since it contains 6,400 yards square, is divisible into 16 or 320 parts without remainder. The advantage of this is evident when it is considered that the Tamul fractions have always 320 its multiple or measure for denominator, and that the fractions in use among other natives of India are in like manner measures or multiples of 16. In this Presidency, too, the *cawny* is already more generally known.

† It is questionable, also, whether the gratuitous information contained in the words on the reverse "*one rupee*" and "*yek roopae*" might not be advantageously replaced with something else.

Coins themselves might be made vehicles of useful information. Their relation to one another, and their weight and measurement, might all be stamped on them. I do not see why the English digits and alphabet might not be inscribed on the reverse of the copper and silver coin, &c. The moralist would be pleased to see knowledge and riches thus go together!

The following table shews the alteration that this would effect in the Maund and Candy, as well as particulars.

Weight in Rupees.		Proposed weight. Grains.	Old weight. Grains.	New weight, less in lbs. and grains avoirdupois.	WATER.
3	1 Pullum.....	540	547	7 grs.	1 Alakoo.....
24	{ 1 Small seer }	4330	4373	55 "	1 puddi = 54 f. oz.
75	{ 40 to a maund }			172 "	1 Marcal = ..
120	Seer of 25 pullum	13500	13673	275 "	1 Garce = ..
960	1 Vies of 40 do.	3 lbs. 600 grs.	3 lbs. 675 grs.	2200 "	
19,200	1 Maund.....	24 lbs. 4800 "	25 lbs.	6 lbs. 2000 "	PADDY.
3,000	1 Candy.....	493 lbs. 5000 "	500 lbs. *	2 lbs. 6000 "	1 Alakoo.....
	1 Maund(Bengal)	77 lbs. 1000 "	80 lbs.		1 Puddi weighs 1
					1 Marcal 9
					1 Garce..... 3,60,0

Were these adopted, the measures at Madras might remain the same, and the weights would be altered so little that I apprehend trifling inconvenience would be felt there.

There would be, perhaps, some disadvantage in the weights not remaining equal to even numbers of pounds English. The rupee † is not an even measure of the avoirdupois pound of 7,000 grains, and, without relinquishing it as a standard, it appears to me that this cannot be effected.

The weight of the 4 pice piece $\frac{1}{4}$ of a rupee, is about 134½ grains; ‡ a weight, however, less convenient than that of the rupee as regards English measures.

Should a decimal system be introduced, coins as well as weights must be altered. The unit might then conveniently be the English pound sterling; the rupee being one tenth, and smaller coins, tenths and hundredths of it, the latter very nearly corresponding with the English farthing. The foot would be the unit of length, the rupee's diameter being one tenth. The weight of one pound sterling, or ten rupees in silver, might be the unit of weight, and the quantity of water weighing ten rupees the unit of quantity. The advantage of the decimal system,

* It may be remarked that the *Candy* being fixed at 500 lbs. English, and the *Maunds* at 25 lbs. and 80 lbs. shew European alteration already effected.

† The Company's rupee weighs 180 grains, or 3 drams apothecaries weight; 32 rupees weigh one pound apothecaries or troy weight. 350 rupees weigh 9 pounds avoirdupois weight. A cubic foot of water weighs 1,000 ounces avoirdupois, or 437,500 grains, or 2,430 $\frac{5}{9}$ Rupees.

‡ It is much to be regretted that the Commissioners in England should have preserved the two different pounds weight, or at least that they should not have made the troy pound and avoirdupois pound to bear a more convenient proportion to one another than 5,760 to 7000.

§ If the alloy of the rupee is copper, the value of that metal appears to be $\frac{1}{50}$ th part of that of silver—and the rupee worth 6,450 grains of copper nearly.

and the convenience arising from its facility of arithmetical reduction, would not be felt so immediately by the native community to whom generally the decimal fractions* are unknown. For them the continued division by 4 would be more convenient, as it is that to which they are accustomed, and to which their notation is adapted. It also should not escape remark that the proportions of weights, &c. however arbitrary they may seem, have doubtless been regulated by convenience, and relatively to the value, the size of the packages, and the methods of transporting the articles weighed or measured.

VII.—On the Induration of Mortar.

The paper on this subject in the April number of the Journal, has recalled my attention to an enquiry which formerly much interested me, and its general usefulness will be my excuse for offering the following observations on it.

The strength of cements may be compared by attaching bricks to a wall of the same material, added one by one (each being allowed to dry before a second is applied) until by the weight the cohesion of the cement is overpowered, and the mass breaks off from the wall. In the 285th page of Barlow's 'Essay on the strength and stress of Timber' some experiments made by J. Brunel, Esq. in this manner are mentioned; and, by comparison with these, the relative cohesion of Indian and British cements may be ascertained.

The use of sugar (*jaggry*) in the preparation of cements is attributed to two causes; its being partly composed of carbon and oxygen, and

* India in bestowing the decimal arithmetic upon Europe seems to have forgotten it herself. At least the Mahrattas, Canarese, Malialies, Telingas, and Tamulians as well as the Musulmans, make use of different fractional systems, while the notation of the Tamulians and Malialies, is very defective, compared with the rest, the digits not deriving value from position, so that thirteen of them are required to represent the number 2,231,567.

The publishers of books in the native languages would have done well to have made use only of English numerals and notation, which would have assisted their introduction throughout India.

Since the forms of 5 of the 10 digits are the same in English, Mahratta, Sanscrit, Canarese and Telooogo, there can be little doubt that an order that the English notation only should be used in Cutcheries after the 1st of January 1837, would be easily obeyed, and it may be remarked that were the English figures used, it would be easy for the European officers themselves to examine and correct accounts without translation, and that the copying of them might be saved by having the headings written in the native languages, and those translated in English. Considering how voluminous accounts are, the saving of stationery and writers' labour would not be so trifling as to be unworthy of consideration.

The European vulgar fractions are infinitely more convenient than those of the natives, both Hindoos and Mahomedans, which, among other objections, admit only of a limited number of denominators.

consequently able to afford carbonic acid to assist in the conversion of the hydrate of lime into carbonate, and the property that substance has of, in a peculiar manner, facilitating the solution of the alkaline earths in water.

With regard to the *jaggry* supplying carbonic acid to the mortar, I have made the following calculation, shewing that, in order to give sufficient carbon, 48 parts of sugar must be mixed with every 100 of unslaked lime. But, as the quantity used is but one lb. to 288 lbs. of slaked lime, it appears improbable that the *jaggry*, if useful, is so on this account.

4.68 parts of hydrate of lime contain	To which add 1.73 parts of sugar containing	There will result
3.56	Lime..... 0	3.56 lime.
.94	Oxygen..... .801	1.741 oxygen.
.185	Hydrogen..... .179	.75 carbon.
	Carbon..... .75	.364 hydrogen.

To which, if .259 of oxygen, obtained from the water or air, be added, there will be oxygen and carbon in the due proportion to make 2.74 of carbonic acid; which, with 3.56 lime, will form 6.30 carbonate of lime. Now 3.56 : 1.73 : : 100 : 48.

It must be particularly noticed that, in order that the mortar should harden, it is not merely necessary that the lime should be thoroughly carbonated. Common chalk and shells are as completely carbonate of lime, as are the calcarious spar or marble; yet the hardness of the former substances is very inferior to that of the latter.

The hardness of the mortar probably depends upon crystallization. A writer, quoted in the Encyclopædia Britannica, says, that the lime crystallizes and entangles the sand in its crystals. Now, in order that crystallization may be effected, it is requisite that the crystallizable matter be dissolved, in the first instance—and the *jaggry*, in assisting the solution, probably assists crystallization. The use of lime water—i. e. a crystallizable solution of lime in water, instead of common water, has, I know, been practised by the Madras engineers at Nagpore, if not elsewhere, and with good effect. Water dissolves but 1-450th part of lime, but the addition of sugar would enable it to dissolve a larger quantity, in proportion as a larger quantity of sugar was employed.

It appears to me probable, therefore, that it would be found a good method to use, instead of a solution of *jaggry* in water, as is the present practice of the bricklayers in this country, a solution of *jaggry* in water, which should afterwards be saturated with lime, and then made use of to moisten the mortar, when the brickwork is being built. There would thus be used, in an early stage of the building, water holding a quantity of the lime in a crystallizable state, which,

as I have found from experiment, would rapidly deposit crystallized carbonate of lime and assist the mortar in hardening. The deposit takes place even under water, shewing, perhaps, a property necessary in water cements.

In Spain, and in some parts of this country, a mixture of chunan and fish oil is used for the purpose of defending the bottom of vessels, to save the expense of coppering them. This composition gets covered with sea-shells, and it is necessary to chip it off and replace it every now and then. When first applied, it is soft as putty, but in the course of a fortnight it hardens, and after some time becomes so hard that it is cut with a heavy axe with great difficulty. It appears likely that this would be found a very useful water cement, especially with sea water, and, as it is not likely to make any great difference with what description of oil it is made, a cheap one, too.

I am not chemist enough to answer the question whether the sugar and the oil act upon lime after being changed into a state analogous to oxalic acid. It may be useful to remark that the three substances are composed of the same elements, and not in very different quantities, and that oxalic acid is that which has the strongest affinity for lime as well as for magnesia.

The quantity of lime that should be mixed with sand, in order to produce the strongest mortar, has been frequently discussed, and very various indeed have the results of these discussions proved—as, indeed, might have been expected from experiments which do not appear to have been carried on in the same manner. The first paragraph of these remarks shews a good and easy method of trying the cohesion experimentally. Theoretically, it may be considered that all that is not brick or stone in a building must be mortar, in order that it should be one solid mass. In like manner, it may be considered that all that is not sand in a quantity of mixed mortar which has dried should be carbonate of lime. Now, if you take a tumbler, and fill it with dry sand, you may afterwards pour into it without spilling rather more than half as much water (by measure) as you put sand: consequently the sand does not fill half the space that it occupies. Hence it would appear that mortar should consist by measure of equal quantities of carbonate of lime and of sand—or further, that, since 630 parts of carbonate of lime contain 356 of lime, that the proportion should be 356 parts of lime (or 498 parts of hydrated, or slaked, lime) to 630 parts of sand—which is nearly in the proportion of two to three. It is to be remarked that if coarse sand be mixed with fine a larger part of the space occupied will be filled; and also, that this proportion of two to three is that in use among *maistries* in this country.

With regard to the quantity of mortar that should be used with bricks, this must depend on the closeness and goodness of the work. If 1,000

bricks of the regulation size (the thickness of which, by the bye, is too great for the native method of burning bricks) be allowed to 66 cubic feet, and 100 bricks are deducted for breakage loss by carriage, &c. the remaining 900 will fill $47\frac{1}{2}$ feet, and $18\frac{1}{2}$ remain to be filled by mortar; or as a *parrak* measures $2\frac{5}{6}$ feet, about 6 *parraks* and a half—so that $2\frac{1}{3}$ *parraks* of slaked lime, $3\frac{1}{2}$ *parraks* of sand, and 900 bricks, appear to be a just proportion. B.

VIII.—On the Homöothermal method of Acclimating Extra-Tropical Plants within the Tropics.—By ROBERT WIGHT, ESQ. M. D. &c. &c.

TO THE EDITOR OF THE MADRAS JOURNAL.

DEAR SIR,—Believing the views, propounded in the accompanying observations on the acclimating of extra-tropical plants in tropical climates, of much importance to this country, I am very desirous of having them speedily subjected to the only test that can determine their value—carefully conducted experiment—both in India and Europe: you will therefore much oblige me by giving them a place in the forthcoming number of the *Madras Journal*. Early publicity is desirable, because it is to the philosophers of Europe (enjoying as they do unrivalled facilities for conducting the enquiry, as well by the juxtaposition of two climates, as by their skill in performing experiments) that we must look for the final determination of the truth or fallacy of my deductions from the few facts already ascertained. As the paper was originally written while encamped on the Pulney mountains, separated alike from books and every collateral source of information, I do not hold myself responsible for having overlooked the works of other labourers in the same field, if such there be, for truly I know of none. The principles have long been public property, but their application, in the manner here proposed, has never, I believe, been recommended by any one.

I remain, dear Sir,
Yours, &c.

ROBERT WIGHT.

SALEM: 24th November, 1836.

Numerous analogies between vegetable and animal life have been observed and dwelt upon, by nearly all writers on vegetable physiology. This knowledge has, however, been but little applied to the advancement of horticulture, and not at all to that of agriculture; so far at least as I yet know: and I think I may with safety assert, that it has never till now been proposed, so to act upon the principle which governs the functions of vegetable life, as to alter entirely the constitution of the plant, and thereby qualify it, though originally from a cold or temperate climate, to endure, uninjured, the extreme heats of the tropics. To produce this change is the object of the Homöothermal method of acclimatizing plants: to point out how it may be accomplished, is the purpose of my present communication.

The effect of cold in preparing plants for forcing, has been long known, and is now constantly employed for that purpose, but the application of heat to seeds during the act of germination, as means of enabling them afterwards to resist, uninjured, high temperatures, has never been had recourse to on principle, and but seldom as a chance experiment. Two such experiments, however, have been recently recorded in the Transactions of the Agricultural and Horticultural Society of India.* These I shall briefly recapitulate, and then explain the principles on which their respective results may be accounted for, and lastly show their application to the improvement of agriculture, and the acclimating of foreign plants. The following extract, from a report of a Committee of the Society of Arts, explains the successive steps of the first of these experiments, conducted by Mr. Anderson, Curator of the Chelsea botanic garden, for the introduction of Joomla rice (a very hardy plant) into England. He was furnished with some seeds of five varieties of hill rice. "They were sown in March, and some of each kind germinated, and did very well while they were kept in the hot-house. In May they were removed to the green-house, where they became stout and healthy plants. In the end of June, they were transferred to a sheltered place in a basin for the growth of aquatic plants, having 9 inches depth of water, and 12 of mud. Here they grew and promised well till the beginning of August, when the weather becoming cloudy and rather cold, they became sickly, and were all dead by the beginning of September, without having come into flower. It seems therefore evident, that the temperature even of the warmer parts of England is not sufficient for the cultivation of hill rice."

The second was made by G. T. F. Speed, Esq. of Calcutta. He "after repeated and disheartening failures with celery and some other English seeds, at last resorted to the plan, almost unthought of in India, of making a hot bed." In this he sowed his seed on the 24th

November. On the 4th December they germinated, and on the 10th of January he planted them out in trenches. During the time they were in the bed he daily moistened them with water that had been exposed for several hours to the heat of the sun: and, on the 11th May, a bundle of red celery, sent to the Society with his communication, is recorded "very fine considering the late season of growth."

Can the opposite results of these experiments be referred to any fixed principle, governed by the laws of organic life, which, if discovered, could be successfully applied to the introduction of foreign plants into tropical climates?

I think they can, but, to explain the principle, I must seek the aid of animal physiology, from the laws of vitality being better understood, and more cognizable by the senses, in animals than in vegetables.

Animals are endowed with a principle of life, only known to us by its effects, but the laws of which have been carefully studied. It has received the name of Excitability or Irritability (I prefer the former term) from its property of being acted on, and excited, by the application of external agents: the agents are called stimulants; and the action excitement. Excitability increases in proportion as we reduce excitement by the abstraction of stimuli, and diminishes with their application: hence a person famished with hunger has his excitability so increased, that the stimulus of the mildest food induces violent excitement, and a person frozen will, from the same cause, be destroyed by heat of a moderately warm room. On the other hand, a person in the habit of maintaining considerable excitement by the habitual use of stimulants, cannot bear their privation so well or for so long a time as one habitually temperate; nor does the same quantity of stimuli produce in each an equal degree of excitement; on the contrary, the quantity that would produce high fever and rapid exhaustion in the one, is barely sufficient to preserve health in the other. Excitement is the process by which excitability is reduced, and kept within the bounds consistent with the health and well being of the animal; and by the graduated use of stimulants, we can so modify the susceptibilities of this vital principle, that a considerable degree of stimulation becomes necessary for the maintenance of the organic actions, by which the functions of life, assimilation, circulation and transpiration, are carried on: or, by their abstraction we can raise the susceptibility so high that a slight stimulus will cause great excitement. Excitability is then equivalent to privation of stimuli, excitement to their excess. Excitability being high, a slight stimulus produces violent action, if low, strong stimulants produce little excitement. Let us now apply these principles of animal to vegetable life, and see whether they afford us a satisfactory solution of the question proposed, and prove the

* Vide vol. 3 pages 88 and 89—103, 104 and 119.

identity of the vital principle which governs both animal and vegetable existence.

Mr. Anderson commenced his experiment, by changing, through the application of the stimulus of heat to the germinating seed, the character of his subjects, from hardy extra-tropical, to tender tropical plants, and then concludes, that they are naturally too tender to withstand the cold nights of an English autumn. Mr. Speed by the application of heat, at precisely the same stage of their existence, changes his from hardy to tropical plants, and then successfully rears them in a tropical climate. Both are surprised at the result, while in truth, on the principles here explained, the success of the one was as certain as the failure of the other. Had Mr. Anderson sown his seed in autumn, in the open air, as he would have done winter wheat, and as is done in their native country, their power of resisting the cold of its almost Siberian climate, would easily have protected them against the much milder winter of England; while their excitability, accumulated by the long privation of the stimulus of heat, would have prepared them to start vigorously on their course to maturity with the first heats of spring, and, in all probability, they would have matured their crop in the course of the summer or early in autumn. Mr. Speed having failed in rearing celery by adopting the contrary practice, with most commendable perseverance, determined to sprout his seeds in a hot bed, and is rewarded by the possession of a plot of fine celery in May. From this it would appear, that plants raised from European seeds, if germinated in cool shaded beds, retain in a high degree their excitability, unfitting them for successful culture in a hot climate; but which is exhausted by the application of heat to the germinating seed, and their constitutions so modified and assimilated to the climate, as not only to resist a high temperature; but even to render it necessary to their after existence.

Does the seed of plants so altered, retain the tropical character communicated to the parent?

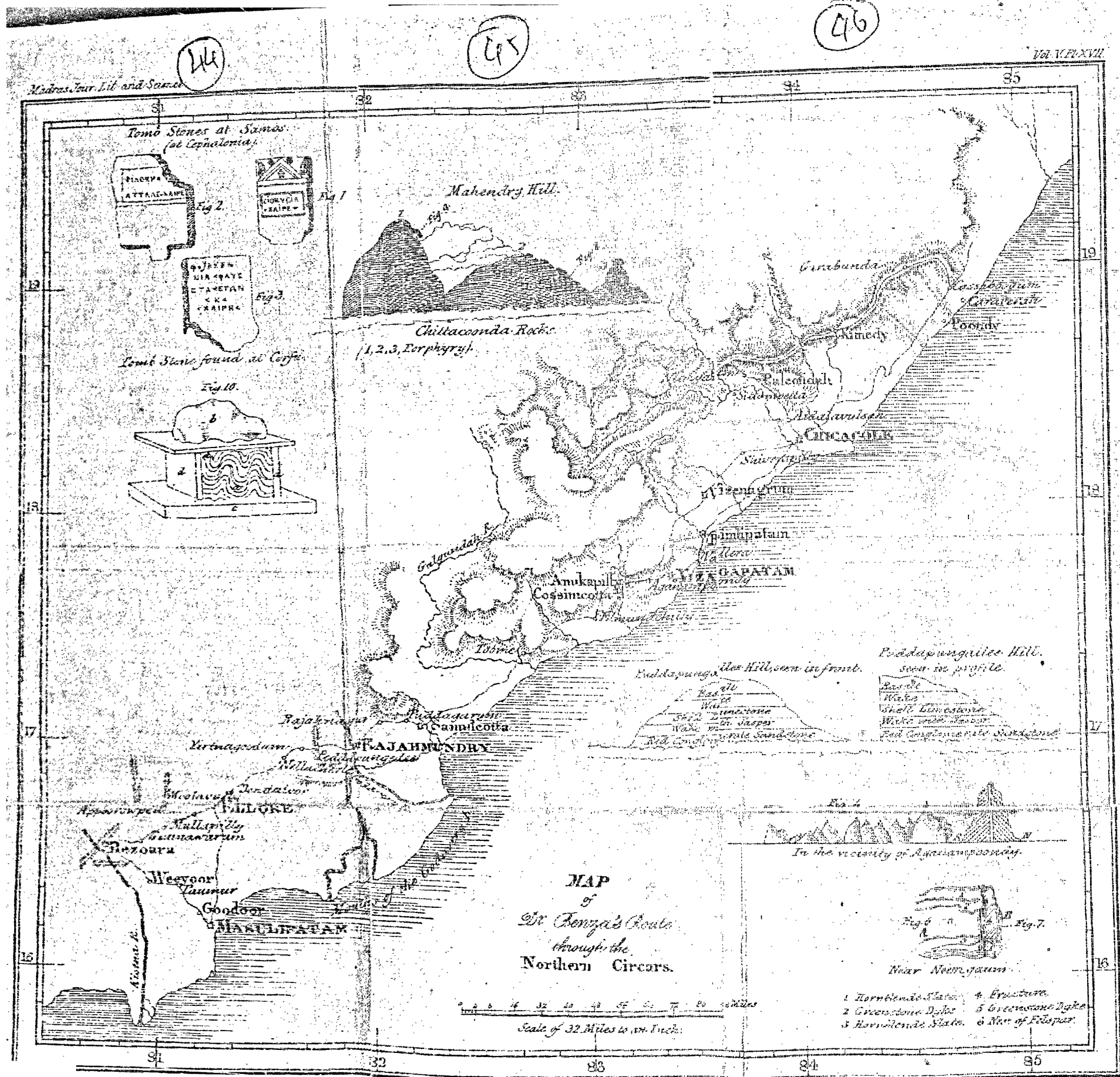
In the present state of our knowledge it is impossible to answer this question, as not a single fact exists directly bearing on the subject: but, reasoning *a priori*, I can see no reason for doubting that they would in the second, if not in the first generation; and if numerous and carefully conducted experiments prove this to be the case, I have no hesitation in assuming, that the two experiments which form the basis of this communication, have led to the most important and valuable discovery ever made in the science of agriculture, in connection with vegetable physiology. It is almost superfluous to add, that the obvious deduction from them is, that we may, if we choose, see the plains of India, and not of India only, but of the whole torrid zone, covered with the highly nutritious grains and roots of Europe, in place of the very inferior ones now in use. Nor need we confine ourselves

to the introduction of Karyococcus
45-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-1222-1223-1224-1225-1226-1227-1228-1229-1230-1231-1232-1233-1234-1235-1236-1237-1238-1239-1240-1241-1242-1243-1244-1245-1246-1247-1248-1249-1250-1251-1252-1253-1254-1255-1256-1257-1258-1259-1260-1261-1262-1263-1264-1265-1266-1267-1268-1269-1270-1271-1272-1273-1274-1275-1276-1277-1278-1279-1280-1281-1282-1283-1284-1285-1286-1287-1288-1289-1290-1291-1292-1293-1294-1295-1296-1297-1298-1299-1300-1301-1302-1303-1304-1305-1306-1307-1308-1309-1310-1311-1312-1313-1314-1315-1316-1317-1318-1319-1320-1321-1322-1323-1324-1325-1326-1327-1328-1329-1330-1331-1332-1333-1334-1335-1336-1337-1338-1339-1340-1341-1342-1343-1344-1345-1346-1347-1348-1349-1350-1351-1352-1353-1354-1355-1356-1357-1358-1359-1360-1361-1362-1363-1364-1365-1366-1367-1368-1369-1370-1371-1372-1373-1374-1375-1376-1377-1378-1379-1380-1381-1382-1383-1384-1385-1386-1387-1388-1389-1390-1391-1392-1393-1394-1395-1396-1397-1398-1399-1400-1401-1402-1403-1404-1405-1406-1407-1408-1409-1410-1411-1412-1413-1414-1415-1416-1417-1418-1419-1420-1421-1422-1423-1424-1425-1426-1427-1428-1429-1430-1431-1432-1433-1434-1435-1436-1437-1438-1439-1440-1441-1442-1443-1444-1445-1446-1447-1448-1449-1450-1451-1452-1453-1454-1455-1456-1457-1458-1459-1460-1461-1462-1463-1464-1465-1466-1467-1468-1469-1470-1471-1472-1473-1474-1475-1476-1477-1478-1479-1480-1481-1482-1483-1484-1485-1486-1487-1488-1489-1490-1491-1492-1493-1494-1495-1496-1497-1498-1499-1500-1501-1502-1503-1504-1505-1506-1507-1508-1509-1510-1511-1512-1513-1514-1515-1516-1517-1518-1519-1520-1521-1522-1523-1524-1525-1526-1527-1528-1529-1530-1531-1532-1533-1534-1535-1536-1537-1538-1539-1540-1541-1542-1543-1544-1545-1546-1547-1548-1549-1550-1551-1552-1553-1554-1555-1556-1557-1558-1559-1560-1561-1562-1563-1564-1565-1566-1567-1568-1569-1570-1571-1572-1573-1574-1575-1576-1577-1578-1579-1580-1581-1582-1583-1584-1585-1586-1587-1588-1589-1590-1591-1592-1593-1594-1595-1596-1597-1598-1599-1600-1601-1602-1603-1604-1605-1606-1607-1608-1609-1610-1611-1612-1613-1614-1615-1616-1617-1618-1619-1620-1621-1622-1623-1624-1625-1626-1627-1628-1629-1630-1631-1632-1633-1634-1635-1636-1637-1638-1639-1640-1641-1642-1643-1644-1645-1646-1647-1648-1649-1650-1651-1652-1653-1654-1655-1656-1657-1658-1659-1660-1661-1662-1663-1664-1665-1666-1667-1668-1669-1670-1671-1672-1673-1674-1675-1676-1677-1678-1679-1680-1681-1682-1683-1684-1685-1686-1687-1688-1689-1690-1691-1692-1693-1694-1695-1696-1697-1698-1699-1700-1701-1702-1703-1704-1705-1706-1707-1708-1709-1710-1711-1712-1713-1714-1715-1716-1717-1718-1719-1720-1721-1722-1723-1724-1725-1726-1727-1728-1729-1730-1731-1732-1733-1734-1735-1736-1737-1738-1739-1740-1741-1742-1743-1744-1745-1746-1747-1748-1749-1750-1751-1752-1753-1754-1755-1756-1757-1758-1759-1760-1761-1762-1763-1764-1765-1766-1767-1768-1769-1770-1771-1772-1773-1774-1775-1776-1777-1778-1779-1780-1781-1782-1783-1784-1785-1786-1787-1788-1789-1790-1791-1792-1793-1794-1795-1796-1797-1798-1799-1800-1801-1802-1803-1804-1805-1806-1807-1808-1809-1810-1811-1812-1813-1814-1815-1816-1817-1818-1819-1820-1821-1822-1823-1824-1825-1826-1827-1828-1829-1830-1831-1832-1833-1834-1835-1836-1837-1838-1839-1840-1841-1842-1843-1844-1845-1846-1847-1848-1849-1850-1851-1852-1853-1854-1855-1856-1857-1858-1859-1860-1861-1862-1863-1864-1865-1866-1867-1868-1869-1870-1871-1872-1873-1874-1875-1876-1877-1878-1879-1880-1881-1882-1883-1884-1885-1886-1887-1888-1889-1890-1891-1892-1893-1894-1895-1896-1897-1898-1899-1900-1901-1902-1903-1904-1905-1906-1907-1908-1909-1910-1911-1912-1913-1914-1915-1916-1917-1918-1919-1920-1921-1922-1923-1924-1925-1926-1927-1928-1929-1930-1931-1932-1933-1934-1935-1936-1937-1938-1939-1940-1941-1942-1943-1944-1945-1946-1947-1948-1949-1950-1951-1952-1953-1954-1955-1956-1957-1958-1959-1960-1961-1962-1963-1964-1965-1966-1967-1968-1969-1970-1971-1972-1973-1974-1975-1976-1977-1978-1979-1980-1981-1982-1983-1984-1985-1986-1987-1988-1989-1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-2010-2011-2012-2013-2014-2015-2016-2017-2018-2019-2020-2021-2022-2023-2024-2025-2026-2027-2028-2029-2030-2031-2032-2033-2034-2035-2036-2037-2038-2039-2040-2041-2042-2043-2044-2045-2046-2047-2048-2049-2050-2051-2052-2053-2054-2055-2056-2057-2058-2059-2060-2061-2062-2063-2064-2065-2066-2067-2068-2069-2070-2071-2072-2073-2074-2075-2076-2077-2078-2079-2080-2081-2082-2083-2084-2085-2086-2087-2088-2089-2090-2091-2092-2093-2094-2095-2096-2097-2098-2099-2100-2101-2102-2103-2104-2105-2106-2107-2108-2109-2110-2111-2112-2113-2114-2115-2116-2117-2118-2119-2120-2121-2122-2123-2124-2125-2126-2127-2128-2129-2130-2131-2132-2133-2134-2135-2136-2137-2138-2139-2140-2141-2142-2143-2144-2145-2146-2147-2148-2149-2150-2151-2152-2153-2154-2155-2156-2157-2158-2159-2160-2161-2162-2163-2164-2165-2166-2167-2168-2169-2170-2171-2172-2173-2174-2175-2176-2177-2178-2179-2180-2181-2182-2183-2184-2185-2186-2187-2188-2189-2190-2191-2192-2193-2194-2195-2196-2197-2198-2199-2200-2201-2202-2203-2204-2205-2206-2207-2208-2209-2210-2211-2212-2213-2214-2215-2216-2217-2218-2219-2220-2221-2222-2223-2224-2225-2226-2227-2228-2229-2230-2231-2232-2233-2234-2235-2236-2237-2238-2239-2240-2241-2242-2243-2244-2245-2246-2247-2248-2249-2250-2251-2252-2253-2254-2255-2256-2257-2258-2259-2260-2261-2262-2263-2264-2265-2266-2267-2268-2269-2270-2271-2272-2273-2274-2275-2276-2277-2278-2279-2280-2281-2282-2283-2284-2285-2286-2287-2288-2289-2290-2291-2292-2293-2294-2295-2296-2297-2298-2299-2300-2301-2302-2303-2304-2305-2306-2307-2308-2309-2310-2311-2312-2313-2314-2315-2316-2317-2318-2319-2320-2321-2322-2323-2324-2325-2326-2327-2328-2329-2330-2331-2332-2333-2334-2335-2336-2337-2338-2339-2340-2341-2342-2343-2344-2345-2346-2347-2348-2349-2350-2351-2352-2353-2354-2355-2356-2357-2358-2359-2360-2361-2362-2363-2364-2365-2366-2367-2368-2369-2370-2371-2372-2373-2374-2375-2376-2377-2378-2379-2380-2381-2382-2383-2384-2385-2386-2387-2388-2389-2390-2391-2392-2393-2394-2395-2396-2397-2398-2399-2400-2401-2402-2403-2404-2405-2406-2407-2408-2409-2410-2411-2412-2413-2414-2415-2416-2417-2418-2419-2420-2421-2422-2423-2424-2425-2426-2427-2428-2429-2430-2431-2432-2433-2434-2435-2436-2437-2438-2439-2440-2441-2442-2443-2444-2445-2446-2447-2448-2449-2450-2451-2452-2453-2454-2455-2456-2457-2458-2459-2460-2461-2462-2463-2464-2465-2466-2467-2468-2469-2470-2471-2472-2473-2474-2475-2476-2477-2478-2479-2480-2481-2482-2483-2484-2485-2486-2487-2488-2489-2490-2491-2492-2493-2494-2495-2496-2497-2498-2499-2500-2501-2502-2503-2504-2505-2506-2507-2508-2509-2510-2511-2512-2513-2514-2515-2516-2517-2518-2519-2520-2521-2522-2523-2524-2525-2526-2527-2528-2529-2530

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MAP
of
Mr. Tenzey's Route
through the
Northern Circars.

Scale of 32 Miles to an Inch.

- 1 Hornblende Slate
- 2 Greenstone Dyke
- 3 Hornblende Slate
- 4 Granite
- 5 Greenstone Dyke
- 6 Mt. of Rajahmundry

to the introduction of the herbaceous forms only, but may, by applying the same principles to the arborescent vegetation of temperate climates, extend it to the tropics, thereby supplying ourselves, not only with the products of the farm and kitchen garden, but of the forest and orchard. On these grounds I cannot refrain from soliciting—urgently entreating—all those enjoying opportunities of making experiments, both in India and Europe, to unite in their endeavours to confirm by repeated trials the truth or fallacy of the principles I have deduced from the facts and analogies above stated.

IX.—*Notes, chiefly Geological, of a Journey through the Northern Circars in the year 1835.*—By P. M. BENZA, Esq. M. D.

Sono, prima d' ogni altro, da compararsi i varii, e slegati fenomeni già posti, e raccolti dalla osservazione, e dall' esperienza, così ad uno ad uno, come tutti insieme; per vedere in che si convengano, o peravventura si differiscano.—*Scienza. Introd. alla Fisica Sperimentale.*

MASULIPATAM, Jan. 16, 1835.—We disembarked at this place from Calcutta, and proceeded to the camp, pitched about a mile from the place of debarkation. I felt distinctly that we were passing through an unhealthy, marshy situation, the atmosphere having the characteristic odour of such pestiferous places, arising from the putrefaction of the lacustrine plants the *salicorniæ* principally.

As we traversed the plain, we could not but wonder at the many human skulls scattered over it, having been, as we were told, dug up by jackals, and other animals from their untimely graves. They were those of the unfortunate people, who fell victims to the mortiferous epidemy, which, two years before, carried off a great many European soldiers, and multitudes of the natives.

Although the Right Honourable the Governor's camp was pitched some distance from the unhealthiest part of the plain, yet, the miasmatic effluvia, particularly at night, was powerfully felt. I never recollect the odour so strong, except in the swampy plains of the Acherusian lake (*hodie Fanari*), where, during the heat of the summer months, the exhalations from that vast swamp corrupt the air to such a degree, as to prove exceedingly baneful to the imprudent who ventures to sleep, even one single night, within the influence of these pestiferous exhalations. At Masulipatam, the two nights we slept there, the odour was very strongly developed.

The plain, round Masulipatam, is sandy, having a substratum of clay. In this sand are found many pieces of a concretionary calcareous sandstone, generally speaking mammillary, such as we see in alluvial depo-

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sits* of many places in Europe. This is the only locality, where I did not meet with the substance, so widely spread in the plains of India—the nodular kankar.

In the middle of the Pettah, at the spot where the two principal streets cross each other, are placed erect and arranged in a circular form, thirty-three large slabs of a compact limestone, covered with numerous figures in *basso* and *alto rilievo*, of the most exquisite execution; excelling any in the few places I have visited in India, containing such relics of the remotest antiquity, the Seven Pagodas not excepted. The sculptures at Masulipatam, being cut in compact limestone, of a very fine texture, are susceptible of receiving a delicacy, a kind of majesty in the execution of figures and friezes, which it is impossible to impart to the coarse grained pegmatitic rock of the Seven Pagodas. There is such anatomical correctness in the figures, and so much nature and freedom in their positions and attitudes, that Gaggino† himself would have been proud of acknowledging them as his work.

These sculptured slabs were brought from the ruins of a pagoda, seven miles from Masulipatam; and, by what I remarked in one of them, they must have belonged to a more ancient building, than the pagoda whence they were brought to Masulipatam. One of the largest slabs (more than four feet high) had one of the two surfaces, convex, the other, plane. On the convex one, were multitudes of figures, which covered its whole space, representing processions, sacrifices of animals, and other religious ceremonies, said to be those of the Jain tribe. On the back surface was sculptured a reversed column, the pedestal turned upwards, and the capital downwards; showing that the two faces of the stone had been sculptured and used at two different periods, and for two different buildings.‡

* Doctor MacCulloch describes calcarious concretions found in banks of sand in Perthshire, which "present a great variety of stalactitic forms generally more or less complicated, and often exceedingly intricate and strange, and which appear analogous to those of King George's Sound, and Seewers island." Quarterly Journal, (Royal Institution) Oct. 1833, vol. xiv. page 79--83.

† The celebrated Sicilian sculptor in *basso* and *alto rilievo*.

‡ It is common to find sculptures on both sides of a slab, either as a frieze, architrave, inscription, or other ornaments, in Greece. I discovered in the ruins of ancient Samos in Cephalonia (one of the provinces tributary once to Ulysses), opposite to Ithaca, two sepulchres; the one having on the external surface of the cover the following inscription in ancient Greek: DIONISIA VALE, (Plate 17. fig. 1); and, descending into the sarcophagus, I saw, on the under surface of the same slab, some very old Greek letters, the remains of an inscription, which I could not decypher.

On the cover of the second tomb, externally, there was no sculpture, nor inscription of any kind; but, on turning it was seen, in very rude, and apparently very ancient, Greek characters, the following inscription: PHILOSTRATE ATTATE VALE, (Plate 17, fig. 2). In the island of Corfu (Pheacia, olim), at the summit of Capo Bianco (olim Lencimne) I found a tomb-stone with the following inscription: FULCENNIA FAUSTA, ANNORUM XX. VALE, (Plate 17, fig. 3). On the reverse of this slab there were arabesques, lines, &c, indicating that that side had been probably employed as an ornament in a more ancient building, before it was used as a tomb-stone.

Among the sculptures at Masulipatam there was a piece, apparently part of the entablature of an architrave, which was really in a very refined style; there were figures of lions, tigers, rhinoceroses, buffaloes and men, executed with so much taste, and so exquisitely correct, as to call forth the admiration of all who saw it.

This, and many others of the sculptures attracted the Right Honourable the Governor's attention, who on the spot gave orders for their transmission to a safer, cleaner and more conspicuous place.*

The limestone of these slabs is stratified, and has great similarity to that used for lithographic purposes (No. 1)—colour, yellowish gray—fracture, splintery and dull, occasionally glimmering—semi-transparent at the edges; in short, it resembles magnesian, or some species of the alpine, limestone. I was told that it is quarried on the banks of the Kistna river, near Chindapilly.

GOODNOOR, January 19.—The substratum to the alluvial sand, in the plain between Masulipatam and this place, is blackish clay (No. 2), containing some fresh water shells, such as *ampullaria*, *planorbis*, &c. (No. 3). Just before reaching Poomroo the sandy alluvium is succeeded by the black cotton soil, in which I found also *ampullaria* and *planorbis*.

WEEVOOR, Jan. 21.—Cultivation of all sorts of grains appears to prosper in the environs of Weehoor, and the black soil prevails, in which are found, even at one or two feet depth, under the surface, fresh water shells, of species now existing in tanks.

BEZOARA, Jan. 22.—All the plain between Weehoor and this place has the usual uninteresting, monotonous appearance of the plains of India; but close to the village of Pattamotta, not three miles from Bezoara, we were relieved from this dispiriting sameness, by the sight of elevated land and hills. The knoll, at the foot of which the village stands, is hardly 40 feet above the plain; and another near it has somewhat less elevation. Both are formed of a variety of gneiss, which contains garnets instead of mica; although, in some blocks we see this last mineral not only added to the other three, but sometimes predominating over them (No. 4). We shall see, hereafter, that, in the whole province, this is the predominant rock; the quartz of which has a gray colour, the felspar white, with the appearance and nature of albite; the garnets, generally amorphous, but occasionally crystalline, and of the common colour.

* They have not yet reached their destination, the Museum of the Literary Society.

The different colours of the minerals give to the rock a fine appearance. The direction of the strata in these hillocks is N. and S. dipping east, and, as far as could be judged at that distance (3 miles), the hills west of these last are formed of the same rock, the direction and the dip of the strata being the same as of the eminences near Pottamotta. This species of gneiss seems to decompose easily, the albite being the mineral to decay first. Many blocks, both loose and fixed in the soil, are seen between Pottamotta and Bezoara. This last town is situated close to the left bank of the Kistna, at the eastern side of the hill, whose western base, is washed by the river during the freshes. Two ranges of hills, having the same direction, viz., N and S., confine the river in a kind of gorge; the one to the north, the other to the south, and therefore running in a direction at right angles with the course of the river. The height of both these ridges seems to be the same, about 600 feet above the river.

The water in the Kistna at this season is hardly one-third of the breadth of the river during the monsoon; but during the freshes the waters expand, filling the whole breadth of the bed, reaching the foot of both ranges of hills; and then the stream must be at least a mile and a half broad. It appeared to me that, both above this gap of the hills, through which the river runs, and below it, the country is flat, and nearly on the same level; therefore, what I have read in some publication, of the waters of the river having cut through this chain of hills, does not appear very probable.

In the alluvium, many strata of which are seen on both banks in an horizontal position, are composed of a coarse sand, alternating with those of a greyish clay (No. 5). The rock forming the hill, at the eastern foot of which Bezoara stands, is the gneiss I have just described, the strata being very much distorted and inclined, dipping south. It is not rare to see entire strata formed exclusively either of quartz, or felspar, or hornblende rock, which last lies, dyke-like, among the gneiss.

The direction of the strata is N. E. and S. W. nearly perpendicular to the course of the river, which at this place runs N. W. and S. E. Gneiss is the lowest visible rock about Bezoara, the contortions of the strata of which are well displayed in the sections of the new road at the base of the hill to the left.

GUNNAWARUM, Jan. 23.—Early in the morning we passed over a ridge, the continuation of the Bezoara hill, running eastwardly; it was still dark, so I could not distinguish the nature of the stone composing it; but some specimens I picked up in the road, proved to be garnetic gneiss, analogous to that of Bezoara. The plain near this place displays hardly any blocks of stone, either loose or implanted in the soil, except near

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a deep nullah, where are many masses of quartz-rock, which must have been brought from the distant high hills to the north, and accumulated there for the purpose of building a bridge; the few projecting rocks are the usual garnetic gneiss, often decomposing, the garnets assuming a canceled structure (No. 6).

This gneiss, like all primitive Indian rocks, whether stratified, or massive, contains immense beds, or veins, of quartz. When the other minerals decompose and are removed, the quartz must protrude, and, deprived of support, split into fissures, the pieces being scattered in the plain; or, if the rock be in the declivity of a hill, it is hurled down into the ravines and valleys. In one place, to the right of the road, there is a little elevation of sandstone, with a few blocks projecting at the summit (No. 7) which sometimes assume the conglomerate structure, resembling clay porphyry (No. 8), or conglomerate sandstone (No. 9); over the whole plain, pebbles of quartz and of sandstone are very abundant.

APPOORAPET, Jan. 24.—The Right Honourable the Governor having resolved to stay here for the remainder of this, and all the following day, I did not miss the opportunity of examining the diamond mines, which the Honourable Mr. Russell informed me were only six miles north of this place.

Having made my arrangements for the journey, a tent accompanying me, I started at 5 o'clock next morning in a palanquin. After about three miles having traversed a plain of some extent, near the village of Shingoonoosondum, the guide, who had assured me, with an oath, that he knew the place, began to talk with every person he met, *sotto voce*; which led me to suspect he was ignorant of the place we were going to. Fortunately, meeting a man who understood Hindostanee, and having the memorandum, with which Mr. Russell kindly provided me, of the name of the village close to the mines, I asked for Mullavelly, and immediately the man pointed out a tuft of lofty trees, in the middle of which were seen the huts of the village, I was in search of. He took me, at my request, to the headman of the village who conducted me to the pits, answering, with a captivating affability, all the questions I put to him in our way to the excavations.

The road from Appoorapet to Mullavelly, lies along a sandy plain, which, I am told, is swampy during the heavy rains. Approaching the last mentioned village the plain is bestrewed with blocks and fragments of a very hard conglomerate sandstone, some pieces being of a purplish colour (No. 13). There are also some large blocks of garnetic gneiss, in a state of decomposition (No. 14). But the red sandstone abounds most, although rolled pieces of quartz, with a covering of a ferruginous clay, or carbonate of iron, together with the conglomerate sandstone, are scattered over the plain.

The hollow flat, where the diamond pits are excavated, was a low swampy plain, at the season I visited them, the lower part only containing some water. Being surrounded by a bank, or rising of the soil in a circular manner, it has the appearance of having been once a lake. The banks are formed of the red ferruginous sandy soil, prevailing all round this place; through this plain no river or rivulet flows, and the pools in its lower part dry up about the month of March; and it is then the time when the excavations may be commenced, and not before.

The few hills I could see near this place were those to the north, not above two or three hundred feet above the plain, and covered with underwood, interspersed with large trees. Some miles beyond these hillocks runs another range of hills, loftier than the nearest ones, having, however, the same direction.

The diamond pits are in general excavated at the north end of the bank that surrounds the hollow. Judging from some which were dry, the deepest could not be more than 12 feet; and I observed that, whatever their depth was, they never came to a hard mass of rock. The strata which they penetrate during the search are—first, a grey, clayey, vegetable mould, about a foot or two thick; below this an alluvium, composed of the following pebbles, (not including the diamonds) which have evidently undergone attrition, their angles having been worn off: sandstone similar, to the one already described—quartz—siliceous iron—hornstone—carbonate of iron—felspar—conglomerate sandstone, and a prodigious quantity of kankar, or concretionary limestone (No. 15). Of this last mentioned rock, we must say a little more than of the others; the reason is obvious—namely, that the gem is the base of the acid in the calcareous stone.

Besides the numerous pieces of this concretionary rock, scattered on the surface of the soil, and also intermixed in large quantities in the diamond alluvium, it forms regular strata, or veins we might call them, in a horizontal position, both in the vegetable earth, and in the diamond alluvium, precisely like flints in chalk. Many of the pebbles of quartz, and hornstone are not only varnished, as it were, with a ferruginous *enduit*, but it penetrates into their substance. This kankar contains not a trace of quartz or any other mineral; and that in strata, in the vegetable soil and in the diamond alluvium, is more friable than that exposed on the surface of the ground.

It is in this alluvial detritus that the diamonds are found; my specimens were taken from a heap, on the brim of the last excavation, made five years ago. From this refuse, the headman told me, were obtained, as many small pieces of the gem, as might fill, the hollow of the palm of the hand; no other excavation has taken place since.

All the pits are of an irregular form; generally, oblong; the head-

man told me they were not more than ten feet deep; this I could not ascertain, on account of the water, with which they were partly filled.

The headman, who appeared an intelligent, obliging person, gave me the following information, in reply to my interrogatories; he always presides over the excavations, whether the pits are farmed, or are worked on account of the Nizam. The diamond is never found imbedded, or, in any way, attached to any of the pebbles, with which they are invariably associated in this locality. They are always found loose, mixed with the other little stones. On my particularly pointing out the kankar, he said the gem was never attached to that substance. On enquiring, which were the pebbles most constantly associated with, and forming infallible indications of the existence of, the diamond; he picked up from the heaps of detritus, the following pebbles—iron ore, hornstone and the kankar.

Notwithstanding the prodigious quantity of carbonate of lime in this locality, the water did not appear to contain any traces of it; and the inhabitants used even that collected in the pits.

The detritus, forming the diamond stratum, must have proceeded from the hills north, the only ones near this place; being probably the continuation of the sandstone range, which extends eastwardly from Banganapilly, Condapilly and Mullavelly, in all of which localities the matrix of the diamond is a conglomerate sandstone.

ELLORA, Jan. 26.—This place is more celebrated for handsome women, and fine, muscular, well proportioned men, than any other in the peninsula. And indeed, among the numerous persons both young and old, who crowded along the road to see the Governor pass, I did not perceive one who could be called ugly, or who was sickly in appearance, filthy, or in ragged attire.

The Native regiment in the garrison (of course recruited from different parts of India) had suffered severely this year (1835) from pernicious intermittent and remittent fevers, the inhabitants having likewise their share of the mortiferous scourge. Dr. Davison, a very able, well informed, zealous professional man, told me that the proximate cause of this epidemic, was, both in the last and present year, the profuse rains, which, whenever exorbitant, never failed to impart to the exhalations from the rice fields a deleterious influence, that proves very baneful to the human system. The same happens in the south of Italy, where, if on account of profuse rains, or ill-managed irrigation, the rice fields be overflowed, a burning sun succeeding to them, the air in their vicinity becomes pestiferous, and very dangerous, to the cultivators particularly. We were informed, that out of five hundred men of the regiment, one hundred were in hospital; and although the disease had then abated in severity, yet many of the con-

valescents had engorgement of the spleen, or other abdominal viscera, which eventually terminate in dropsy, beriberi, or other sequelæ, most of which prove incurable, and at last end fatally. The condition in which the Governor found the hospital, although unavoidably crowded, gave great satisfaction, and did credit to Dr. Davison's zeal and exertions.

1. NULLACHERLA, Jan. 28.—The plain, which surrounds Nullacherla for some miles, is covered with a sandy soil, overspread with numerous pieces and blocks of sandstone. The grains of quartz, in this last mentioned stone, are cemented by a ferruginous paste, which gives to the rock a deep red, or purple, colour; the loose pieces apparently have undergone long attrition, being rounded, or at least their angles very much blunted. In many places there are blocks of the same rock jutting many feet above the soil, and evidently impacted deeply in it.

In these last mentioned rocks the stratification is quite evident (No. 16), and in many pieces the iron is in such a quantity that they might be called siliceous iron ore, rather than sandstone (No. 17). About half a mile before we come to this sandstone, in the middle of the road, are seen some projecting blocks, of a black colour and cavernous structure, so as to simulate lava, for which I took it at first, when at some distance; but, on a closer examination, it proved to be the lateritic stone of this part of India, differing from that of the Red Hills, and other localities of the Carnatic, in containing more quartz, being more cavernous, with more sinuosities, which are empty, not being lined by, or filled with, felspar (No. 18). It is evidently a conglomerate rock, some of the composing pebbles being carbonate of iron, of a dark brown colour. As these lateritic rocks are, as it were, impacted in others of purple-coloured sandstone, and protruding in a similar way to those of the latter rock, we may infer that the cavernous iron ore forms a bed in sandstone.

PUDDAPANGALLEE, Jan. 30.—About five miles before reaching this place, and between it and Yernagorium, is seen a small hillock, to the right hand side, near the road. I was riding in company with my friend Colonel Cullen, conversing on the geology of the district we were travelling through. He told me that just before us there was a very interesting phenomenon; nothing less than shell-limestone underlying, and alternating with, basalt. Before reaching the place I saw in the dry beds of the torrents, and in the ditches on both sides of the road, a very compact, conglomerate sandstone, which I will hereafter describe.

As may be supposed I was extremely anxious to arrive at the locality indicated by Colonel Cullen, which we did, in less than half an hour.

Having reached a nullah, which ran down from the north declivity of the hillock, we dismounted, directing our horses to be taken a mile or two further on.

In the bed of the dry nullahs, as well as along the road, were seen blocks of limestone, some of them loose, and others implanted in the soil of the declivity of the hillock. This rock has a white colour, and a fracture semi-conchoidal and glimmering, on account of the numerous crystals of carbonate of lime, into which all the fossil shells are converted. The height of the hillock may be three or four hundred feet above the plain, and the slope of the northern side is gentle and gradual. Its form is oblong; the ridge having a north and south direction.

The north declivity is covered with blocks and large pieces of basalt, scattered and intermixed with those of the limestone. Some of the masses of the last mentioned rock were entirely composed of shells, converted into brilliant and sparry crystals of carbonate of lime. It seems, that they must have undergone violent compression, since they are fractured, and many of them crushed into comminuted fragments. This limestone is very compact, and differs from that a few yards higher, in not containing sparry particles (No. 19). Ascending still, the basaltic masses became more numerous, both loose and fixed; many of them decomposing in concentric layers, and passing into wacke (No. 20). Although this trap appears tough and of a firm compact texture, yet when looked at through a lens, it is observed full of microscopic cavities, some of them lined with a yellow powder (No. 21).

The top of this hill, which forms a kind of table-land, is capped with basalt, apparently extending a few miles eastwardly, and decomposing in concentric layers, which are clearly seen in the dry beds of brooks, having their line of separation well defined. This wacke contains no shells of any sort (No. 22). Many of the masses of basalt, on the summit of the hill, are vesicular, sometimes approaching amygdaloid, not only on the surface, but also in the substance of the stone. Not rarely, large isolated nests of this amygdaloid occur in the compact basalt, the cavities being, in both cases, lined or filled with calcespar (No. 23).

Descending a little way to the right (N. E.) we came to a thick bed of limestone projecting in a little ridge, a foot or two raised above the side of the declivity, running some hundred yards east and west, and cutting the hill in a direction parallel to its base; it appeared to be vertically situated. The outgoings of this bed are tufaceous, as well as the surface of the implanted blocks all around it, and in which the fossil shells were clearly distinguishable, such as oysters, limas, small melanie, &c. (No. 24). Notwithstanding the tufaceous structure of the outgoings of this bed, the limestone, when fractured deep, exhibits a texture similar to that of the loose blocks on the declivity of the hill,

full of small cavities lined with calcespar, and exhibiting only the impressions of the shells, their substance having been absorbed.

The colour of this compact kind of limestone is whitish, verging to yellow, and its geological position appears to be that of a bed in the wacke, into which last the trap has decomposed; so that the calcareous rock is imbedded in, and alternates with, the decomposed basalt. Descending a little lower down, the wacke is again seen, with jasper, of a very compact structure, in the form of thick veins, or thin ramifications, or in beds (No. 25), in which, however, no fossil shells are contained, as we know to be the case in other localities in India, where the basalt overlays shell-limestone, and a similar kind of sandstone to that mentioned in these pages. The wacke being removed by atmospheric influences, these pieces of jasper are scattered over the ground.

The outlines of the hills to the eastward, appeared to indicate their being of the same formation as the one we had examined; and Colonel Cullen, who had, some years before, examined the whole of these hills, confirmed my surmise; with the addition, that the other hills being less steep than the one we stood upon, and presenting deeper nullahs, vertical escarpments and precipices, better opportunities were afforded of seeing the position of the rocks.

This place is about ten miles from the right bank of the Godavery, in a line with Rajahmundry. Along the road to the last mentioned place, at the foot of this group of hills, immense blocks of conglomerate red sandstone are seen, apparently underlaying the limestone. Many rounded pebbles, resulting from the disintegration of this conglomerate, bestrewed the road, and lay in many of the nullahs (No. 26).

Having travelled a couple of miles towards the Godavery, I saw, in the middle of the road and in a nullah near, the outgoings of a thick bed of limestone, which in texture, compactness, and composition, differed from that we examined in the hill. It was crystalline, contained no shells, was of a grey colour, with the aspect of dolomite (No. 27). This bed is evidently flanked by the wacke and basalt, which are seen, the one in concentric laminæ in the beds of brooks, the other imbedded in the vicinity.*

To conclude my short account of this interesting locality, judging by what a cursory examination can warrant our saying, regarding the geological position of these rocks, it seems—1st. That the lowest visible rock is the conglomerate red sandstone, so common throughout this district;—2d. That shell-limestone is a subordinate rock to it—3d.

* Is this crystalline limestone, without shells, of the same age as the compact kind containing them? And, if we suppose that the igneous rock converted it into dolomite, why did it not produce the same change in the other?

+ Putting aside the consideration that basalt appears to be the lowest rock, not only in this locality, but perhaps in all the crust of our Planet.

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That jasper must have had its origin in sandstone, acted on by the igneous rock, which, bursting through both the sandstone and the limestone, altered their nature.

Colonel Cullen informed me that, in the hills further east, the beds of shell limestone are seen alternating with the corresponding beds of trap, in more than one locality, and that tufaceous limestone contains the shells of large *ampullaria*, living now in many of the tanks in India.

RAJAHMUNDRY, Jan. 31.—During the freshes, the Godavery must carry an immense volume of water, judging by the breadth of the whole bed, which cannot be less than three miles. Puddapangallee, being ten miles from Rajahmundry, when we entered the dry bed of the river we had gone only seven miles; therefore we had yet to go three miles to the latter place, which space is all occupied by the water of the river during the rains. At this time of the year the stream is hardly half a mile broad; of the remaining breadth, there are two miles of very fine and deep sand, from the right bank to the margin of the present stream, and half a mile of the same sand on the left bank. The tide does not reach Rajahmundry, which is about 30 miles from the sea.

The sand carried down by the Godavery, is the detritus, resulting from the disintegration of the granitic rocks of the hills about twenty miles north. Were we to judge by the alluvium, daily deposited on the banks, and by the more ancient one some miles inland, the water, during the freshes, must flow with extreme velocity, after having run along a level ground, to be able to propel large rounded pieces of rocks, many the size of an orange, while the ordinary impetus of the stream carries along only coarse sand. This difference in size of the transported pebbles, according to the velocity and the volume of the water, produces in the silt deposited, and still depositing, strata of various composition. We see, therefore, both in the ancient alluvium in the plain round Rajahmundry, and in that close to the banks of the river, strata of large rounded stones alternating conformably with those composed of very fine materials (No. 28). This indurated silt is seen clearly in the left bank of the river, and better still on the sides of the Fort ditch. This conglomerate decomposes easily, however, covering the soil about Rajahmundry with pebbly shingle. Mount Delight (hardly ten feet above the plain!) is the only elevation about Rajahmundry, and is formed of this indurated, easily disintegrated, silt.

In the sandy bed of the Godavery, are found the beautiful *pietre dure*, so much esteemed; such as jaspers, agates, sardonyx, onyx, cachalong, cornelians, &c. (No. 29), mixed with black, scabrous pieces of kankar (No. 30). These stones, collected so low down the river, are not large; but, I am told that, about twenty-five miles above this place, they are commonly found of great size. They are undoubtedly

derived from the decomposition of the amygdaloidal trap, which, with granite, forms the hills to the north of Rajahmundry. In the indurated conglomerate silt composed of large pebbles, are some pieces of porcelain earth (No. 31), which the natives employ in the manufacture of a fine kind of pottery, very much esteemed all over India. The decomposition of the felspar into porcelain earth, must have taken place after deposition of the fragment, while still hard and compact, so as to be able to withstand in its descent the consequences of attrition; supposing the contrary to be the case, we cannot possibly explain how so friable a body as the porcelain earth, could have been driven to such a distance in water, without crumbling into clay and dissolving. Kankar is very abundant about Rajahmundry, and it is burnt as lime.

SAMULCOTTAH, Feb. 3.—About half past five this morning our road lay between two high hills; the composition of which I could not discover, on account of the darkness.

At day break we approached the village of Puddagarum: before reaching it, I went to examine some hillocks near the road. The summit of the first I came up to, was formed of sandstone of a deep red or purple colour, the grains of quartz being cemented by a ferruginous clay (No. 32). The surface of the blocks at the top is extremely scabrous and beset with sharp points.

In this hill, the sandstone overlays lithomarge, tinged of different colours (No. 33); but in others the lithomarge is overlaid by a lateritic rock. Close to this first hillock, there are two others of greater dimensions, in which the abovementioned geological position of the rocks is seen in a more defined and distinct manner.

A hill to the eastward of the first, has a kind of talus (not formed of any detritus, but by the strata of the sandstone elevated a few feet towards the hill), which extends one or two hundred yards round its foot. This rock being evidently stratified, slabs of any dimensions and forms may be easily detached, for architectural purposes, for which it seems to be extensively employed, judging by the numerous quarries worked in the talus and in the plain round it, where the sandstone is the surface-rock.

The small ridge forming the summit of this second hill is, as it were, capped with modified hæmatitic iron ore, in which last rock, in this locality, is evidently stratified (No. 34). In more than one place of this hill, a bed of lithomarge intervenes between sandstone and the iron ore; this is the case at the western extremity of the ridge, where a deep well is excavated to procure the lithomarge, with which the natives mark their foreheads.

Now, it is curious to observe close to this pit, that the masses just above it are the lateritic iron ore, compact in the lower part, cavernous in the upper; but, attention is attracted by the stalactitical projections of iron ore, some one or two inches in diameter, shooting downwards, penetrating and being imbedded in the subjacent lithomarge. Some of these stalactites imitate the drippings from a candle.

The third hill, a continuation of the second, but higher than any in this plain, (being two hundred feet high, or little less,) is capped by the already mentioned lateritic stone. It is very cavernous, mixed with a good deal of sand—a conglomerate in composition—the sinuosities lined, or filled, with a whitish or yellowish clayey substance.

But, what we must not lose sight of is, that this lateritic mass is traversed by thick veins of the compact, glimmering hæmatitic ore: and the passage of the one into the other is hardly perceptible. This is one of the localities in the plains of India, which, together with those on the Neilgherry mountains examined by me, might invalidate the opinion that the laterite is a formation *per se* associated with trap.

The fort of Puddagarum is built on the summit of a hill of this sandstone; and the soil covering the plain is a red ferruginous sand containing many pebbles of sandstone and the lateritic rock just described. Next day I re-examined this locality, and clearly noted the insensible passage between the hæmatitic iron ore and the lateritic stone; in some places, this last overlaying the former, and in others *vice versa*.

PAYKAROW and TOONEE, Feb. 7.—These two villages are divided by a torrent, being situated at the foot of a group of hills, which rise in a ridgy form with an east and west direction. Some hills of this group attain a height of about one thousand feet above the plain, and are thickly covered with shrubs and underwood. They are formed of garnetic gneiss with occasional strata of quartz, their direction being that of the ridge itself, viz. east and west, and nearly all of them are vertical; at least those of the summit are clearly so.

The populous village on the left bank of the torrent, is called Paykarow, the other on the opposite bank Toonee. The skeleton of the famous bandit Paykarow is seen hanging on a gibbet here, outside his own village. This marauder gave the Government much trouble many years, and defied the few troops sent against him and his associates; the gang burning, destroying and plundering the houses and property of the Zemindars, and of all who were known to be partial to their enemies. They cut off the ears and noses of those whom they thought befriended the British Government and sent them to our Commissioner, the Honorable Mr. Russell. The energetic and decisive measures of Sir Frederick Adam, carried into

execution, in a prompt and determined manner, by Mr. Russell, caused the dispersion of the whole gang; many of whom were caught and hanged on gibbets.

ANUKAPILLY, *Feb. 9.*—The country, between Toonee and this place, is interspersed with numerous hills and knolls, all of them of a conical shape, covered with thick shrubby vegetation. They are formed of the garnetic gneiss; the only difference between this rock and that of other localities, is that the felspar has the composition of that variety called albite or cleavelandite.

Close to our encampment was a hill, about four hundred feet above the plain, near whose summit is a kind of grotto, over which hang two enormous masses of gneiss, which has been converted into a tiny pagoda, dedicated to the goddess Coocooresha, whose devotees must have patience to ascend 295 steps cut in the rock, besides paying their propitiatory offerings. The view enjoyed from the pagoda is magnificent. The whole hill is gneiss, and, in the large masses on the sides and above the pagoda, the stratification is well marked, the strata dipping eastwardly.

YELLAMUNGALLEE, *Feb. 10.*—The approach to this place is very picturesque, the village being surrounded by numerous hills rising abruptly to various heights, and assuming the most romantic shapes. The rock is garnetic gneiss, most of the garnets being amorphous, and decomposed into a cancelliform structure, to be explained at a subsequent portion of this journal (No. 35). The quartz strata sometimes resemble quartz-rock, and at others they are divided into many smaller strata conformable to those of the rock. The colour of the quartz is white, except in some few blocks, when it becomes of a rose colour (No. 36).

Some strata of this as well as of the other kinds of gneiss, are exclusively formed either of garnets or felspar, which last mineral, when decomposed, forms a coarse kind of porcelain earth (No. 37). The strata near our camp had a vertical position, their direction, and that of the other neighbouring hills, being about N. E. and S. W. dipping west. These strata are easily separable, and the pagoda, in ruins at its summit, is built of this gneiss, which is exceedingly well adapted for such purposes, on account of the great facility of its cleavage into slabs of any dimensions and form. The felspar has often a laminar structure, and assumes a beautiful scarlet red colour (No. 38).

CASSIMCOTTA, *February 11.*—Approaching this place, the hills are composed of the gneiss previously described; and the garnets are so

numerous as to form strata exclusively. The direction of this range is the same as the preceding, the strata being nearly vertical.

The sides of some of the hills presented a chalky colour, owing to the number of decomposed felspathic strata. I must here particularize an observation which occurs in more than one place of my note book, regarding the durability of this gneiss, namely, that quartz seems to give a greater compactness to the rock, than when the other two minerals are the only ones composing it.

Besides the seams of the strata, this gneiss is intersected at all angles by many fissures, which divide the strata into rhombs, cubes and other angular forms; which is clearly seen in the two hills close to Cassimcotta to the north. The usual nodular kankar is frequently seen over the soil. This concretionary rock, met every where in the plains of India, and particularly along water-courses, seems of recent origin, and, indeed, to be daily forming.

AGANAMPOODY, *Feb. 12.*—Anukapilly being only three miles on our way to this place, instead of remaining at Cassimcotta the whole night, some of our party went to visit the residence of Sooria Pracasa Row, who has laid out his gardens, and fitted up his houses after the European fashion. Sooria is one of the Zemindars who contributed so materially to the destruction of Paykarow and his gang. He is one of the *rare uves* among the higher class of people of India. He is very partial to European manners and adopts them (not for affectation sake). He speaks and writes the English language uncommonly well, and his pronunciation evinces hardly any foreign accent. He disregards the show and glitter, the suite of attendants, the umbrella-carriers, and other indispensable appendages of his countrymen, of rank corresponding to his own; and wears none of their ornaments. He came to visit the Governor on a superb Arabian horse, and was introduced without a single attendant. We accompanied him on his return to Anukapilly, and he conducted us to his garden, which was laid out in a most beautiful style, rich with indigenous and exotic plants and trees, before Paykarow laid his destructive hands on it, as well as on his other houses. Yet, being in some degree repaired, the garden and bungalow were in a very neat and comfortable condition, all in true European style. Some of us slept at Anukapilly, and had scarcely eight miles journey to Aganampoody, and did not leave the former village till past seven in the morning.

All the hills on the way had the usual conical shape, and were formed of gneiss. Those to the north of our camp, were quite of a different outline and form from most seen during this excursion, being of a ridgy shape, with spiry summits and naked precipitous sides (Pl. 17 fig. 4). Close to the camp was an isolated hill about

one thousand feet above the plain, of peculiar conformation, being of a conical shape with a vertical, ridgy projection, some feet thick, down its eastern side from apex to base, dividing the hill into two halves, a northern and southern portion. The strata forming both sides have an opposite dip; those to the north dip northward, and those to the south, southward; thus diverging from the projecting ridge, as if from an anticlinal line (Pl. 17 fig. 5). If this vertical ridge had had a black, instead of a whitish grey, colour, as it appeared at a mile distance, I should have taken it for a basaltic dyke, bursting through the gneiss, and at the same time elevating the margin of the fractured strata. I then recollected that, at the western foot of this mountain, there was a dry deep nullah, in the bed of which were implanted large masses of common granite, projecting many feet above it (No. 39). From this I conclude that the lowest rock is common granite, which elevated, and intruded into, the stratified rock.

The appearance of the spiry, sharp-peaked mountains to the north, seems to countenance the above mentioned surmise; nor can we suppose the enormous blocks in the bed of the nullah to be erratic boulders; because many had their extensive, convex surface a few inches only above the bed of the torrent. The other rocks in this plain, are loose pieces of lateritic iron ore, and below the soil a thick stratum of kankar. Carbonate of soda incrusts the indurated sandy soil in some places (No. 40).

WALTAIR, Feb. 13.—From the last encampment to this place the hilly appearance of the district continues; the rock is gneiss, the strata highly inclined, and, in some hills, nearly vertical, and traversed by fissures, which, cutting the seams at an angle, the naked sides of the hills are thereby marked with lozenge shapes. The plain before reaching Vizagapatam, is covered with a white efflorescence, like hoarfrost, produced by the small crystals of muriate of soda, deposited after the evaporation of the sea water, with which this soil appears to be impregnated. Numerous pits are dug in the soil, close to the hill of gneiss in the road to Waltair, to obtain the shells many feet below, which are burnt for lime; generally they are salt-water shells. If my memory does not fail me, a portion of this plain has been lately drained, by which the air, before proverbially unhealthy, has been rendered pure, and many thousand acres of land have been reclaimed from the sea.

The hills about Waltair are gneiss; some of the strata are exclusively formed of garnets, sometimes containing more mica than in other localities, occasionally in nests (No. 41). The way from Vizagapatam to Waltair lays through rocky knolls, hillocks and masses heaped one over the other, and before reaching Waltair there is an undulating sandy plain (perhaps not a quarter of a mile broad) of a red colour, the result of the disintegration of the gneiss abounding with garnets.

BIMLIPATAM, Feb. 14.—It seems that the range, or at least a branch, of the mountains composed of gneiss terminates in abrupt cliffs and precipices in the sea, a few miles north of Waltair. The tide ebbing after midnight, we availed ourselves of that time to start from Waltair, the road which traverses the shore and passes over the large masses of rock which jut out into the sea, being at that time passable. This spur of the gneiss forms rough tabular masses, which, in a vertical position, extend some way into the sea; and, although the moon shone bright, I could only discriminate the position of the strata. The specimens, which I broke off as I passed, proved to be the gneiss, which prevails in the road we followed.

The hill at the foot of which Bimlipatam stands is also composed of this rock, the strata being in no way contorted, although very much inclined. This is the case, likewise, with this rock, in other localities of the Northern Circars; differing from other species of gneiss common to the table-land of Mysore, and extending as far as Errood, which are tortuous and twisted in all directions. The summit of this hill is capped with an enormous tabular mass of a lateritic stone, placed horizontally over the bassets of the vertical strata of the gneiss (No. 43). This cavernous, ferruginous clay-stone imbeds very large pieces of the subjacent rock, not only near its surface but also deep in its substance. The nearly vertical position of the strata is seen better than in any other situation of this hill, in the sides of the tank close to the ruined house, which is cut in the hard rock. It must be remarked, that, at the points of contact between the gneiss and the lateritic rock, the former is very much infiltrated with iron.

VIZIANAGRAM, Feb. 16.—The plain, for many miles round Vizianagram, is sandy, mixed with some pieces of quartz; below the soil, in one or two nullahs, are strata of nodular kankar, occasionally imbedding pebbles of hematitic iron; the stalactitic kind of this ore being also common (No. 44).

Behind the barracks and the bazar of the Native Regiment quartered here are some hillocks quite different, in aspect and form, from the gneiss rocks we have described. It is common granite, having the mica both disseminated and in nests, and contains a good deal of quartz. Enormous masses of this granite are heaped up in great confusion, some of them placed, tor-like, one above the other; many rest on the convex surface of others, which are deeply fixed in the ground. On the surface this granite has a brownish black tinge, but it is whitish grey in the fracture. When the mica is wanting and the felspar scanty, the rock resembles quartz-rock. Close to these hillocks some blocks of lateritic rock are seen, which have the same position as the granite, that is, implanted in the soil.

The black soil in this locality, as in other places, has a substratum of nodular kankar, besides the tufaceous kind scattered on the soil. In the dry bed of a brook, I saw enormous blocks of this last mentioned rock jutting forth.

COTTEEPOLLUM, Feb. 18.—We left Canada this morning at half-past four. I employed about an hour in examining a hill to the north of the road, not more than two miles from this place. It is rather steep, about four hundred feet from the ground, formed of gneiss abounding in garnets. At the summit I looked for lateritic ferruginous clay-stone, but I did not see a trace of it, nor in the declivities, except a few erratic pieces in the talus. It is in this locality, that I first saw some blocks of garnetic gneiss, with strata very much distorted, their parallelism being not affected. Those on the summit were vertical; at least the bassets of vertical strata were seen running in a direction N. and S., while those on the eastern and western sides appeared to diverge (having the same direction as those of the summit) anticlinally, the western dipping west, the eastern to the east. This hill, and another near, were surrounded with a talus at their base, an unusual occurrence in India. The kankar is abundant.

CHICACOLE, Feb. 19.—As it was hardly day-light when we left Cotteepollum, I could not distinguish the character of the rocks, projecting here and there close to the road, which appeared of a black colour, and probably were greenstone, or basalt. On arriving at the camp I saw many masses similar in appearance to those passed early in the morning. These were hornblende slate, and those previously seen were probably the same rock, both being in immense tabular masses laid one over the other horizontally, or placed in an erect position, the raised extremities leaning against each other, or heaped together, without any regularity or order; when the quartz was scanty, the rock became characteristic hornblende slate (No. 45).

The highest hill, about five hundred feet above the plain of Chicacole, is composed of garnetic gneiss in a state of decomposition, the strata nearly vertical. From the north side of this hill, is seen projecting along the plain, in the manner of a dyke, many blocks of hornblende rock; and at the foot, facing north, is an enormous vein, or rather bed, of quartz rock, many yards thick, whose outgoings form a kind of shelfy projection at the base of the hill; the direction of this bed being east and west. Most of this latter rock consists of the intimate agglutination of angular pieces of transparent quartz, without any apparent cement (No. 46); although in some parts they are united by a clayey ferruginous paste, producing a kind of silicious puddingstone (No. 47), or claystone porphyry.

SITTUMPETTA, Feb. 23.—In the middle of the new Palconda pass. This road, which has lately been constructed, is cut through a group of hills, covered to the summit with thick impervious forests of gigantic trees, the road lying along the tortuous valleys, and intricate paths at their base. On account of the thick arborescent vegetation, the prevailing rocks are seen now and then only, jutting through an occasional avenue, or in the openings between the trees, or, more perfectly, along the space which has been cleared for the road. They are all of hornblende slate, the strata of which are well defined; the same rock, found near Chicacole, is probably a diramation of this centre group, which appears to give off branches in different directions.

This schistous diorite has a bluish colour, on account of the large quantity of hornblende entering into its composition—its fracture is splintery and glimmering (No. 48); and when the felspar predominates, the colour changes into whitish. In most of the places we have been journeying through, all the hills, knolls and elevations, and projecting rocks of any altitude, have been of the class of primitive stratified rocks, but, the reader must have remarked, that, wherever opportunities of observation occurred in deep nullahs at their base or in the valleys, common granite formed the lowest visible rock. This is the case in the Palconda Pass; the beds of the torrents, which occupy the narrow and deep valleys among these closely crowded hills, show blocks of granitic rocks, deep in the ground, composed of quartz, felspar and a few garnets (No. 49), and exfoliating in concentric laminæ, as other granites do.

Below the soil of the valleys through which we passed, the kankar formed, as usual, a substratum. Some of the hills, near the eastern end of the pass, present denuded, vertical, precipitous façades, which permit of no vegetation, and the stratification of the rock is displayed in the most striking manner. This place recalled to my mind the awful escarpment of the northern side of the Holykooldroog, facing the Koonoor Pass (Neilgherries) the summit of which presents to view the immense strata of hornblende, which rock forms in most places, the extreme vertical precipices of the Neilgherries.

NEEMGAUM, Feb. 25.—The Governor and party, left Cootoor at 4 o'clock p. m. to visit the western end of the pass, the strong hold of a gang of desperate marauders, who, during many years, issued thence to commit highway robbery and murder, maiming those whom they thought friendly to Government; the wild imperviousness of the place, rendering it almost unassailable by regular forces.

Close to Neemgaum is a hill about 1000 feet above the plain, covered on all sides to the summit with thick jungle, and almost inaccessible. Only a few masses of rock, are seen on the sides and at the top. At

the base, however, and some way up, many blocks are seen apparently of the same nature as those on the sides. Many of these are *in situ*; but some have evidently been hurled down from the summit or sides of the hill. They are all hornblende slate, probably a diorite of the Sittumpetta group, being composed of felspar, hornblende in large proportion, and a few garnets—the fracture glimmering and texture extremely tough (No. 50). Although, generally speaking, this rock is stratified, yet there are some blocks that put on the appearance of a granitic, unstratified rock. There is a huge block, just above a hamlet, at the southern base of the hill, which seems to have been precipitated from near the summit of the hill, where many similar are perched, nodding to their fall. This mass, of an oblong shape, is traversed in different directions by regular dykes, either of hornblende, or of greenstone. The diagram (Pl. 17 fig. 6), is meant to represent this block: A is the longitudinal face of its north side, and B the fracture perpendicular to it. Along the lower margin of the northern side, runs horizontally a very thick dyke, the line of demarcation, between the intruding and intruded rocks, being well marked. The dyke having reached the middle of the mass, bifurcates to inclose an oblong mass of felspar, which follows all the windings of the dyke which thus imbeds it. Looking at the fracture B, we see that the dyke of greenstone did not penetrate so far into the substance of the hornblende slate, as to burst through the other side of the mass; but, having intruded some inches, ended in the substance of the rock (Pl. 17 fig. 7). The texture of this hornblende slate appears to have suffered no change, by the contact and proximity of the dyke. This dioritic rock is of a composition common in India, entire strata being formed of hornblende with a few garnets, and others of felspar alone. The greatest number of loose blocks along the road, from Neemgaum to Kimidy, are gneiss, composed of quartz, felspar and garnets (No. 51). Some masses have occasionally a small stratum, a few lines, of gold coloured mica in the seams.

KIMIDY, Feb. 23.—At day-break I saw a hillock near the road, formed of immense unstratified masses, which proved to be common granite, with the addition of a few garnets. Although this rock is unstratified in the large, it is laminar in the small, on account of the mica being placed in parallel laminae. The felspar is in large well-formed crystals in some masses. Close to the town of Kimidy are many erratic blocks of hornblende rock.

March 1.—I rose early this morning, with the intention of ascending to the summit of the high hill which rises behind Kimidy, and had mounted nearly half way up, along a fatiguing path, when a thick fog

descended from the top of the hill, and in a few minutes enveloped it in obscurity. I waited patiently for some time, but, seeing no prospect of the weather clearing, I pushed on towards the summit, and proceeded about twenty minutes, groping my way all the time, both on account of the darkness from the fog, and the slippery nature of the path, which was full of loose stones, rendering my advance difficult and laborious. At last, seeing that there was no hope of the speedy clearing up of the weather, and the time for departure approaching, I descended; breaking some specimens from the blocks on my way. They were of garnetic gneiss, the garnets decomposed, assuming the cancelliform structure. The direction of the strata was E. and W.

GARABUNDA, March 2.—Four miles before reaching this place, I remarked, just in front of us, a very black looking hill, apparently formed of a single enormous block, of an oval form; one third of the broadest part of which was buried under ground. At a distance of two or three miles I took it for basalt; but, on nearing it, I saw no fissures, no columnar structure, no step-like sides, but, an uniform, convex surface. It was about 400 feet high, and when we came abreast of it, another hill, not so lofty, was perceived behind, very convex, and lying against the eastern side of the former one (Pl. 17 fig. 8). These enormous monolithic masses were unstratified, with no trace of split or fissure; the natives call these rocks Chittabunda. Being hardly half a mile from the road and one from our camp, I went to examine it leisurely. On a nearer approach it was evident that they were formed of porphyry, composed of very large, well defined crystals of pearly felspar, imbedded in a paste of hornblende (No. 52). On the convexity of the lower rock to the east, were scattered many tabular masses of the same porphyry, of different angular forms, such as rhombs, cubes, parallelopipeds, &c., all evidently portions of the thick concentric laminae, into which this porphyry exfoliates. The most striking of these tabular masses is seen in the eastern side of the highest of the two hills, where it hangs from the precipitous face of the rock by a very precarious hold (Pl. 17 fig. 9).

The crystals in this porphyry are very large, many of them being two or three inches long, and many lines thick. It is worth remarking, that nearly all of them are placed in the rock in the same direction, and parallel to each other; at least that is their position on the surface, and I could not see any of them crossing each other, or having different directions. The hills on the opposite side of the road, about a mile from these porphyritic masses, differ in aspect from them, being covered with impenetrable jungle, so as to conceal all rocks, that might project on their slopes and summits. Notwithstanding which, judging by the few blocks, fixed and loose, near the road at their base, they are of

sienitic granite, composed of felspar, quartz, and hornblende (No. 53); the presence of the last mineral accounts for the difference in the outline, and in their being covered with luxurious shrubby and arboreous vegetation; in opposition to the barrenness of the porphyritic ones.

The felspar of this sienitic granite is of a pale yellow, which gives to the rock a different colour to that of the same species in other localities. The hills to the north, very near to our encampment, were formed of porphyry similar to that of Chittabunda. Their black, barren appearance bespoke, even at a distance, the nature of the rocks forming them. That which we are now describing, however, differed in having some clefts and fissures, in which many shrubs take root. In this locality, many of the masses abound with hornblende, with a few garnets, the rock then resembling hornblende porphyry (No. 54), somewhat similar to that rock at Mantoo on the Neilgherries. Here I observed, what I did not see at Chittabunda, large nests, or veins, of a fine grained granite, or of pure hornblende, intruding in the usual irregular manner, and imbedded in the substance of the porphyry.

In general the crystals of felspar are white, but, not rarely, of a reddish colour. On the last described hills were seen rhomboidal and cubic masses like those at Chittabunda, either suspended from the nearly vertical façade, or laid on their convex surfaces. To the south of our camp, facing and hardly two miles from the porphyritic ones, are some hills, the continuation of those of the same nature opposite to Chittabunda, of similar outline, and covered by the same thick vegetation.

CASSIMBOGA, March 3.—This village is fourteen miles from the last stage. The pass of Cassimboga is the eastern end of the Sittumpettas; the strong hold of the famous Paykarow, Garolle, and their associates. The narrowest part of the pass commenced about three miles from our last camp, but its whole extent from Cassimboga is eight miles. The Governor wished to survey the place where had been perpetrated hundreds of murders and robberies, the victims being sometimes mutilated to annoy the Government, which was taking every measure to suppress this gang of assassins, which kept the whole province in the greatest confusion and alarm. We did not leave Garabunda until half past six; the road lies between two ranges of hills, along the narrow valleys at their base, which, until two years ago, were covered with thick jungle, almost impervious, except along foot paths known only to those who frequented them. The horizontal branches of the gigantic trees, crossing each other and descending very low, rendered the path difficult and laborious, giving full scope for the attacks of robbers, and, in case of their being assailed, enabling them to resist any force sent against them.

Some of the spurs of both mountains extend more than others into the little flat, the pass contracting in those places. In these narrow spots the gang awaited their victims; and, in such inaccessible positions, a few persons could defy all troops opposed to them. Besides their natural strength these places were guarded by parapets of mud, with a ditch behind them, extending from one to the other, leaving only a very narrow space for passengers. Even this precaution did not appear to them sufficient security. They piled up entire trunks of trees and brambles on the summit of this imbankment, rendering it nearly impregnable. Two or three of these trenches extended from one extremity of the pass to the other. After having resisted several years, the present government put a stop to the iniquities committed by this gang.

The officers sent against them, got information of an intricate by-path, full of dangers, on account of the numerous wild animals and the probability of being lost in the jungle. But, English bravery is not easily daunted by difficulties, and in the night the guides succeeded in conducting safely the attacking party to the rear of the enemy. The success was complete; the military entered the marauders' villages, set fire to them, and the conflagration of their homes was the first intimation they had of their being surrounded. Of course, they had recourse to the *saue qui peut*, and scrambled up the hills. Some were taken, others killed; it ended in the total destruction of this abominable nest of villains. This pass, after the extinction of the gang, was cleared, and a spacious road formed, flanked by several hundred yards of clear ground.

We have said, that the hills of this pass are porphyritic to the north, granitic, to the south. A mile or two from the eastern end, a dyke of basaltic hornblende is seen (No. 55), flanked to the west by projecting masses of porphyry; it is of moderate thickness, and many hundred yards long; some of the exposed blocks have a cavernous or amygdaloidal structure. Further on, at a little distance from the road (S.), I saw another dyke of the same trap, capped by a stratified rock, seemingly gneiss.

After passing these dykes, all the hills and knolls to the left were of the already described porphyry, and those to the right, granitic. Only one hill, about four miles before reaching this place, is of a different composition. Its lower part was porphyritic granite, the crystals of felspar being neither so large, nor so well defined, as in the porphyry of the pass, but yet the rock was unstratified, in immense masses, exfoliating concentrically. This granite is overlaid by gneiss, resembling that of Kimidy, with a profusion of amorphous garnets.

In the brief manner these cursory notes permit, we may draw the following conclusions, with regard to the geological features of this noted pass. The hills, which confine it to the north, are porphyritic

almost exclusively; those to the south are, in general, gneiss with garnets, with one or two hills of granite. The porphyritic formation seems to extend as far as the Mahandry mountain (N.), the highest in this district, which does not appear to have the conformation, outline, and black aspect, of those formed of porphyry. The soil all along the level of the pass, is sand and clay of a reddish colour; the nodular kankar forms the stratum under the vegetable soil, and is also scattered on its surface. A few pieces of loose lateritic stone were met with, but none implanted in the ground; the gravelly detritus of this ferruginous claystone on the soil was not scarce.

POONDY, March 5.—The sand, over the whole plain before reaching this place, is very fine grained, whitish and extremely loose. Having ferried over the river near Poondy, we proceeded to our camp, pitched on a sandy eminence, not two hundred yards from the sea. In the swamp, between the river and Poondy, are numerous blocks produced by the oysters, which are very abundant at this place, the masses projecting some feet above the mud. They are composed of nothing else but oyster shells, with little cement agglutinating them. These are the only rocks at Poondy; cut into square pieces they are used for constructing the walls of huts; with them, also, they line the interior of wells, to prevent the sand, through which they are dug, from falling in. The water of these wells, although a few yards only from the sea, is perfectly fresh and drinkable.

About two miles north of our camp, near the beach, a village is situated at the foot of a granitic hill, the rock of which is composed of a great quantity of garnets and hornblende, with felspar. At the surface of some blocks the rock appears stratified, but the huge masses at the summit are all unstratified. In the more compact pieces the felspar changes into albite (No. 56); and some, composed of a prodigious number of large amorphous garnets, are knobby on the surface, owing to the two other minerals having decomposed, and left the decomposing garnets, like small filberts, protruding (No. 57). Not rarely some masses are entirely formed of garnets, to the exclusion of the other minerals. All the black looking masses along the beach and protruding from the sea, opposite to this hillock, are the continuation of this rock.

POONDY, March 9.—The whole plain west of this place, and along the shore for some miles, is covered with a very thick deposit of whitish, extremely fine, loose sand, which, extending for a quarter of a mile inland, is undulated with numerous swells and small elevations of this highly comminuted sand, on which nothing but a species of

convolvulus grows. In this thick stratum of sand no shells are to be found, except those thrown by the sea on its surface. Under it, however, a clayey stratum, the thickness of which it is difficult to ascertain, contains a great many shells, both salt and fresh water. This is clearly seen in the sides of wells; in digging which they always come to this clayey substratum, before water is obtained.

Many of these shells are identical with those of mollusca now living in the river and on the shore, besides the pelagic ones. The stratum of clay with shells, extends three or four miles inland, where pits are dug to procure them for lime; and these fossils may be seen, even, in the soil thrown up by the large crabs which burrow in the ground.

In the plain of Poondy we thus see phenomena similar to those witnessed at Vizagapatam, and the same inferences may be drawn at both places. There are frequent signs, along the eastern shore of the peninsula, of estuaries, or shallow bays, having formerly existed, into which rivers discharged their waters: thus the clayey stratum, containing sea and fresh-water shells, must have been deposited. When the catastrophe happened which heaved up to its present altitude this part of India, the clayey bottom of these estuaries containing shells, was raised into the atmosphere, and, at the same time, the hills around. The subsequent decomposition, and gradual decay, of these mountains, has covered this stratum of clay with one of sand.

POONDY, March 11.—About a quarter of a mile north of the village of Guirzinghee, two miles from Poondy, there is a ridgy hillock, two miles from the shore, not more than 200 feet high, its direction east and west, sloping gently on both northern and southern declivities; with the village of Carverà at its northern foot. It is composed of the usual garnetic gneiss, stratified. The felspar, one of its ingredients, is of the species called albite or silicious felspar, in a granular state, and also in slender needle-shaped crystals (No. 58). The cleavage of this gneiss is in the line of the seams, which renders it extremely useful for architectural purposes, as it splits easily in the usual way of masses with parallel surfaces.

This rock, to the touch has a harsh, rough feel, probably on account of the great number of the crystals of silicious felspar. The albite sometimes is in slender prisms, one or two inches long, particularly when on the surface, dispersed through the rock without regularity or any common direction; many crossing each other forming a net work. No mica enters into the composition of this gneiss, except a few plates dispersed through the rock; a few garnets, which are imbedded in the albite or cleavelandite, are not always in regular crystals, sometimes being finely granular, which gives the rock a remarkable glim.

mering (No. 59). Between the seams of the strata, the albite sometimes forms a thin stratum of the pure mineral, in needle-shaped crystals. Judging by the outline of the hills six or seven miles west of Poondy, it would seem that they are formed of the same gneiss as that near Carverà, the ravines, down their sides having the same reddish appearance in the places divested of vegetation.

Leaving this hill, and going north about two miles, in the middle of the road are some enormous masses of porphyry, their surface nearly level with the ground and convex, perfectly similar in composition to the rock of the Garabunda pass, the crystals as large, and as well defined. About fifty yards beyond these masses, was a heap of immense blocks of the same rock, many implanted in the soil, while others were placed, tor-like, over the surface of the former. In these rocks the crystals of felspar were better defined and larger than those of Garabunda.

Not more than five yards to the west of these rocks, is a small double eminence, composed of albitic gneiss, similar to that of Carverà, on the little ridge of which were placed many granitic blocks, analogous to those of Guirzinghee. Looking at the direction of the masses of this porphyry, which is precisely the same as that of the pass, it is more than probable that they are the prolongation, under ground, of the same formation. The hillocks and small eminences in other parts of this plain, are either the common garnetic gneiss, or that in which the laminar felspar passes into albite; through which the porphyry at this place seems to have forced its way.

In conclusion, we may be permitted to make a few general remarks on the phenomena observed during the journey. The first is the singular fact, observed and mentioned by writers on Indian geology, Dr. Heyne among others, of the total absence of organic exuvie in both species of kankar, which, notwithstanding the different periods of their deposition, are alike deficient in this respect.

The same remark has been made with regard to the laterite, in which no shells or other fossils have been found, either in the Indian peninsula, or on the opposite continent and adjoining islands. Such absence is more remarkable, because it is observed of two rocks; the one concretionary, the other conglomerate, which appears to indicate an origin not very ancient; and the kankar, in particular, which invests, not only the detritus and small pieces of the unstratified and stratified primitive rocks, such as granite, gneiss, hornblende, chlorite slate, actynolite schist, quartz, &c.; but also the modern ones, I mean the fossiliferous, such as mountain limestone, sandstone, basalt, &c.

The lateritic rock at Puddagarum, is the modified hæmatitic iron ore,

and the conglomerate rock results from its detritus. At Nullacherla, the blocks were little above the soil, and situated in the same position as those of conglomerate sandstone, evidently forming a bed in the last mentioned rock. The third kind of laterite, that at the summit of the hill of Bimlipatam, overlaying, and imbedding fragments of, gneiss, both at the surface and near the points of contact with the subjacent rock, contains many veins of hæmatitic iron of different thickness, into which it passes in its lower part. Those blocks called laterite at Puddagarum are, evidently, in appearance, and in the circumstance of association with the hæmatitic iron ore, analogous to that of the Neilgherries; of the other two, we must be satisfied of their similitude, by induction only.

Adverting to the rarity of contorted strata in the rock prevailing in this part of India, namely, garnetic gneiss, with occasional intermixture of albite; and to their frequency in the other variety of the analogous rock, containing mica, in many other localities, we must feel anxious to inquire, what is the real cause of the difference in the forms assumed by the strata, when in a semi-consolidated state.

Along the route which we have travelled, the only two places, where I met with gneiss whose strata were contorted and undulating, were the hill of Bezoara, and that about two miles west of Cottipollium. We must not omit mentioning, that, in both places, the disturbance did not extend far; at Bezoara it occupied only one side of the hill; and in that near Cottipollium, the contortions were seen only in loose, erratic blocks, perched on the south declivity of the hill. It is necessary here to remark that, through the Bezoara strata, were seen large dykes, or beds, of greenstone, which, evidently, must have contributed greatly to the distortion of the strata.

The other variety of gneiss, containing mica, such as that in the table-land of Mysore, and elsewhere, is traversed by numerous basaltic or porphyritic dykes, the existence of which suggests a plausible reason for the disturbed strata of gneiss in that district.

Thus, suppose two enormous dykes of basalt, at a certain distance from each other, bursting through the semi-consolidated, horizontal strata of a rock, say gneiss, enclosing between them a certain extent of these strata, which, we suppose, to be under a moderate pressure from above: what will be the consequence of a force, such as that of the intruding basalt, applied on the extremities of the strata, in opposite directions?

The luminous experiment of Sir James Hall, answers satisfactorily this question. He put on a table different coloured square pieces of cloth, horizontally, one over the other, having put a board with a moderate weight on them (Pl. 17. fig. 10): *a a*, are the pieces of cloth, which, in the beginning of the experiment, were horizontal; *b* the

weight; *c* the table; *d* the two pieces of board, which are made to slide on towards each other. It was found that the superincumbent weight was raised some few inches, and the horizontal pieces of cloth became distorted, like the strata of many rocks.

We must take into consideration the numerous fissures, through which the immense quantity of trap in India must have been erupted at some remote period, and of which, at present, nothing remains, except the outgoings of these gigantic dykes, on mountains, and in plains, sometimes invisible, because covered with the soil.

The mass of gneiss, which we have supposed to be enclosed, and compressed between two opposite forces, having been lifted into the atmosphere; owing to the comparatively speedier decomposition and disintegration of the basalt, which, after a time, falls away, the contorted stratified rock is left, either as a solitary block, or as an implanted mass in the detritus of the imbedding rock accumulated round it.

This must have been the case, with many of the masses of gneiss near Bangalore, Golcondapatnam, &c.; whose strata, although exceedingly disordered, yet have very little trap in their vicinity, which, however, is seen at some distance from them. After what we have stated, we may safely affirm that the frequency of intruding rocks in a formation of stratified ones, produces the contortions in these last; and that when rare, or totally absent, no disturbance in the strata is observed.

To conclude these cursory notes, we will give a brief catalogue of the principal rocks, examined during the journey, ranged according to their degree of prevalence.

1. Garnetic gneiss, the felspar sometimes changing into albite or [adularia].
2. Porphyry.
3. Hornblende slate and rock.
4. Sandstone.
5. Kankar, ancient and modern.
6. Shell limestone.
7. Common granite.
8. Basalt.
9. Lateritic iron ore.
10. Sienitic granite.
11. Black soil.
12. Allavium.

X.—*An Account of the Tribe of Mhadeo Kolies.*—By Captain A. MACKINTOSH, 27th Regiment Madras Native Infantry, Commanding Ahmudnuggur Police Corps.

Preliminary and general observations, respecting the different tribes of Kolies, and where they are located.

Among the various classes of inhabitants, within the territory forming the Government of Bombay, the names of few are more familiar to us, than that of the tribe of Kolies—more usually written *Cooly** by the English. They are to be found nearly in every part of Guzerat, and, in several of the districts of that province, they constitute a very large proportion of the agricultural population, and, in many instances, are most notorious robbers. They are very numerous in the Attaveessy, and there are many settled in the northern Konkan. In the hilly tract of country, lying between Moossa, south west of Poona, and the hill fort of Trimbuck, the source of the Godavery river, the inhabitants are chiefly Kolies, and a few are scattered over the districts of Candesh, Ahmudnuggur, Poona and Shollapoor, and along the Ballaghaut on the western frontier of the Hyderabad territory.

Although the information we possess of these people must be considered rather imperfect, I think we may venture to say, that, in the earlier ages, they were the only inhabitants of a portion of Guzerat and of the Attaveessy, for a part of the latter tract of country is termed by the natives Kolwun or country of the Kolies. Hills and forests, and such formidable barriers, will tend to divide communities, and local situations will not only induce new and appropriate names, but will also produce some difference in manners and habits. Notwithstanding that these people have, in the course of time, separated into different classes or minor tribes, they continue to retain the general appellation of Koly; which seems powerful evidence of their original affinity, and of their being branches of the same stock.

The following are the common designations of the different classes or castes of the tribe of Kolies; and they appear to be located nearly as here described.

* On a former occasion, I ventured to derive the term *Cooly*, applied by us to porters, labourers or persons who work for hire, in the following manner—as the fishermen, boatmen, and many of the common labourers, at Bombay, and along the coast, are Kolies, the term *Cooly* may have originated among the English at Bombay. A passenger coming ashore, when a ship arrived from Europe, might have wished to give a box or package in charge to a native (probably a person of rank or caste); he would say, or a servant in at-

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The *Raj Kolies* reside chiefly in the Attaveessy, and in the Wunn, Dindory and Nassick Pergunnahs. A few are settled in the vicinity of Jowair, in the Konkan; they are cultivators and labourers. They worship the gods Khundobah, Bhyroo and Bhowany. They say that they have derived their name from the Koly rajahs in former ages having intermarried with their ancestors, and employed them in their service as domestics and sepoys. The Sir Naik Ballajee Buddajee resides at Wagya, in the Nassick districts, and holds the village of Vellgum in free gift, and enjoys several perquisites. The village, &c. was presented by the Jowair rajah to one of the Naik's ancestors. The Naik settles disputes connected with the infringement of their customs. These Kolies are sometimes called *Bhen Kolies*, and are said to have originally belonged to the tribe of Mhadeo Kolies, but, having committed some irregularities, they fled from their tribe and associated with Kolies of an inferior description, and at present hold no intercourse with the Mhadeo Kolies.

The *Solesy Kolies* are settled in the same parts of the country as the *Raj Kolies*; and are also cultivators and labourers. The *Solesy Koly* is known by the name of *Lall Lunggooty Wallah Koly*, and *Kasthy Koly*. They worship Khundoba, &c.

The *Toukry Kolies* are inhabitants of the Attaveessy, principally around Peint and Dhurrumpoor. Like the other Kolies some of them are cultivators and others labourers. As the term for a large bamboo is *toukry*, and a number of these Kolies are employed cutting down bamboos, that are afterwards conveyed to the coast and to the Dukhun for sale, it is said they derive their name from their employment. They worship Khundoba, Bhyroo, &c.

The *Dhour Kolies* are numerous in the Attaveessy, and a few of them are settled in the Wunn Dindory districts. They appear to be the most degraded of all the tribes, and do not hesitate to partake of the flesh of cattle that have died a natural death, and they are, at the same time, the most determined drunkards. When I was employed in the Attaveessy in 1820, this tribe was considered no better than the *Dheres* (pariahs) of the detachment with me. They are farmers and labourers; some of them are employed in cutting down the teak-wood within the districts of the Peint and Wassoonda rajahs, &c., which the timber merchants from the towns in the Dukhun purchase from them.

A few enterprising *Parsees*, who are settled in some of the largest villages on the public roads leading through the Attaveessy, supply the Kolies with abundance of arrack, distilled from the mowah flower. The Koly pays the *Parsee* in grain for his spirits. In many places they distil the liquor for their own consumption. These four classes seem to be one and the same people in the Attaveessy, but there appears

to be some difference in the manners and habits of those residing in the Wunn Dindory districts. The Naiks adjust matters connected with the usages of their tribes.

The *Doonggury Kolies*.—A few of these Kolies reside in the Attaveessy and in the Wunn Dindory districts. They are farmers and labourers, and some of them are employed as the local police of the district, in the pay of government. Kolies that reside near a hilly district are termed occasionally *Doonggury Kolies*, from *Doonggur* a hill.

The *Bheel Kolies* are not by any means numerous. We find one or two families settled in a few of the villages along the banks of the Pera and Godavery rivers. They appear to have been runaways, who associated with the Bheels, and subsequently intermarried with them.

The *Mullar Koly*.—This Koly seems to be one of the most pure and respectable classes of all the tribes. They are also known by the name of *Panburry Kolies*, from their employment of supplying the villagers and travellers with water. They generally employ buffaloes, to carry the *pukhall* (leather bag), in which the water is contained. The *Panburry Koly* is a member of the third division of the *Bulottah* institution, and receives his pay in kind from the villagers for his services. It is his duty to wait on travellers in the employ of government, and strangers; to clean out and plaster (with cow-dung) the floor of the *Dhurum Jalla* or *Chourry* (the public resting place); to supply them with water, &c. He also attends at all festivals, marriages, &c. in performance of his duty. This Koly is also termed the *Choomly Koly*, from a twisted piece of cloth, which he places on the crown of his head to rest his water pot on. The same Koly is frequently called the *Koonm Koly*, from his associating with the *Koonbies* or cultivators, for they occasionally partake of food at each others houses. One or more families of the *Mullar Kolies* are settled almost in every village in the Dukhun and in Candeish, and along the Ballaghaut in the Hyderabad territory, extending eastward to Khandhar, Indore and Boden, between the Godavery and Hyderabad; they are settled in the Ballaghaut (in a south-eastern direction) in the vicinity of Nulldroog. In many of the villages around and south of Punderpoor, this Koly holds the situation of the village *Efskur*, or beadle, and is consequently termed *turrall*. We find them occasionally employed as sepoys and village watchmen. In such villages in the southern portion of Candeish and north of the Godavery river, as the *turrall* (the person who performs the duty the *Panburry Koly* does in other parts of the country) is either of the *Dhere* or *Bheel* tribe, a Koly is engaged as his deputy to perform the service, his own low caste not admitting of his doing so. There are a few *Mullar Koly Patells* of villages in the Candeish and Ahmudnuggur districts. The hereditary Kolies of the

hill-forts of Poorundur, Singhur, Torna and Rajghur, all south of Poona, are Mullar Kolies, their duties consisted in guarding the approaches leading to the forts, &c. They held enam lands and received regular pay from government, besides enjoying the privilege of cutting grass and firewood, &c. In the year A. D. 1340, the Singhur Koly Naik resisted the attacks of the army of the emperor Mahomed Toghluq, during several months. A few of these Kolies are settled at Bombay, and along the sea coast, as cultivators. They worship Khundobah, Bhyroo, &c.

The Aheer Koly.—The Kolies of this tribe are inhabitants of Candesh, and they reside chiefly in the villages along the banks of the Girna river, and on the southern bank of the Taptee, one and two, and sometimes five and ten families, are found in those villages. They are very poor, but there are several instances of their holding the Patellships of villages in the vicinity of Yewall Sakry. It is said they originally came from the south. They are not held in high estimation, for they perform the hereditary duties of the turrall, or village Mhar, or Dhere (pariah), and, on this account, are entitled to receive the skins of bullocks and buffaloes that die a natural death, and they plant the horns of the animal in front of their door and worship it. The Aheer Koly is engaged occasionally to perform the duties of the jaglah, or village watchman, and at times as the Koly or water-man to supply the inhabitants and travellers with water, &c. In some villages, where the members of a family of the Aheer Kolies perform the different duties of the turrall or village beadle, those of the Koly or waterman, as well as those of the jaglah or watchman, they have been presented by the British government with from ten to fifteen, and twenty to thirty, beeghas of land in free gift, according to the size of the village, and the responsibility of the duties they had to discharge. The object of this grant, was to ensure their becoming more faithful and diligent public servants. They worship all the Hindoo deities, but the goddess Kanby Ranby (a derivative of Bhoany) is an object of great adoration with them. Their marriage ceremony is performed by a Brahman, and usually in front of the shrine of Kanby Ranby; this does away with the necessity of providing a feast for all the guests, &c., so that the expense incurred is trifling. They have two chief Naiks, who adjust matters connected with the affairs of their caste, one of these resides on the banks of the Taptee, and the other near the Girna.

The Muroy Koly performs similar duties, in every village in the northern Konkan, to those the Panburry Koly discharges in the Dukhun. He receives the Balottah allowance, and holds a piece of ground rent free, worth a few rupees. There are about a hundred families of the Muroy Koly at Bombay; they serve as palankeen bearers, labourers and porters.

The Sone Kolies are settled along the coast from Angriah's Colabah to Surat. At Bombay and Colabah (old woman's island) there are about two thousand houses of the Sone Kolies; they are all fishermen, with the exception of a few that enter as sailors on board of ships belonging to native merchants. It is said they have a dislike to going on board of vessels, owned and commanded by Europeans, in case they should lose their caste. They state that they came originally from Angriah's Colabah. They follow the profession of arms there, and do duty in the fort. Their chief men are styled Patells. The chief Patell resides at Angriah's Colabah; he possesses all the authority of the Goturany, and adjusts all disputes and irregularities connected with the infringement of the usages and rules of their caste. The chief Patell has an agent, termed Shisha (disciple), in each village or community of the Sone Kolies, who settles all disputes of a trifling nature; but, when it happens to be one of importance, it is submitted to the chief Patell Kanoojee at Colabah, for his consideration.

Such persons as are proved guilty of unchastity, are repudiated from the caste, and not re-admitted. So are such offenders as infringe their customs, and disregard the authority of the chief Patell. Occasionally a person who has behaved in a vicious and immoral manner, although he may have been rather perverse, yet, if he subsequently seems very penitent, he is received again by his kinsmen, after a large quantity of liquor has been expended, producing the inebriation of the greater portion of the assembly. In fact these Kolies seldom or never meet in any number, on occasions of congratulation, or of condolence, or for the adjustment of affairs connected with the usages and customs of their tribe, that they do not drink large quantities of spirits.

Their women, contrary to the usual customs of other Hindoo castes, wear long sleeves to their choulies, or jackets, and have glass bangles only on the left hand. At the time of their marriage, the bangles intended for the right wrist are consecrated, and cast into the sea, on which occasion the spirit of the ocean is invoked, and asked to be indulgent and kind to her husband, and to preserve her from becoming a widow, while he is traversing the deep in search of a livelihood. As a substitute for the glass bangles thus devoted, three silver ones are worn on the right wrist—several of these Kolies are said to possess great wealth. There are from five to six hundred families of the Sone Kolies settled at Bassein. Some of these serve as palankeen bearers, while those at Bombay are all fishermen. There are a good many of the Aggry Kolies settled at Bombay, Bassein, Thanna, and Punwell; also along the coast towards Surat. These people are boatmen, and serve as sailors on board of vessels belonging to natives. Some of them are palankeen bearers, cultivators and labourers. Their chief Patells settle matters connected with their caste. They worship the god Khundoba, &c.

The Mettah Kolies appear to be confined entirely to Bombay, where they have between five and six hundred houses. From residing on the hill, or rising ground, south of Mazagong, they are occasionally termed Doonggurfry Kolies, from *Doonggur*, a hill. The part of the native town called Doonggurry derives its name from these Kolies, having originally been the first inhabitants, not only of that spot, but of the island of Bombay. In fact, they assert that the place belonged to them in days of yore. They are all fishermen and seamen; they do not retail the fish themselves, but hand them over to other persons in the bazar. There are persons of considerable wealth among them, who are owners of vessels that trade along the Malabar coast, navigated by sailors of their own tribe. The head Patells, Gopalljee Guary and Bheojee Soory, adjust all disputes connected with their caste. Such persons as are proved guilty of unchaste and immoral acts are expelled from the tribe, and not received back again into their community. These Kolies consume large quantities of liquor at their festivals, and convivial and ceremonial meetings. The wives of the Mettah Kolies devote the glass bangles of the right hand to the deep, to propitiate the spirit of the ocean for the sake of their husbands, in the same manner the Sone Kolies do, and they replace them with silver ones. They worship Khundoba, Bhyroo and Bhowany.

In Bombay, Thannah, Bhewndy, Kallian, Bassein, Damann, &c. we find a people, termed by the inhabitants, the Christian, or Portuguese Koly. It is said that their ancestors were of the tribe of Sone Kolies, and that they were forcibly converted to Christianity, some ages ago, by the Portuguese. These people are cultivators, extractors of toddy from the palm trees, and others sellers of fish. They follow the precepts of the Roman Catholic faith; but it seems an extraordinary schism has sprung up among them, or, it ought rather to be said, that some of them have forsaken the true faith, and reverted to paganism. This retrogression took place about the years 1820 and 1821, when that terrible scourge, the cholera morbus, was raging so furiously in the Konkan, and along the coast. Many of these poor ignorant creatures, seeing desolation spread in their families by this heavy visitation, thought they would be much more fortunate and happy, were they to pay their adorations to Devy, Khundoba and Wittoba, than by continuing to do so to the Almighty. A portion of them having accordingly come to this resolution, they at once abandoned the true God, and supplicated these false idols to be merciful and kind to them, and to relieve them from the distress by which they were surrounded. They have discontinued all intercourse with their Christian brethren, and resumed the custom of wearing the *sendhy*, or tuft of hair on the crown of the head. They employ Brahmans at their nuptial ceremonies, but the other Hindoo Kolies, considering them a contaminated race, hold no communica-

tion with them. A few of them are cultivators and labourers while others are sellers of fish, which they cut into small bits, and sell in their booths, or *Thanns*, in the bazar, and are therefore denominated Than-kur-Kolies. A few families are settled at Bassein, Thannah, Bhewndy, &c.

There are between three and four hundred families of the Chanchhy tribe of Kolies settled at Bombay. These Kolies bear the character of being a very peaceable and industrious race. They are chiefly farmers, who cultivate various sorts of roots, fruits and vegetables, which they take to market. Others are labourers, and a few of them are employed in the service of native merchants. These Kolies come from Joonagur in Kattywar (Guzerat). They worship Dakkoorjee (Runchonjee) and Mahaluchmy.

The Kolies in Guzerat appear to be divided into several tribes—the Tullubdah, the Puttunwarria, and the Kakrez, the Dhandhour and Babriah. The Tullubdah are the most numerous. The limits of their country extend from the Baroda district, north, to Khyralloo and Massawnah, on the banks of the river Koopyne; and from Dholka on the borders of Kattywar to Lunawarra. Some of them are found beyond these limits, but that above defined they consider their own country. The Tullubdah, in addition to being the most numerous, is considered superior in rank to the other tribes. The Puttunwarria will partake of food prepared by the Tullubdah, but the latter will not touch food cooked by the Puttunwarria. It is a very common practice with them, to call each other by the name of the district in which they reside. The Tullubdah Kolies, residing around Kurree, &c. are known by the name of the Chowally Koly, the name of the district. The Kolies in the Mhyee Kaunta, are termed the Parriah Kolies, also the Mhyee Kaunta Kolies. Those residing in the Pergunnah of Dhygown, about 25 miles north-east of Ahmadabad, are known by the name of Kauntt Kolies. The Thakoors* of Lohar and Amlyah in this division are Kolies. The Thakoor of Goorassur, 25 miles S. E. of Ahmadabad, is a Koly of great influence; also the Koly Thakoor of Ometta on the Mhyee. The Thakoors of Aglore Kuttawun, Bhukkora, Mugoona in the Chowall, are also Kolies. These Kolies form a very large portion of the population of the districts they reside in. It has been estimated that, in the Khaira district alone, there are nearly seventy thousand of them. They are all cultivators and labourers, and often Patells of villages; a few of them being employed

* Rajpoots and Kolies, who are the proprietors of several villages, from which they derive a revenue of a few thousand rupees, or who have an income of a similar amount from revenue and other sources, such as geerass or grass, equivalent to black mail, are termed Thakoors.

as village watchmen, others by native bankers, &c. The Koly watchman is termed Wurtuneeah, Pujy, Puggly* and Rukha. They hold some land rent-free, for their services, and receive other dues. Formerly, and still in many places, the Wurtuneeah is obliged to be on a good understanding with the Geerassy chiefs in their vicinity. The villagers, or the Wurtuneeah, grant a certain allowance to the Geerassy to refrain from plundering their village.

In almost every second, third or fourth village, there are two or three families, known by the name of the Kotewallaha Kolies. They attend on travellers, particularly the government servants, to procure such articles for them as they may require. They get the potter to fetch water. In all the towns there are a few Kolies termed Selottah. These are employed by native bankers in escorting treasure, or other valuables, and they accompany travellers, from stage to stage, for a fixed allowance. Should the Selottah be at enmity with any of his tribe, he will take a sufficient number of his kinsmen with him to protect his charge. When there is danger, the Selottah boldly steps out to face it, and often has sacrificed his life in defence of his charge, and in the performance of his duty. Some years ago, the Selottah's services were eagerly sought after; they at present attend in expectation of being employed, without being called. In some parts of the country the Koly and Rajpoot Thakoors employ some of their dependants to discharge the duties of the Selottah, in escorting property and travellers through their villages.

In every ten or fifteen villages, there is a Koly named the Nathy Patelliah, whose duty it is to adjust any disputes connected with the infringement of the usages of the tribe. The Nathy Patelliah summons any offender before him, and several Koly Patells, and a few elders of the tribe, investigate the affair, and fine the delinquents. He is made to furnish an entertainment for a portion of the tribe, and to pay some money, according to his means. When he has partaken of food, from the same platter with the Nathy Patelliah and some of the others, and has smoked a hooka, of which several of the assembly have also taken a whiff, he is considered to have been readmitted into his caste.

They worship Mhadeo, Bhoany, Ambyka, Devy, Botcherra Devy (Mattah) and Runchore (Krishen) and Hunooman. Of all these, Bocherra, or Betcherra, the goddess who presides over the small pox, seems to meet with the greatest attention from these people. The most sacred and binding of their oaths is that taken when the hand is placed on this idol. Another most binding mode of pledging their faith, is

* The Puggly is well known as the watchman employed by the officers stationed in Guzerat. He takes his name from tracking the foot marks, (pug—foot). They are very expert in their profession.

filling a brass or copper cup with water, placing their hands on it, and repeating the names of all their gods—this they term Pruvopyah.

When any serious quarrel or feud has been settled between these Kolies, they seal their reconciliation by drinking some Koosomb, which is merely a little opium dissolved in water. They are partial to opium, and very fond of spiritous liquors. They are enterprising, bold and most desperate thieves and plunderers; yet they seldom commit murder, unless they are attacked, or resistance is offered to them.

The Puttunwarriah Kolies reside in the district around Puttun, and between the Surrasswatty and Bunnass rivers. I have mentioned before that they do not rank so high as the Tullubdah Kolies; this is on account of their partaking of the flesh of buffaloes. They are dispersed over the southern districts of Guzerat, to the vicinity of the Nurbudah, and in many places are numerous. They are cultivators and labourers, and occasionally employed as watchmen of villages, &c. They worship the same gods as the Tullubdahs, and differ little from them in respect to character. The Kakrez Kolies inhabit the district of that name, to the north west of the Bunnass river. They are numerous, and are bold and enterprising plunderers. The Dhandhar Kolies reside in the district of that name, of which Phanlanpoor is the chief town. They are a daring and wild people. The Bubbriah Kolies occupy the southern portion of the peninsula of Kattywar.

The tract occupied by the Mhadeo Kolies and their origin.

In the following pages, I purpose giving an account of the tribe of Mhadeo Kolies, who reside in the valleys on the east side of the Syhadry range of mountains, extending from Moossa, south-west of Poona, northward to Trimbuck, the source of the Godavery river, and lying between the 18¹° and the 20° degrees of north latitude, and 73¹ and 74 east longitude.

These small valleys are formed by masses or groups of rugged hills, and less lofty ranges, that diverge laterally in an easterly direction from the main chain of mountains, and are known to the inhabitants by the names of Mawills, Khorahs, Nahirs and Dougs—that is, valleys, glens, straths and wilds. They vary considerably in configuration and extent, and, at the distance of ten, fifteen, and twenty miles from the crest of the Syhadry range, they gradually expand into the spacious plains of the Dukhun, when the collateral branches and groups of hills, within the before defined limits, may be said to terminate, with the exception of the low, irregular branch, that protrudes from the north of Joonere, and runs along to the south of the Moolla river, but diverges much in its advance to Ahmudnuggur, after which it stretches, in a

south-east direction, and ultimately constitutes the Balaghaut of the western boundary of the Hyderabad territory. The chief gorges, or passes, in the principal range, leading down from the Dukhan to the Konkan, and the bottom of the different valleys, may average from 1,800 and 2,000 feet, to 2,300 feet, above the level of the sea; and the most elevated points in the main range may vary from 4,000 feet to 4500 feet. However, the summit of the Kullasabaie hill, one of the detached branches, only a few miles from the forts of Allung and Koorung, rises to the height of 5,000 feet, and is considered the highest land in the Dukhan. Many of these lofty, isolated and rocky hills, were selected by the rulers of the country, some centuries ago, as fit places to be converted into fortresses; and, as the sides of the hills were in general very steep, indeed often quite perpendicular, it was only necessary to erect a gateway, and fortify this entrance, to render the place almost impregnable.

These numerous hill forts,* with a few solitary exceptions, have been dismantled by the British government, as they were considered, in a political point of view, useless and expensive. The original object of establishing such strongholds might have been twofold. First, the cost of fortifying such places must have been comparatively very small. Hills, suitable for the purpose, in the vicinity of large, open towns or villages, were fortified, to afford the inhabitants an asylum to retire to, should a formidable body of plunderers threaten to overrun the country—secondly, the object of erecting some of the hills of a mountainous tract into fortresses, might have been to guard passes leading from one province into another, or to overawe the population; for we know that the inhabitants of a hilly country are a very independent and untractable people.

The inhabitants of many of the villages in these valleys suffer very great inconvenience, during the months of April and May, from the great scarcity of water—yet the fortified hills were supplied abundantly with the finest description of this necessary of life. Tanks or re-

* As I was employed, after the termination of the last Maharatta war, in dismantling the hill forts, I can bear testimony to the general salubrity of many of these lofty dwellings, notwithstanding their very bleak and dreary situation, especially during the monsoon, when that terrible scourge, the cholera, was spreading desolation in the villages, in the plains below the forts, and more particularly those situated in low and confined situations. In the years 1818 and 1819 I had charge of five hundred *Sibundies* (irregular troops), stationed in hill forts; of this body, only two men of the garrison of Anky Tanky died of cholera. A party of *Sibundies*, stationed at that fort, went to a village in the vicinity to procure some supplies; they slept below one night, and, in the course of three days, the men alluded to were seized with the disease and expired. I may add that, out of two hundred workmen, employed in destroying the forts, about twenty of them slept below in the plain, as their families had joined them; while all the others slept under trees on the hill, or in caves. The cholera on one occasion attacked several of those that remained below, and one of them fell a victim to it.

servoirs were excavated in the rocky summits of the hills, where the appearance indicated the presence of water; in these excavations, it frequently becomes necessary to form a portion of the rock into pillars, to support the roof of the tank.

It is to be noticed, that the acclivity, on the western side of the Syhadry range, is always abrupt and very steep. Here, especially, as well as among some of the other groups of hills, there are many grand chasms, with rocky walls, several hundred feet in depth. In these immense ravines, on the summits of the hills, and puthars, or plateaux, there are numerous plants, shrubs and beautiful trees. In many places, in hollows, and on the puthars, there are dense and extensive patches of lofty jungle and forest timber, with thickets of impervious brushwood, particularly south-west of Joonere and around Ambygoun. A variety of wild animals inhabit these jungles. Tigers, cheetahs, hyænas, bears, wild cats, hogs, kollussnahs (wild dogs),* jackalls, gowahs (bison), samburs, neelgaie, spotted deer, antelope, bhekkur,

* The animal, termed by us the wild dog, is known to the natives by the name of kollussnah, kollusra and kollussa. It is common in the Kotool district, and all along the range of western ghauts. It is about the size of a panther, with very powerful fore quarters, narrow tapering loins, black and pointed muzzle, and small erect ears. The tail is long, and at the extremity there is a bunch of hair several inches in length. The kollussnah is of a darkish red colour, possesses great speed and hunts in packs of five, eight, fifteen, and even to the number of twenty-five; is extremely active, artful, and cunning in mastering his prey. It is during the night time they move about in search of food, but, should an animal approach near them, an hour or two after sunrise, or a short time before sunset, they will attack it—all animals seem instinctively to dread them. During the daytime they remain quiet in their hiding places. When the kollussnah discovers an animal worthy of being captured, the circumstance is announced to the pack by a barking, whistling noise; the others are on the alert, advance rapidly and post themselves slyly round the spot, and gradually close in on the animal. Upon seeing one or two of the kollussnahs he gets frightened, but much more so when, running away at speed, he encounters one of his enemies in whichever direction he attempts to escape. The consequence is, that he stands quite amazed—some of the kollussnahs run in close to him, and shed water on their bushy tails, which they swing about and jerk into his eyes—he is successively saluted in the same manner, when he approaches them, or they run on him. The unlucky beast is soon blinded by the peculiar escharotic quality of the application; for he begins to stagger and run round and round, and is now beset by all the kollussnahs who make a loud barking and snapping noise while they pull the animal down and tear him to pieces. When few in number, they have been known to gratify their hunger before the poor animal fell down or expired, each of them tearing away a mouthful while the animal remained standing. There are very few instances of their ever having attacked the villagers' cattle, but they will kill stray calves if they fall in with them. The Kolies never molest the kollussnah, in fact they are glad to see them in their neighbourhood, being aware of the enmity that exists between them and the tiger, for they kill that animal occasionally; and in consequence they are considered by the people as the protectors of their cattle and their fields, for neither sambar, deer, or hog, seem disposed to approach places much frequented by the kollussnah. They hunt and kill the sambar, neelgaie, hyæna, deer, jackalls, hares, hogs, bears, porcupines and quails. They killed a tiger, in June, last year, in the Telongua jungles.

monkeys; also hares, pea fowl and jungle fowls, with many birds, small and large, of rare and variegated plumage.

Exclusive of the principal passes in the western ghats, there are numerous foot paths, leading over the mountains, from the Koly habitations above, to the villages below in the Konkan. These paths are very intricate, and it is with much difficulty the people travel along them when loaded, and proceeding with the produce of their fields to the bazars on market days; where the rock is very precipitous they use a simple bamboo ladder,* which enables them to effect their passage by the most direct routes.

During the south-west monsoon, which in general sets in about the end of May, or first fortnight in June, on such days as the rain ceases, not only the summit of the mountains, but the valleys are enveloped in general in a very dense fog, consequently there is always a damp and chilly sensation in the atmosphere at this period. While the months of April and May are often extremely sultry and oppressive below, it is comparatively cool on the tops of the hills. It may be observed that the scale of the atmospherical heat, as indicated by our thermometers at times in such situations, is an imperfect measure of sensible heat. The climate is unhealthy, after the termination of the monsoon, and the inhabitants suffer much from fever and ague in the months of September, October and November.

The population of the tract just described consists of Thakores,† some Hutgur and Telwur Kanarabs, and a few Bunjaries, in addition to the Kolies;‡ including also, some Koonbies, who have intruded themselves within a few ages past.

The following is given as the popular tale of the origin of the Kolies. After the death of one of the rajahs of the race of the sun, named Rajah Venn, who was a very great sinner and a very disreputable person (an account of him is given in the Bhugwutta Pooran), a man of a dwarfish size, sprung from his left arm, and he was called Neeshad (base born), and directed by some saint to take up his residence among mountains and forests. He, consequently, was the ancestor of all Keerants,§ or the barbarous and savage people who inhabit wild places, and subsist by the chase. One of the descendants of Neeshad and a female shoodur, were the parents of the Poolkuss; and a male of the Neeshad lineage and a female of the Poolkuss family, were the parents of the Koly. He was to subsist, by killing whatever animals he encountered in the jungles and forests. It may further be stated, that

* They place a substantial bamboo, divested of its branches, except a small stump that is left at each joint or division, to be used as a step.

† A short account of these people will be communicated in a separate paper hereafter.

‡ There are some Mhadeo Kolies settled around Jowair in the Konkan; the Rajah of Jowair is a Koly. There are some of the same tribe in Bombay.

§ Keeraut, Poolinda and Shubbur, are the Sanskrit terms applied to the Bheels, and other wild hilly tribes.

the Kolies say that they are the descendants of Valmik, the distinguished author of the Ramayun, who, although of Brahman parentage, and born at Veer Wala, twenty-four miles south-east of Poona, it is said followed the life of a Koly. The description of Valmik magnifies him into a huge giant, who could walk fifty miles in less than half an hour. He is reputed to have been a most desperate and remorseless robber and murderer; and that he continued so until he encountered the holy Narud, who ultimately succeeded in persuading him to abandon the wicked life he was leading, for a better and more virtuous one. The Mandur Soombah ghaut, ten miles north of Ahmudnuggur, and close to that beautiful and romantic spot known to us by the name of the happy valley, is said to have been one of his favourite haunts.

The Sanskrit word *kyourtuk*, meaning—boatman and fisherman, is applied by some of the* inhabitants to the Kolies, but in the Dukhun it is unusual to see them engaged as boatmen. A very few of them, from necessity, may in some places follow the profession, for a month or for a season; as the Koonbies, Mallies, Bhoovies, Dheres and Mahomedans do. Neither is it common for the Kolies in Guzerat to labour as boatmen. The term might be more appositely applied to the Kolies along the sea coast.

There are several hundred families of the Dhewur tribe of boatmen,

* The Mahomedans and a great many of the Hindoos are very apt to apply the term Koly to persons of various low tribes, respecting whose origin and habits they may be ignorant. There is a class of people, known by the name of Tarroo, who are boatmen at the ferries of the Godavery, &c. and, although they are quite a distinct class, and not very numerous, some persons ignorantly call them Kolies. In the country to the north and to the west of Hyderabad, there are several tribes of low caste people, who resemble the Kolies in some respects. One of the most numerous of these are the people known by the name of Mootrassy. When they cultivate and work as labourers they are so called; those who superintend water courses and tanks, to see the regulated quantity of water supplied to the people, are termed Neerrorabs; and those who follow a military life are called Tellgolls, which is the familiar word among them for an armed man. The Tellgolls, are much employed as sepoy (hereditary) in the service of the Naiks or Zumeendars, in the Hyderabad territory, and they hold a considerable portion of land rent-free for their service, which is cultivated by some of the family. Besides they receive dues from the inhabitants, for performing the police duties of villages, and are employed in collecting the revenue and on "field service" when the Naik is engaged in hostilities, even should it be with the ruling authority of the country; on which occasions the Tellgolls were frequently in the habit of sending their families to the jungles for protection, while they showed the greatest zeal and most devoted attachment in the Naik's cause. Some of these people were formerly employed in the Poona subsidiary force, as pioneers, lascars and dooly bearers. A few of them are settled at Poona and Seroor as palankeen bearers. The Mootrassy passes under the denomination of Kamatty, at Poona and Seroor. The word Kamatty is applied, by the inhabitants of the Mahratta country, to all descriptions of persons coming from the Ballaghaut and the Hyderabad country who can speak Telingy, Koonbies, Mallies, &c. and even Mahomedans, are classed under the head of Kamatty. The Mahomedans in the country around Communnait, Nullgoonda, Pochumchilloo, apply the term Koly to the Tellgolls. They worship all the Hindoo gods under the Telingy names of Eerranah (Mhadeo) Ellamah (Bhoany), Pochumah (Matta Devy); but their chief object of adoration is Narasingha, the man lion, being the fourth Avatar of Vishnoo.

settled in the towns and villages on the banks of the Godavery river, between Nassik and Gungakhere. They state that their ancestors came from Bundelkund in Hindoostan. They worship the god Ramah, and relate a miraculous story respecting their own origin. They say that they are not Kolies; the terms Dhewur and Kywurtuk are synonymous, and the Poorans state that they are the offspring of a Pursovah, a goldsmith and an Eogvhy or female patruwut (a hewer of stones), who are to be employed as boatmen at ferries on large rivers. A few of them are employed at Ahmudnuggur and Poona as palankeen bearers.

The tribe of Mhadeo Kolies is divided into twenty four Kools, or grand division; each of these is subdivided into branches or classes, amounting in all at present to about two hundred and eighty. Each of these clans comprizes many families, bearing the same surname; the number varies according to circumstances.

The following are the names of the Kools of the Mhadeo tribe of Kolies, with the number of clans or branches that have diverged from each :

Clans.	Clans.
The Wunuckpall, from this have sprung 17	The Polewoss, from this have sprung 13
The Kudum..... 16	The Ottarracha..... 13
The Puwar..... 13	The Dulvy..... 14
The Keddar..... 15	The Goully..... 2
The Boodywunt..... 17	The Agghassy..... 3
The Namdeo..... 15	The Chowan..... 2
The Kheersagur..... 15	The Oojay..... 12
The Bhagghywant..... 14	The Sagur..... 12
The Bhonsla..... 14	The Shaikacha Shesha..... 12
The Jugtap..... 13	The Khurad..... 11
The Gykwar..... 12	The Seerkhy..... 2
The Sooryvaunssy..... 16	The Sew..... 9

Although it is impossible to ascertain who the original founders of each Kool or grand division might have been, we are, however, supported by traditionary evidence in stating, that persons of rank or influence in former ages, who might, from necessity, choice or other causes, have joined the Koly community, occasionally became, in such case, the founder of a new Kool. As a proof of this, it may be mentioned here, that the origin of the Lökkriah and Garriah clans of Kolies, who are numerous in the Ghore Nahur or valley of the Ghore river, is popularly accounted for in the following manner. A person named Batty Row Sirkhay (styled Rajah, and said to be connected with some of the powerful families of the name in the Dukhun), having been afflicted with a very terrible and most loathsome disease, repaired to the celebrated temple of the deity Wittoba at Punderpoor, and implored the god to

remove the terrible disease and restore him to health. The deity is said to have listened to his earnest entreaties, and recommended him to proceed along the bank of the Bhreema, until he reached the temple of Mhadeo at Bheema Shunker, the source of the river; and that, if he paid his devotions diligently at the shrine of Mhadeo at that place, he might expect to find that the deity would restore him to perfect health. He accordingly commenced his journey towards the western ghats. The jungles or forests in the vicinity were, in those days, almost impervious; however, Sirkhiash gradually advanced, and, when he had approached the hill near the temple, he discovered a cave, in which an old Koly and his daughter resided; he made up to this Kolen while her father was absent at the temple, and learnt from her that her father was the attendant of the temple of Mhadeo. However, to cut the story short, Sirkhiash recovered his wonted health, and became enamoured of the Kolen, who, in the course of time, presented him with a boy, and as the child had an unusual quantity of hair on his body, he was nicknamed Lökkriah, which, in the Mahratta language, means hairy. Tradition further says, that Sirkhiash invited many of his relations and friends to join him, and that he founded the village of Shawpoor; but, as he subsequently became a bold and daring plunderer, orders were given for apprehending him, and in an attempt to capture him he was killed. His son is supposed to have been the founder of the clan Lökkriah. The Sawunt Desmooks in Bhaumnhair have a copy of a document, dated Anno Hijera 827, corresponding with A. D. 1423, in which the services of one of their ancestors are commended by the king of Bedur, for having suppressed an insurrection caused by Batty Row Sirkhy, on which occasion the village of Irum was conferred on him in enam (free gift), and he was confirmed in the Desmooky of 84 villages. The descendants of Sawunt continue to enjoy these grants.

Were we to judge from the similarity, some of the names of the twenty four Kools bear to the present Koonby surnames, we might feel inclined to conclude that the Kudum, Gykwar, Puwar, Jugtap, &c. were apostate Koonbies who had joined the Kolies: but then it is to be recollected that these surnames are common to all the families of the very lowest classes of the community. The Chowan Kool is thought to be of Rajapoot origin, and the Namdeo Kool, it is conjectured, must have been founded by one of the Mahratee Namdeo Simpees, or tailors, as they are the only Kolies who abstain from killing sheep at their weddings, following the example of the Namdeo Simpees in this respect, who do not partake of animal food during the nuptial ceremonies, although they offer propitiatory sacrifices to their gods, some days previously. One of the members of the Memany family of the Kheersagur Kool, who are Patells of the village of Kheerysur, in Mhurr Khora, some four or

five generations back, received a Bunjara boy into his family, and adopted him as his son, the boy taking the name of Memany. This circumstance has been the cause of much strife and quarrelling among the members of the family, the descendants of the Bunjara claiming the Patellship, while the lineal descendants deny their right, and upbraid them with the nature of their origin.

It appears that nineteen of the original names of the persons who were the founders of the different Kools of this tribe, have in the course of time become extinct: yet the numerous clans who have respectively sprung from each of them, carefully retain and cherish the name of their original founder. The Mhadeo Kolies are peculiarly tenacious of the Hindoo usages, of adhering strictly to established rule in forming their matrimonial connexions. For it is only persons of different Kools that can be united in marriage. Those of the same Kool, or original family stock, are prohibited intermarrying. It is a common observation, that, were persons of the same Kool to marry, the circumstance would entail much unhappiness and misery on the parties, and that their offspring would never thrive. I know an instance of such an irregular marriage, and it is rumoured that the couple are very unhappy and have no children. The mistake occurred by the parties omitting to institute the necessary enquiries at the proper time.

The estimated number of the tribe—their Patells—the Revenue system, and grains cultivated by them.

It is said, the Kolies were much more numerous about seventy years ago than they are at present; that many of them were destroyed during the various disturbances that have taken place since then, and by the famine that occurred in 1803-4, and, latterly, by the cholera morbus. To afford a better idea of the amount of the Koly population at present, and to show how they are dispersed over the hilly tract, I will give the estimated number of their houses in each valley and glen.

There is reason to suppose that they were more numerous in former times, around Poona and the valleys south of Loghur fort. But, in the valley of the Moossa Khora, they have only thirty houses, and in the Mootah Khora they have also thirty houses, and forty in the Puwun Mawill; all of these are Oopry* cultivators and labourers, there being no Koly Thullkuries or Wuttundars so far south at present.

In the Andur Mawill there are sixty Koly houses; they are the Patells of two villages and share the Patellship of two others with the Koonbies.

* Oopry—a tenant, of one having no property in the soil; whereas Thullkury means one that has a right in the lands he cultivates.

In the Nana Mawill the Kolies have a hundred houses, they hold a share of the Patellship of several villages, and the Heemarrah Koly Naik, with ten men, is employed in the police.

In the Bhaum Nahir the Kolies have 45 houses, and they hold a share of the Patellship of two villages; but the Koonbies, who hold the other, are in a fair way of gaining the entire power, by forcing the Kolies from their houses. Much intriguing, and a great deal of villany, is often exercised among these people on such occasions. The Mettull clan of the Kedar Kool is the most common in this strath. The Kolies residing in four villages in the Koorah Barrah and Arrull Khorah have about 85 houses; they hold half the share of the Patellship of two villages, the Koonbies hold the other. It is said that it is only very lately the Koonbies have unjustly secured the share of the Patellship for themselves. The Koonby, who now holds the Patellship of Kheirpoor, is a nephew of the Desmook of the district; he only took up his residence in the village a short time ago, for the purpose of grazing his cattle in the adjoining jungles. Although the title and a share of the office of Patell was conferred upon him, no enam land could be granted without the sanction of the government authorities; however, as the village Chougla died without any heir, the Desmook transferred his enam land to the new Koonby Patell. The Parday clan of the Gykwar Kool is the most numerous in this glen.

In Bheem Nahir, the Kolies are the only inhabitants of nine small villages, and in nine other villages they and the Koonbies hold each a share of the Patellship, the Koonby Patell takes the precedence of the Koly Patell in all the village affairs, which is a source of great vexation and complaint to the Kolies, as they declare the Koonbies have unjustly taken possession of these situations. The number of Koly houses here is estimated at 288, and the names of the Langly, Murkhy and Nanggry families are the most numerous.

In the Ghore Nahir, or valley of the Ghore river, and in the Ambygown quarter, there is a great deal of jungle. The Kolies are more numerous here; in forty villages they have nearly one thousand houses; and hold the entire Patellship of 35 villages and share that of five others with the Koonbies. The Koonby Patell's share of the village of Wuspah was purchased, only a few years ago, from the Koly Abbajee Singgariah, for the small sum of forty rupees. The Koly was involved in difficulties; his property had been distrained, to pay arrears of revenue; and, to get rid of his debt, he was persuaded to sell his share of the Patellship. The Koonby Patells of this quarter are constantly exerting themselves to dispossess the Koly Patells of their rights. This leads to incessant strife between the parties. The Koonbies using

their influence with the Desmook and Koolkurny to get them either for love or money to support the claims they put forth.

Three very small villages have been deserted in this quarter, within these last six years. In two of these there were only a very few inhabitants, and, as they had suffered much from sickness, they quitted the place. The third was deserted owing to a boundary dispute not having been satisfactorily adjusted. In the quarter called Ghora of this valley, there are one hundred Koly houses in six villages, and in one village they continue to retain a share of the Patellship.

The Koly Naik, Dada Baunlay of Bhoregur, is employed in the police with twenty-five Kolies. They have charge of the valleys, of the Ghore, the Bhaum and the Bheema rivers. The Naik's pay is 25 Rupees per mensem; the men receive four rupees each. The Lokkriah, Assaully and Bendery clans are the most numerous in this valley. In Meen Nahir there are 321 Koly houses in 17 villages. The Kolies hold the entire Patellship of eleven of these—the Patellship of five others they share with the Koonbies, and of one with a Mussulman. These are constantly squabbling, and claiming precedence of each other. The most common family names in this strath are the Neegly, Silligada, Ballcheem, Dorrorry, &c. In the Kookur Nahir the Kolies are the sole Patells of thirteen villages, and they share that of eight with the Koonbies. The number of their houses amounts to 316. The Toory Koly, Patell of Tejoor, and the Koonby Patell Khurrad, are always quarrelling. The Koonby is accused of having come to the village jungle to graze his cattle, and, by unfair means, to have usurped a share of the Patellship. The Sablah, Naggry, Dewtah, &c. are the most common family names in this strath.

Mhurr Khora.—The Kolies are the only inhabitants of five of these villages of which they are the Patells; in four of the other villages there are a good many Koonbies, but the Kolies are the Patells; with the exception of one, which they share with the Koonbies. In the village of Peeplegown the Koonby Jumdurry is the sole Patell. The family of Bhokkur, notorious among the Kolies as being one of their greatest chieftains, was Patell of this place, and resided here. It is known by the name of Peeplegown Bhokkur. It is said that the Bhokkur Naik fled, during an insurrection of the Kolies, when Nana Phurnavees was minister; and that the ancestor of the present Koonby Patell contrived then to secure the situation for himself. The present Koly Naik continues to claim the Patellship. There are 164 Koly houses in this glen.

The Bhokkur Koly, Naik of Mhurr Khora, with 25 Kolies has charge of the police of Meen Nahir, Kookur Nahir and Mhurr Khora.

In the Ootdoor quarter the Kolies are the sole occupiers of ten villages, of which they are the Patells, and they share the Patellship

of twelve others with the Koonbies. In the 22 villages there are 394 Koly houses. Diggy Mally and Gondky are the most common family names.

In the Kotool Dang there are 840 Koly houses in 32 villages, and they are the Patells of 29 villages. In the Kotool puthar (plateau) and adjoining villages, there are 200 Koly houses. Between the Singgally Koly, Patell of Wanjoollsett, and a Telwur Kanara, who has claimed the Patellship for these 35 or 40 years, much enmity exists. The Koly's corn and sugar cane fields were lately destroyed by the Kanara's cattle. The latter has a little money, and bribes the Zameendars, and by this means retains possession of the office he has usurped.

In all there are about 1,040 houses. Bhauggrah, Moottah and Heelah are the most common family names. Ballajee Bhauggrah of Khona, the hereditary Koly Naik of the hill fort of Koonjurgur, was appointed to the police of the Kotool districts, with ten men, a few years ago. He shortly afterwards died, and although his son ought to have succeeded him, as the Naik Rukwuldar of the district, another, but more wealthy, clansman, by means of bribing the Brahman agents, got confirmed in the appointment, to his detriment, and he is constantly complaining of the injustice done to him.

In the Rajoor Dang, the Kolies inhabit 35 villages, and they hold the Patellship of 35 of these, and share that of the Kusbah of Rajoor (the market town) with the Bunjarrahs, who are settled there. Much strife and bad feeling exist between the two parties, owing to the rivalry between them about taking the precedence at festivals, and in other affairs connected with the village duties. The Desmook of this district is a Koly (the family intermarry with the Rajahs of Jowair) the surname Peechur, and the Bhauggrah family of Ekdurrah have been the Naikwarries for ages past. The present Koly Naik, Gungojee Bhauggrah, communicated information to me of a most important nature, relative to the movements of the rebel Kolies some years ago, for which he was handsomely rewarded by government. The number of Koly houses is estimated at 992. Bhauggrah, Peechur, Kudally, &c. are the most common names in the district.

The police of Rajoor and Malldesh is in the charge of the Koly Munsubdar Naik, Jowjee Baunlay, who has forty men under him; and the Sir Naik Bhauggrah of Sakurwary with twenty five; and the Khary Naik of Barrah with fifteen men.

In the twelve villages of Putta (under the forts of Ounda Putta) the number of Kolies' houses is about 163, and they hold the Patellship of six villages. The most common family names are the Tullparah, Duglah and Sablah.

The cattle, in the villages of the tract around the forts of Ounda Putta, are all singularly marked, being invariably spotted white and

black, red and white, or black and red. *Ounda Putta* means marks reversed, or upside down.

In Malldesh, the Kolies inhabit three villages of the Takeed Khora, of which they are the Patells; and they hold half the Patellship of two others. They have 269 houses in this glen.

In the Kounnaee Khora, the Kolies have 200 houses; they hold the entire Patellship of seven villages, and share that of another with the Thakpoors. Amby Mohur rice, of a superior kind, is grown here. The surnames, Perrykur, Khuttelah, and Gubbalah are the most common.

In the Dharrun Khora the Kolies are the Patells of five villages, and hold half of that of another; they have 262 houses here.

In the Oondhwale Khora the Koly houses amount to about 217. They share the Patellship of six villages with the Koonbies. The two parties are constantly quarrelling about their rights in these six villages. It is said the Kolies were the sole proprietors of these Patellships some sixty or seventy years ago.

To the south of the hill fort of Trimbuk, in 14 villages, the Koly houses amount to 223. They are the sole Patells of eight villages. They share the Patellship of two others with the Thakoors, and one with the Telwur Kanarabs—surnames Gondky and Wagh.

In the town of Trimbuk and neighbouring villages, there are about 250 Koly houses of the Mhadeo tribe. Here some families of the Koly tribes from the northward are settled.

In the town of Nassik and its vicinity, there are about 200 houses of the Mhadeo Kolies, and in and around the town of Sinnure, about one hundred, and about one hundred more settled in and around the town of Ankollah. In the Konkan, but chiefly in the Jowair district, there may be about 2,500 houses, and it is supposed that the Mhadeo Kolies, who are settled in Bombay as labourers, &c. have about one thousand houses there.

From the above we find that there are in the Dukhun about. . . 6,895

In the Konkan and Bombay 3,500

In all about houses 10,395

As two and three families reside frequently in the same house, if we take the average number at five for each, it will give us upwards of fifty thousand souls of this tribe.

The Koly Patell, or the chief person of the village community, has to perform the same duties in their small villages and hamlets, that the same officer has to execute in other parts of the country. They have to lend their assistance in collecting the revenue and other dues from the inhabitants of their villages, and to aid the police in their magisterial capacity. For the performance of this duty the government remunerate them by granting them a portion of rent-free land, termed

Passoury,* which varies in quantity, from about 100 begahis, to half, a third or a quarter of that number, according to the size of the village and supposed responsibility of the Patell. He also holds a portion of Meerassy-land for which he pays rent.

From the inhabitants he receives the following perquisites or dues. Every householder presents him with one fowl annually, and every farmer gives him one seer of ghee; if the farmer is very poor, the Patell will be content with a half or quarter seer. Each farmer presents the Wannolla (a sort of friendly offering) at the harvest time; this is a little of the produce of his fields, which may be about a paillie, or four seers. Should the farmer have a large quantity of rice, nagly and koorachny, the Patell will take about four seers of each, and one or two seers of any other grain he may have grown.

In such villages or kushbahs, where fairs or markets are held, once or twice a week, the Patell is entitled to a small quantity of the vegetables and fruits brought for sale. From the venders of uttur (essence of roses, &c.) the Patell occasionally claims a narrapoorah; this is a small packet containing a little koonkoo, missy, abheer, hul'd, goolloll, and frankincence, each tied up separately. This is brought into requisition after the birth of a child, when the mother takes the packet to the temple of Sutwaie,† when it is placed before the shrine of the goddess, along with the offerings, and she is invoked to bestow her favour on the infant. If there is a bunniah (a grocer) in the village, he presents one soopary (nut) and a little tobacco daily to the Patell, but he has to send for them. He also receives one seer of coarse sugar at the Dussera, Hooly, Dewally, and a few other festivals.

The Patell's rank entitles him to the Maun or precedence at all public ceremonies connected with their customs and habits. If there be a mochy in the village, he must present the Patell with a pair of shoes annually at the Dussera. On the occasion of a marriage, or the naming of a child, the Patell receives a soopary (nut). When sacrificing the sheep at the Dussera he begins the ceremony. Also in the month of Jesth, when the villagers kill a young buffalo, to propitiate Bhoany, the Patell goes through the ceremony of wounding the animal slightly (in any part of the body) with his sword. He is entitled to certain services from the village Mhars.

The Desmook of the district enjoys a few begahs of land-rent free, and receives a Bheut rupee from each village in his district, besides he manages to get an additional rupee from each, as a substitute for a Passoury, which he solicits the people to give him. One seer of ghee and

* Passoury means two pieces of cloth that are stitched together at the sides, and then doubled over, and stitched all round, and is used as a wrapper.

† The goddess that presides over childbirth.

a fowl is also presented to him annually by each village, as well as the Wannolla of rice varying from four to sixteen seers, according to the size of the place. The Desmook receives from government three per cent. on the revenue of each village. The Desmook sends a sepoy to the different villages for these articles, and they are transported to his house by the village Mhars.

The Desmooks originally were the hereditary collectors of the revenue of their respective districts, which they paid into the government treasuries—owing however to their great dishonesty, and having been guilty of embezzlement, and corruption in the performance of their duties, they do not appear to have been employed in the fiscal department for a very great number of years. As they are in general very intelligent persons, and possess much influence in their districts, I suggested to government, about six years ago, the advantages likely to arise from engaging their services to some extent in aiding the police of their districts, thinking them fit instruments to be employed in assisting the government agents in maintaining the tranquillity of the parts of the country in which they resided, to prevent gang robberies, &c. Lately, they have been called upon to communicate information respecting the state of cultivation in their districts, and to encourage the extension of it.

The Naikwary of Rajoor.—This office has been held, for many generations, by the Bhaugraha Koly family of Ekdurrah. This appointment was instituted for the purpose of watching the agricultural interests of the district. The Naikwary was constantly on the move, visiting every village within his range, and seeing that the cultivation was not neglected. If any of the cultivators were unable to carry on their farm, having lost their bullocks or incurred any heavy loss or expense, the Naikwary obtained an advance of money for their use from the government, or in some other way enabled them to go on with their labours. If a cultivator absconded, owing to his having been oppressed by the Patell or other persons, the Naikwary had to discover the place of his retreat; and it became his duty to bring him back to his village, and to settle any quarrel that might have existed between him and any of the villagers; the Naikwary warned the Patell against his behaving ill towards this man, and he explained to the villagers that if, in consequence of their threatening or maltreating him, he absconded a second time, the inhabitants would be obliged to make up the loss by paying the rent of his fields to government.

Should the man have absconded to escape paying his rent to government, the Naikwary went in search of him and persuaded him to return to his village. The Naikwary, accompanied by the Desmook, the Despondiah and the Koolkurny, also by the absconder, then proceeded to the Soobahdars, when the Naikwary explained matters, and became security for the good conduct of the absconder. The Naikwary had to re-

port to the government authorities all irregular conduct on the part of the Patells, and others towards this man after his return to his village.

The Naikwary's perquisites consisted of from 16 to 24 seers of grain from each village according to its size; also a seer of ghee, a fowl and one rupee in cash. The Naikwary's services are dispensed with at present, and they no longer receive the dues of their office; some of them occasionally endeavour to levy a few annas or a rupee from the people.

The Koolkurnies (the village registrar or notary) and Despondiahs (the district record keeper) being Brahmans, there is little occasion to say much about them. They exact in some places a seer of grain for every rupee of revenue paid to government; also a seer of ghee and a rupee on account of stationery, from each village. The Despondiah and the Koolkurny receive 2½ per cent. on the amount of revenue collected annually. These men, having charge of the village allowances, deducted from the revenue for discharging the various public expenses of the village, contrive to embezzle a portion of it; they also plot and intrigue with some of the Patells and Desmooks to deceive the government Shaikdars and Mamlutdars, with respect to the amount of money actually realized, by returning some of the cultivators as dead, absconded, or as paupers, and exhibiting a false return of the quantity and quality of the land actually cultivated. There are instances of the Koolkurnies in the hilly country overawing the government agents, and completely thwarting them in their endeavours either to ascertain the real state of the districts or afford any redress to the complaints of the people. However, they have considered it advisable to conciliate such of the Mamlutdars as were of a fearless character and a meddling disposition. Such matters are commonly arranged with comparative facility among Brahmans, by which both the people and the government are frequently defrauded. It is seldom necessary to grant any remission (abatment) of the revenue to the Koly population, as the supply of rain in the hilly districts is pretty regular, but when this takes place, little or no benefit is ever derived by the wretched Koly from this act of generosity on the part of the government. The intermediate parties divide the amount among themselves, and the probability is, that the man it was intended for never hears any thing more of it. At all events, if he is sufficiently daring to question them upon the subject, some perplexing statement is read or explained to him, which compels him to remain silent. It is to be hoped that the spread of education will gradually ameliorate the condition of these ignorant, impoverished and much oppressed people; that it will diffuse among them a more elevated tone of moral feeling and moral courage, and enable them to assert their own rights by dissuading and checking the numerous irregular and fraudulent acts, of which the village and district officers, as well as the government agents,

are so often guilty, when collecting the revenues of the state, and distributing justice to the vast population of its extensive territory.

The inhabitants of this part of the country (Rajoor, Malldesh, &c.) assert that their village lands were never measured, that the size of the patches of arable land was determined merely by estimation, and a certain number of these patches, or thikkas,* according to their dimensions, were considered to constitute a chour, or measure of one hundred and twenty begahs of land.

The revenue is therefore adjusted according to the ooktty or contract principle, but several modes exist under this head. First "the thikka bundy system," or patches of an estimated size and value—secondly "the outh bundy," or quantity cultivated with a plough either with two, four, or six bullocks,—thirdly, "the Dullie," or plots of ground cleared and prepared by means of the hoe or koitta.

A few poor Kolies (but much more frequently the Thakoors) cultivate small patches of ground with the hoe, or koitta, on the summits or declivities of the hills that are inaccessible to the plough; this the people term Dullie. The ordinary rent levied from a man for the extent of ground he can cultivate with the hoe is one rupee, and from a woman half a rupee annually. If the man and woman labour together, and the spot they cultivate is rather open, and the soil tolerably good, they will have to pay two, and sometimes three rupees. In the months of December and January they cut down the trees and bushes in particular spots, on the summits and the declivities of many of the hills, and when these have partly withered and the surrounding grass has become quite dry in the hot weather, they set fire to it, and after the first fall of rain, generally in June, when they have had a few fair days, they sow nagly, khorachny, sawa, and wurraie broad cast. They endeavour to cover the seed with the ashes and a little earth, by scratching and drawing lines in a zigzag manner with the hoe.

The outh bundy system.—As the ground has not been measured, the Kolies sometimes pay their rents according to the quality of the soil and the quantity they can cultivate with a plough with four bullocks; for the best description of soil they pay 28 rupees annually; for medium soil from 18 to 22 rupees, and for the third or inferior sort sometimes only from 8 and 10 to 12 rupees. With a plough of four bullocks, a man will cultivate from 30 to 40 begahs of land. A plough with two bullocks will of course only have to pay half of the above rates, while one with six bullocks will have to pay half as much more.

In the low grounds, and along the banks of rivers or streams, there are patches of land composed entirely of black earth, and others of

* Thikka, meaning a patch or lot, is a different word from the term Tukka, which means a few copper pice, and is applied to a measure of land in some parts of the country.

different mixtures, which vary much in quality; these are frequently classed under the term thikka, as well as the Mallzumeen (that is, the more elevated, less fertile, stony, red soil, clear of jungle) but the most productive and highly valuable lands are the thikkas, which have been divided into bhautt churries, or rice fields, and that have been chiefly formed by artificial means, on the shoulders of some of the more shelving and gently sloping hills, and in small ravines or gullies, by building a succession of bunds on imbankments across them, at suitable distances, and filling up and levelling the intermediate spaces. Erecting these imbankments, for sustaining the earth of each plot, must have been a work of immense labour and fatigue, for they are principally composed of very large stones. Constant attention is required to be paid to them during the monsoon, to prevent the torrents that rush down the sides of the hills from destroying the fields and removing the materials of the imbankments. The dark reddish soil of these bhautt churries is very rich, and productive, being fertilized annually with a fresh supply of a mixture consisting of the debris of rock and decomposed vegetable matter, washed down by the monsoon rains.

The finer and better varieties of rice, which are so much esteemed and prized by Brahmans and wealthy natives, are grown in the greatest perfection in these fields. The owners of these thikkas that are divided into bhautt churries, are allowed to cultivate a certain portion of the adjoining Mallzumeen, as they pay no rent for the usufruct of it, the cess on the bhautt churry originally including such an arrangement. The rent of each thikka varies from 2 to 10 rupees, all depending on the estimated size, &c. of the different plots.

Should a poor Koly, for want of means, forego cultivating his bhautt churry, he will very likely cultivate a portion of the Mallzumeen attached to it, for which he will pay two or three rupees. All the bhautt churry thikkas, as well as those of the Mallzumeen, &c. have names of long standing. The rent of each plot has never been altered within the memory of man. The only time when they try to effect a change, is when a man has laboured hard to clear a patch of the Mallzumeen, in which he sows the coarser descriptions of rice (takia, dhoull, &c.) which he can irrigate from its vicinity to a stream, should there be any scarcity of monsoon rain. The rent of such a plot is raised on this account, but the Koly will struggle to retain it at the rate he had previously paid, not considering it worth more to him. In the event of this being denied to him, he will threaten to quit the village,* and often

* Some years ago I took the liberty to recommend that the assessments on the lands in the hilly country should be lessened, were it only for a period of a few years, as the arrangement might tend much to induce the Kolies to remain in their own villages, and wean them from their wandering propensities, at the same time to guard against the Koonby farmers of the plain settling in the Koly villages. A system of much forbearance is required to be pursued in collecting the revenue, where such poverty exists, and where such injurious consequences are likely to result.

moves off to a distance to escape from his creditors, and to avoid paying his arrears of revenue to the government agents.

During the period that benefactor to his country, and most able and intelligent minister, Nana Phurnavees, was supreme in the management of affairs in the Mahratta government at Poona, he issued orders to the revenue officers, to hold out every inducement to the Kolies, and other inhabitants of the hilly country, to extend the cultivation, and to grow the finer sorts of rice, on a more extended scale, as the soil and climate of this tract appeared to bring these grains to such great perfection. And as the labour and expense of forming new bhautt churries, or rice fields, in the most desirable situations, would be attended with a considerable outlay of money, advances of cash were made to the people to enable them to form new fields, and repair the old ones, which were in such a very dilapidated state at the time, owing to the anarchy and confusion that had extended to this part of the country, when many of the Kolies had neglected their fields, and many families had been destroyed. The money advanced was to be repaid to government by instalments at a very easy rate.

The Kolies are much in want of such encouragements at present; for some of their fields are neglected, and others out of repair. The chief object ought to be to extend the number of their rice fields, which would ensure a more extensive cultivation of this grain. The interests of the government, as well as that of the people, would be much benefited by such an arrangement.

Notwithstanding there is a much greater fall of rain in this tract than in the open country, to the eastward, yet, owing to the rocky nature of the hills, and the little depth of soil in the valleys, the supply of water during the dry season is often very inadequate to the wants of the population. I have known several instances of the inhabitants of some villages, having to go to the distance of two and three miles for water in the hot weather, and what they procured was stagnant and filthy, from a pool in which buffaloes soaked themselves; so that it was with the greatest difficulty a person could drink it.

The following are the various sorts of grain cultivated by the Kolies. Rice, bhautt, tandool—first, that known by the name of Amby Mohur, is a small grain, but a superior description of rice; it is high flavored, rich and pleasant to the taste, consequently much esteemed by Brahmans, and wealthy natives. The Kolies in general sell it to the Bunniahs, at the rate of twenty seers (forty Bombay) the rupee. It is retailed in the Poona market from 12 to 15 seers per rupee, and from eight to ten seers the rupee at Ahmudnuggur. Cheemun sall—this is a much esteemed rice, being also a small and fine grain, but has no flavour—it sells at the same rate as the Amby Mohur. Jeery sall—this is also a fine grained rice, and highly prized; it sells at the same rate as the

amby mohur. Krishen Sall—this is a coarser description of rice, and rather dark. It is called the black rice, and sells about twenty-two seers for the rupee. Kummode—this is a large grained rice, it possesses a high flavour, and is much sought after, as it is in general cheap, selling about twenty-four seers for the rupee. Raie Bhogg—this is a rather common rice, grain of a medium size, has little flavour, sells at the price of the Kummode rice. Sukwar rice—this grain is of a medium size, has no flavour, but is rich and glutinous, sells about twenty seers the rupee. Wurrunggnll—this is a rather large grain, is coarse and tasteless, sells about twenty seers the rupee. Takkia—this is a large coarse grain. It is very insipid, sells from twenty-eight to thirty-two seers the rupee. Some of the poorer Kolies make it into bread. Dhoull rice—this resembles the takkia rice very much in being coarse and tasteless, and sells at the same price.

These three latter grains are sown on the mallzumeen, where it can be irrigated by some passing stream, otherwise they must depend on the monsoon rains. These coarse kinds of rice are sown early in June, after the first fall of rain, and ripen in September, and are consequently called hullwa, meaning early; while the finer kinds take longer time to attain maturity, and are called gurwah, or slow. They are also sown in June, and pulled up in July or beginning of August; the roots having been well washed, they are replanted in the bhautt churries, or fields prepared for their reception, and cut down in November. The operation of transplanting the rice into the new fields, is not only an important, but a tiresome and most fatiguing one. The new fields require being well soaked with water, and the earth softened, so that when the hand is placed on the surface it produces an undulation like a bog. The men and women employed provide themselves with small stools to sit on in the midst of this sheet of mud. It frequently rains all day, and they are teased in a distressing manner during the time by mosquitoes, gnats, &c. A few weeks after this, when it becomes necessary to weed the rice, all engaged in the labour keep a coudung bratty (cake) burning near each, that the smoke may assist in driving away these tormenting flies. Men and women use a description of covering of leaves and split bamboos, made to fit the body, and termed yearlah, to shelter themselves on this and all occasions from the rains. While weeding, it requires no small ingenuity to keep the piece of coudung burning, owing to the rain and wind: they therefore are frequently obliged to keep it inconveniently close to them.

The Kolies dispose of the different kinds of finer rice to the Bunniahs or grain merchants, retaining only a very small quantity for their own consumption, on the occasion of particular festivals, and when visited by any friends to whom they are anxious to show attention.

Nagly (*Cynosurus Coracanus*)—this small grain is sown broadcast, chiefly on the rough ground (dully), prepared for it with the hoe,

on the tops and declivities of the hills, when the cloudy weather begins, and a few days before the setting in of the monsoon rains. Some of the Kolies sow at the same time a few seers of nagly, in a field that has been well manured with ashes and dung, and, in the month of Ashar (end of June or beginning of July), they transplant it into other fields in the mallzumeen, and, should the plant appear to be growing up too rapidly, for the purpose of obtaining a richer ear, the plough is used, and a plank is subsequently dragged over the corn, which presses it down, and checks its growth for some little time. It ripens in the end of October and beginning of November. Nagly bread is one of the principal articles of food of the poorer Kolies.

Khoorachny (*Verbesina Sativa*) is sown on the hills and mallzumeen in Jest and Ashwin. From this an oil is expressed, which is used for their lamps and in their food—the Pend or oil cake is very nourishing, and given to milch cows and hard working bullocks. Toor (*Cytisus Cajan*)—the toor (dholl) grown here is of the same kind as they have in the Konkan. It is sown in the same fields with nagly, in the mallzumeen, before the first fall of rain in June, and ripens in December and January; used as dholl. Rahlay (*Panicum Italicum*)—the Kolies sow a little of this small grain for their own consumption. Bhadully (*Paspalum Pilosum*)—this is sown after the first fall of rain. They eat this, prepared as bread, and boiled as rice. Sawa (*Panicum Miliacum*)—this grain is sown broad cast, on spots of ground cleared for the purpose, on the tops and sides of some of the hills, also in the mallzumeen. It is sown early in June, and ripens in August. This is prepared somewhat similar to rice. Rajgeera (*Amaranthus polygamus*)—the seed of this plant is sown in June and ripens in December. This grain is eaten on fast days, being prepared as flour; it is mixed up with milk on such occasions. Waall (*Dolichos Lablab*)—the Kolies grow small quantities of this pulse which they use like split pease. Wheat (*Triticum Monococcum*)—Gowho—the Kolies sow the katiash wheat and pottah wheat, gowho, in the bhautt churries, in the end of November and in December, and it ripens in January and February. They keep the wheat for some merry making, or for festivals. Oordiah (*Phaseolus Max*)—they prepare, and use this as dholl, or split pease, for soup, in which a quantity of red pepper and salt are put. Hufburrab—known also by the name of chinna, (*Cicer arizianum*)—this grain is sown in the Bengal horse gram in some parts of India. The Kolies sow a small quantity of it in their bhautt churries in October and November. It ripens in January and February. Musapor (*Eryum Lens*)—a small quantity of this pulse is sown after the termination of the monsoon. It is used as split pease. Wattanna Pismur Salwon Pease—the Kolies grow a small quantity of pease in the cold season—the pea is very small and used as dholl.—Kodroo (*Panicum frumentaceum*)—this small seed

is cultivated on the hills and in the mallzumeen; it is prepared and eaten after the same fashion as rice. Mukkah (*Zea Mays*) or Indian corn—a little of this grain is sown in June, and sometimes in December—it ripens in three months. The Kolies prize the ears much when toasted. Ambarry (*Hibiscus Canabinus*)—this is sown at the beginning of the monsoon. Some of the poor people eat the seed, mixed with other flour, the leaves are very bitter, but when mixed with red pepper and salt, it is much eaten with bread. The stalk is soaked in water and used as hemp for making ropes, &c. Tag, (*Crotalaria Juncea*)—this is sown in the beginning of the rains, and ripens in November and December. The stalk is used as hemp, for making ropes and a coarse material for bags, used by the Banjarahs for grain, salt, &c. and they feed their cattle on the seed. Sugar cane—Majratta, Oas—they plant the canes entire, and close to each other (that is the end of the one joining the other), in the bhautt churries, which have been well manured and prepared for the occasion. This is in the month of October or November; the dew during the cold season keeps the soil moist, and the cane shoots up six or eight inches before the Hooly (at the vernal equinox). The cane is cut down in the following December—cane, grown after this mode, is said to produce sugar of a much better description, than that constantly watered from a well or stream. Jowarry and bajeere are not cultivated in these hills. The Kolies bordering on the plains, grow some bajeere.

They cultivate a few of the vegetables and legumes, commonly grown in the open country. Their jungles supply them also with a great variety of vegetables, from twenty to thirty sorts, besides fruits, berries, &c. The principal jungle roots are the anway, kaudur, chaie, sardull, pundah and turpull. The anway grows in the hardest red soil among the rocks, and consequently it is a difficult and laborious task to dig it up. In appearance, and in many respects in quality, it resembles the yam. The root is found from one to two feet buried in the ground; it sends forth a shoot like a creeper, which clings to any bush or tree near it. The substance of this plant is white, and it is boiled in milk. The natives of rank prize it much. The plant of which arrow root is made, grows abundantly in the hills and near some of the villages. The Kolies call it Sillinda, but they do not use it for any purpose.

The kaudur resembles the plantain tree. The root is much eaten by the Thakooras and some Kolies during a scarcity. They also eat the root of the turpull, pundah and chaie, when grain is dear. The sardull is a large bulbous root, and is also eaten by the Kolies in time of scarcity; it is extremely rough and unpleasant to the taste. They use it also to cure the guinea worm.

Their character and habits, &c.—From what has been stated it will be seen that the Mhadeo Kolies, must be considered a strictly agricultural people, and in general they appear to be well acquainted with the usual system of husbandry of the country. Many of them are hard working and diligent in their farming pursuits, and are consequently placed in pretty easy and comfortable circumstances, compared with a large portion of them who live in the greatest distress and poverty. Although the Kolies are quick and possess a good deal of shrewdness, they are not so steady and intelligent as the Koonby cultivators of the plain, being generally disposed to be more indolent, thoughtless and improvident. No doubt, local circumstances, the influence of climate and the nature of an oppressive government, tended much to induce unsettled and predatory habits among them. A few of the most ignorant and destitute frequently quit- ted their homes, and fled to a distant part of the country, to evade pay- ing their rents or adjusting their accounts with their creditors; while some of the most dissolute, who preferred leading a life of idleness, and enjoying such comforts as a little money only could procure, were in the habit of stealing privately to supply their wants, or joining a party of their kinsmen on a plundering excursion, most commonly into the Konkan, for they always have been a most determined and desperate set of robbers.* However, within these few years, they have been greatly restrained, indeed nearly weaned from this wicked propen- sity of helping themselves to the property of others. Generally speak- ing they are not so stout and robust in their persons as the inhabitants of the open country; their clothes, too, are of a coarser description and more scanty; but, in other respects, they differ little. In former days many were of a bold and high bearing; a spirit of great independence and freedom existed among them, chiefly inspired by their inhabiting a naturally strong and romantic country, where they could roam at pleasure, and enjoy the liberty their wilds conferred, by seeking refuge in their fastnesses, when they deemed it necessary to fly from the strong arm of power.

They may be considered a sober and temperate people, not being much addicted to the use of spirituous liquors; this, however, may be owing principally to their poverty. They are excessively fond of to- bacco; they both chew and smoke it, and declare they could not exist without it—the elderly females enjoy this weed amazingly. Both men and women consume an immense quantity of red pepper in their food,

* They were in the habit of torturing persons they seized, in order to extort money from them. I recollect seeing the Patell of a village near Talmuk in 1819, who was cruelly burnt by the members of a gang with the matches of their guns, as he refused giving them three hundred rupees. A man, the same gang had previously seized and treated in a most shamefully cruel manner, died in consequence.

conceiving that something healing is necessary, in the moist and cold climate of their hills during the monsoon.

The Kolies are rather apt to accuse each other of being faithless and un- nerving; they seldom communicate their intentions of a private nature to any friend. They also bear the character of being very revengeful, and gladly, but patiently, await an opportunity of secretly indulging their vindictive passions. But one of the most odious features in their character, is the envious spirit said to be more or less common to them. Any unusual superiority, good fortune, or happiness, visible among any of their kindred, kindles a feeling of such malicious envy in their bosoms, that they are frequently urged on to attempt, by some secret means, to lessen the happiness of the object of their hatred, by mixing some deli- cious matter in his food, which may either kill him or render him an object of pity, during the rest of his life (this is supposed to be effected by magical powers); or they will injure his cattle, or set fire to his house, when it is well stored with grain.

Notwithstanding the Kolies exhibit so many vices in their disposition, to which the common ones of falsehood and deceit are to be added, yet, in their intercourse with each other, as members of the same village community, they in general bear a pretty fair character for honesty and plain dealing, and their readiness to aid and accommodate each other at particular seasons seems mutual.

Being thoughtless and imprudent, they are too easily misled by advice, that they ought without hesitation to disregard. The Ko- lies are readily elated with success, and, on the other hand, failure or misfortune greatly distresses them. They do not show great energy in contending with, or trying to overcome, calamity. In conversation they are very fond of using proverbs and similes. Very few indeed have received any education, or are able to write or read. Some are gifted with retentive memories, and although they are so illiterate, they ap- pear to relate traditions connected with their own history with great precision. The animal perceptions of the Koly seem very acute, and their agility and speed are often very great.

Excepting the cow and the village hog, the Kolies eat all animal food; they are very fond of the wild hog, and occasionally contrive to kill it by pursuing and forcing it to leap down a precipice. It is a most ex- citing spectacle to see the inhabitants of two or three Koly villages, bounding with rapidity over the hills after the wild hog, shouting and heering their dogs forward in pursuit of the game. The Kolies in the ay of government are armed with matchlocks and swords. They never appear to use the bow and arrow, although the Bheels in their vicinity scarcely use any other arms.

The Koly females are generally slender and well formed, with features of a pleasing expression. Some are very pretty. When compared with

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the stout, robust, and often coarse, Koonby women of the plain, a very considerable difference is perceptible. Where so much poverty reigns, we cannot expect the females to be particularly well dressed. The Kolehens in general have a very limited wardrobe—the whole consisting of little more than two or three sarbies (and these are often much worn) and about an equal number of cholies. They tuck up the sarby, after the fashion of the women of the Konkan, so that it seldom comes down lower than the knee. They have few ornaments; a small golden nose-ring, and, probably, a small ring of the same metal in each ear, with two or three silver rings on their fingers. The wives of some Patells and of the Naiks, of course dress a little better than the other women of the village. Yet all the Kolehens are, like most other Indian females, fond of ornaments and dress. As wives (notwithstanding the Kolehens have sometimes more than one) there is every reason to suppose, that they are as faithful, and as much attached to their husbands, as those of any other tribe. That there are instances of infidelity among them cannot be denied; but in their small villages there are seldom, or never, such instances of highly degrading and immoral conduct to be seen as are so prevalent in the towns and villages in the desert, or plain. Indeed the Kolehens, both men and women, appear shocked at the dissolute manners of the population of the open country. The Koly women have commonly very large families; but many of their children die in their infancy of the small pox, the measles and hooping cough. They are affectionate mothers, and, notwithstanding the very laborious life they lead, seem cheerful and happy. Their time is much occupied with their domestic affairs and out door work. In fact their drudgery seems unceasing.

They rise every morning at dawn, and often before that time, to grind the corn required for the days consumption; they then milk their cows and buffaloes, and assist in driving them out to graze; they sweep the house and frequently plaster the floor; their business is to bring water from the river, which is frequently at a considerable distance. Cooking provisions for the family follows—besides attending to the children, or nursing one of them. However, it is during the rainy season, that the heaviest share of labour revolves on the Koly females.* They have also to perform a most onerous portion of the field labour, as they assist their husbands in the arduous task of transplanting the rice plants, and, at a subsequent period, of weeding them and the various grain growing in the other fields. They likewise contribute their aid at the reaping season.

* In the months of August and September, the grass on the hills becomes very rank; that known by the name of *Phokona* is said to possess a peculiar heating quality, and that the milk of cows and buffaloes that graze on it produces a great degree of stupor, and, on strangers, that it acts as a drastic cathartic.

It is the duty of one of the elderly females of the family to look after the dairy; as the milk in a few hours becomes sour in this country, the people for their convenience boil it. The Kolehens for this purpose place their fresh milk (invariably on a very slow fire, and it is gradually heated for several hours, when it is suffered to boil for a few seconds; after which, it is poured into flat earthen dishes, and some sour milk, or a little butter milk of the preceding day, is added, in order to thicken it; the following morning it is made into butter.* Once a week, all the butter that has been made is boiled sharply on a brisk fire, and strained while hot; when cooled it is termed ghee. They only make ghee during the monsoon and two of the cold months. *Bunniaba* travel about the country and buy it up weekly at a very low price.

As one of the days of the week is consecrated to each of the chief *Bhaddo* deities, by their respective votaries, and kept as a fast, the Kolehens dedicate one of their buffaloes or cows to these household gods, and all, who wish to be considered punctual observers of their religious rites, abstain from using the milk of the consecrated cow on these fast days. It is converted into ghee, and burnt in the evening, in a lamp placed before the family idols.

They sometimes burn some of this consecrated ghee near a precipice in the vicinity of water, to propitiate the tutelary spirits of the place to prevent any accident befalling their cattle, when descending into the bed of a river to quench their thirst.

To ensure the milk being readily converted into good butter, the Kolehens insert a small piece of the *bhoot khet* tree into the slit end of the churning staff. This is supposed to possess the virtue of counteracting the influence of the evil eye (principally that of the females), and the machinations of the sorceress; therefore it is used for that purpose. When they fancy one of their cows has been enchanted, her milk driven away, or she objects to her calf sucking her, all supposed to be owing to the evil eye (especially of a female), they drive a peg, made of the *bhoot khet* tree, into the ground, to which they fasten the cow. This is said to act as a charm, the animal becoming quite submissive, and the milk immediately returning to her.

The Kolehens are fond of charms or amulets. They believe, like many others of the inhabitants, that the tail of the chameleon possesses many virtues—that it will cure a fever of the tertian type, &c. &c. It is only on a Friday that they catch a chameleon they wish to destroy for the sake of its tail—they keep it all night in a pot with a little ghee, and kill it on Saturday morning, when they divide the tail into

* The butter and ghee, made from the milk of the cattle which graze on the coarse grass of the hills, is considered of an inferior quality to that produced from the milk of cows in the open country.

little bits, and secure it in a small copper case. They, like the rest of the Hindoos, draw omens from the flight or passage of birds and animals. The circumstance of a crow, a cat* or a deer crossing a Koly, just as he has quitted his house, is considered unlucky; if they cross from the left to the right when he is proceeding on some important business, he will return and delay his departure for a few hours, or, probably, a day or two. However they sometimes rest satisfied with turning round on the spot they were standing upon at the time, and changing their shoes from one foot to the other, and then recommence their journey. A hare or snake crossing their path, either from the right or left, on similar occasions, they consider very unfortunate, and they will return home with the determination of deferring their journey; for they believe, that, if they should prosecute their journey after such an occurrence, they would not succeed in their object. When proceeding on business, they also have a great dislike to seeing the tass or Indian jay, particularly if it passes from their right to the left. If they happen to see this bird in front of them they will make an obeisance to it, and then pass on leaving it on their left hand. Meeting or seeing a jackal, is reckoned a very fortunate circumstance, when proceeding on business.

The Kolies seem to possess a little knowledge respecting the medicinal properties of the plants, &c. of their jungles and the mode of using them. They attribute much of their sickness (fever and ague chiefly) to their partaking largely of melons, gourds, mukka and vegetables, grown during the monsoon.

In fever cases they use the bhooie khullah, which is the name of the root of a creeper, known by the term peettanah. It grows chiefly in ravines that are well watered and shaded. The root is of a large white and bulbous nature, and they cut it into thin slices, and steep it all night in water; a little of this water is given to the patient to drink, and his arms and body are gently moistened with the liquid. They say it is only necessary to apply it a few times to cure a person attacked with fever. The leaves (large and round) of the peettanah are capital food for horses, rendering them sleek and fat in a very short time. The root of the kassada plant is also used in fever. It is an annual, and grows near hedges and dunghills; its leaves are small and resemble those of the tamarind tree; the flower is yellow and the seed is in a small pod, (there are two kinds of the plant). The root, after having been cleared of its bark or skin, is pounded, then mixed in a small quantity of water, and strained; a little is given in

* As the Koly habitations are much infested with rats and mice, they keep cats to destroy them; but the large owl of their forests is, again, a great enemy of poor puss—when opportunity offers striking her talons in her neck and carrying her off.

the morning, at noon and in the evening to the patient. A profuse perspiration is brought on, which tends much to produce an early cure. In very severe fever cases, it is given for several successive days if necessary.

- In dysentery and diarrhœa they administer various medicaments. The fresh root of the bhooie sakly is pounded, and the juice expressed and mixed with goat's milk or with water. This is given for three successive days early in the morning, fasting. A little lime juice and sugar candy, to which is added some poppy seed that has been soaked all night in water, is mixed to form a paste, which the patient takes for three successive mornings. The root of the yell toorrah is prepared and administered in the same manner. The root of the ran (jungle) bhendy (*Hibiscus esculentus*) is pounded and mixed with dhyn, or sour thick milk, and administered also.

They cure wounds of all descriptions by filling them or placing over them the pounded bark of the dhouly khurmatty tree—they also use the pounded leaves of the cully-tree for the same purpose.

To children they give a small quantity (a pice weight) of the juice of the oombre tree, they obtain this before sun-rise, by making an incision in the bark of the tree; this is mixed with an equal quantity of the mother's milk, and given for several days.

In cases of marasmus in children, the pod of a creeper, called the morrar sengh, is ground down in milk or water; and the fruit of the kombullna (a bush) about the size of a small lemon, are mixed together, and a small quantity given to the young patient for three or four days.

They use various roots as purgatives. For the toothache they apply a small pill, the size of a pea, made of the leaves of the ran (jungle) moggury. This is laid on the diseased tooth; if it touches the tongue or gums it raises a blister.

They are much annoyed with rheumatic pains in December and January. To cure this they apply the actual cautery and burning turmeric.

Beggars are seldom seen in the small villages in the hills; it might therefore be supposed that the inhabitants were not often called upon to exercise the duties of charity; however, it is known that there are many indigent, blind, and sickly persons who are supported entirely by the bounty of their relatives, who are actuated solely by the praiseworthy motive of strong natural affection. Very possibly a spirit of ancestral pride might induce a few persons to bestow a little in charity to their poor connections, rather than hear of their subsisting by mendicancy among strangers. To persons passing through their villages, they are generally attentive and kind, and they will permit them to occupy the small temple of the tutelary deity of the place, or some family will grant them leave to sleep in the shed adjoining their dwelling, in which their household gods are kept. The Kolies build their houses by erecting a number of posts, filling up the intermediate

spaces, with wattle-work, plastered over with mud. The roof is thatched with grass. These dwellings, in general, are spacious, and commonly divided into several apartments. That in which the family usually assemble is the largest; the grain, stores, &c. are kept in another, which sometimes forms one of the sleeping apartments, and where the females retire to. Some of the cattle, especially the cows, are frequently kept in the dwelling house. The furniture in a Koly's house consists of two or three coarsely manufactured couches, used as beds; a few copper and brass pots for cooking and boiling water; small and large earthen pots for containing water, ghee, oil, spices, and a little grain. They keep their store of grain in large wicker baskets plastered with cowdung.

The Kolies pay their adorations to all the Hindoo deities, but their chief object of worship is Khundy-row, commonly called Khundobah. This is an avatar of Mhadeo, assumed by him when he destroyed the giant Manny Mull, and one of the most popular of the Dukhan objects of worship. His chief temple, in this part of the country, is at Jejoory. There is another of great repute at Bheema Shunkur, the source of the Bheema river—as this is in the tract inhabited by the Kolies, numbers of them attend there during the different festivals, especially on the Sheorattri, or night dedicated to Sheo, in the month of February. Bhyroo and Bhoany are also much worshipped by the Kolies. These three, and the derivative deity Heerobah, constitute the Koly's household gods. They present offerings at the tombs of any Mahomedan saints, like the rest of the superstitious Hindoos, and at times they pay divine honours to persons whose existence may have been terminated in a violent manner, particularly if they, or their ancestors, were accessory to the event; in the hope of propitiating their favour, and that the past may be forgotten.

Their principal holidays are the Hooly, Dussera, &c. The Hooly festival is supposed to be in commemoration of the vernal equinox. The Kolies enjoy themselves greatly during this merry-making time. In many respects it may be compared to the Roman Saturnalia.

The Kolies commonly swear by Mhadeo and the bell bhundar, but the oath which they consider most binding, is that taken on the bank of a river, or near a well, when one of the party takes up a little water in the palms of his hands, and some bhundar, a few leaves of the toolsy, and of the bell, with a few grains of jowary are mixed; each of them pours this into the other's hand, at the same time imprecating evil upon themselves, if they act contrary to their declaration.

The Kolies generally celebrate the nuptial ceremonies of their children, when they are between the ages of six and ten years. The ceremonies attended to by them, correspond exactly with those performed by the Koonby cultivators (who are Shoodurs) on similar occasions. The expense incurred at a marriage by the poorer Kolies, varies from 15 and 20, to 25 and 30 rupees, and those in better circumstances

expend from 40 to 60, while a few of the Patells and Naiks will disburse a hundred rupees and upwards. Many of them too often involve themselves inextricably in debt when their children are married.

It is a common practice among the Kolies for their widows to enter into the matrimonial state a second time, conforming to the pot or mhotur ceremony.

When a woman abandons her husband, and takes refuge with a man of a different caste, the husband performs the kreea kurm, or breaks the murkhy (pot); that is, he performs all the funeral rites, as if she had died a natural death, after which he is at liberty to marry again. But if the woman leaves her husband to live with another Koly, the kreea kurm is not then performed. A woman eloping seldom marries her paramour, according to the mhotur ceremony, until after her first husband's death. Should a Koly die, who had been very much attached to his wife, and she marry again, and she or her husband be attacked by severe sickness, or any unpleasant occurrence befall them, a Bhuggut is immediately consulted, to ascertain what is best to be done to restore health and peace to the family. The Bhuggut will most probably declare that the woman's first husband has caused the affliction, but, if suitable peace offerings are made by way of atonement, the distress and vexation complained of will be removed. She will consequently entertain some of her friends, and bestow some trifle in charity, besides having a small silver image (of the value of a rupee) made up, which ought to be a likeness of her first husband; this is cast in copper, and it is necessary she should wear it suspended from her neck, or place it with the household gods.

When a man dies who was never married, which among the Kolies seldom happens, they say an Attwor (unmarried) has died, and, unless offerings are made to his manes, previous to a marriage being celebrated in the family, it is said some great calamity will befall the bridegroom or bride; that they will be greatly tormented with sickness, have no offspring, or, in the event of their having children, that they will not be long-lived. Therefore to ensure happiness to the parties, a sheep or fowl is sacrificed as a peace offering, and a few friends are invited to partake of the feast. Should years have elapsed, and the family have removed to a village distant from that where the Attwor was buried, the party will go out into an adjoining field, to perform the ceremonial worship, before any stone (a substitute for the grave of the deceased), upon which some bhundar and koonkoo, &c. have been rubbed, and some jowary and a soopary nut placed. These articles and a burning lamp had previously been put into a flat brass dish, and carried to the spot by a female, over whose head four men held a stretched sheet by way of canopy; a boy holding a naked sword in his hand, and sitting upon a man's shoulders, follows the female, and he is made to shout and scream during the time the procession is moving.

The Kolies bury their dead, and observe the same funeral ceremonies as the members of the Shoodur tribe. The bodies of such persons as die of a lingering disease, also those who die suddenly, are burnt, their death being considered to have been caused by conjuration and witchcraft. They examine the ashes, either the same evening or the following morning, in the expectation of discovering some proof of the cause of the death; for they verily believe that if the deceased had stolen or unjustly retained any article of food or wearing apparel, &c. (and the owner of such an article consequently practised some necromantic pranks in order, that the thief or thieves might be visited by some affliction), that a small portion of the said article, enveloped in a part of the intestines, will remain unconsumed by the fire, and will be seen smoking when the rest of the body has been reduced to dust. If the friends of the deceased are satisfied that, by the magical powers of the owner of the article, their friend was put to death, they seized the supposed murderer, and reported the particulars of the affair to the government agents. If the man or woman, thus apprehended, could bribe the influential persons in the district, the affair terminated here; otherwise the magician was kept in confinement in one of the hill forts for some time.

Many of the Kolies experience a considerable degree of uneasiness and alarm, lest they should some time or other, incur the displeasure of some of the magicians* or witches in their neighbourhood, especially the Thakoors and their females, who have the credit of being very great adepts in the necromantic art. In such a state of society, we need not be surprised at hearing of such things, for history informs us, that the Egyptians, Jews, Greeks and Romans, also people of more modern times, believed in the reality of demoniacal possessions; that they supposed spiritual beings did occasionally enter into the sons and daughters of men, and distinguished themselves in that situation by capricious pranks and acts of wanton mischief; in fact, that they afflicted men and cattle with diseases. All nations and tribes immersed in ignorance and superstition, have much the same notions on this subject; the faith of few people is more staunch in the belief of such things than that of the Kolies.† Whatever malady man, woman or child, or even their cattle, may be seized with, the

* There is a Koly family, consisting at present of several brothers, living in a village a couple of koss from Kotool, who are considered great bhootallies, or conjurers. They have the credit of having committed the most atrocious acts; any of their neighbours, who molest or annoy them, they distress at a most unmerciful rate. They destroy and lay waste the corn, the sugar cane and produce of the fields, of persons they dislike. Those that have attempted to make a stand against their evil practices have been forced to quit their houses, although they have expended money (in vain) to bribe persons of influence, in the hope of overthrowing the bhootallies. It is said that the members of the family, for a series of generations, have possessed this influential power.

† All the Hindoos and Mahomedans appear to dread the influence of incantations, and implicitly believe in the mischievous effects of the evil eye, the existence of ghosts and the power of witchcrafts.

Kolies imagine it is produced by the agency of some evil spirit or offended deity, and, after some time, having in vain attempted to cure the disease by the application of such medicinal remedies as they may be acquainted with, they consult some Deolushy, or an exorcist (or caster out of evil spirits), regarding the matter. The chief person, or any male or female, of the family, goes to the residence of a Deolushy,* (there is not one in every village), to beg, he will give his advice and assistance in removing the infliction with which they have been visited. The Deolushy is the Bhuggut, or attendant of the gods Khundobah, Bhyroo, Bhoany and Heeroblah. He makes minute inquiries, or affects rather to do so, respecting the nature of the sickness, and when all the necessary information has been communicated, he tells the person applying for his aid to go home, and to return to him the following day; that he will in the mean time consult his god, and that when he comes back, he will inform him what steps it will be necessary to take, in order to procure the wished for cure. When the person arrives on the following day, the Deolushy tells him that his family have neglected, for a length of time, paying their adorations to his deity, Heeroblah, and vows that were made, have never been fulfilled, or probably the Deolushy will remark that Bhoany, or Khundobah, is offended with the family, and that they must pacify the offended deity by suitable peace offerings. Should the Deolushy have informed the person that Heeroblah was offended, and that some one of the family, or their cattle, was now suffering in consequence, and that they had better make the necessary sacrifices and offerings to appease the deity—he would be asked to say, in what number of days the disease could be removed. The Deolushy possibly says in 15 days, and at the same time, prescribes for the sick person, recommending that he should follow a particular regimen, &c. He then goes to the censer in front of the shrine of his deity, and takes up some of the consecrated frankincense ashes, and gives a portion of it to the man to be rubbed on the forehead of the invalid, and he blows the rest into the air from between his fingers. Vows are now made that the necessary sacrifices shall be made, if the sick person recovers, within the time mentioned by the Deolushy. In this case it is announced that the ceremony will be performed during a particular month (after the termination of the rains); should the Deolushy's prophecy not prove correct, no further notice will probably be taken of it. The Deolushy mentions at the time, that, in addition to the offerings made to Heeroblah, sacrifices must be made to the other household gods. When the time for doing so approaches, three or four sheep are purchased for the occasion, if the family of the invalid can afford to expend so much money. Then, on a Monday evening, at the going down of the sun, two or three sheep are sacrificed as a peace offering to

* Various castes follow this profession, goldsmiths, carpenters, smiths, Kolies, Thakoors and even Dheres; but, among all of them, the Thakoors are most noted.

the goddess Bhoany (Dewee), and the gods Khundobah and Bhyroo, and the Gondhul ceremony takes place afterwards. In fact, a number of the neighbours come and partake of this great and noisy feast, and on Tuesday morning, when the sun has risen, the Deolushy gives the signal for the sheep, set aside for the offering to Heerobbah, to be sacrificed. A number of the villagers assemble now, not only to partake of the feast, but to observe the Deolushy performing the ceremonies customary on such occasions. All the women and children are either directed to quit the house during the time, or they are sent to such part of the dwelling as may be to the westward and out of the way, so that their shadow* cannot fall on the place to be occupied by the Deolushy. Near the spot where the household gods are placed, a fire is kindled, and a pot placed on it, into which four seers of oil are poured. When the Deolushy enters the house, he sits down near the household gods; some of the family prepare some dainty cakes, and choice bits of the mutton, which are deposited on the ground near the fire; while others cook the rest of the meat, &c. on a more extended scale. A band of musicians seat themselves close to the Deolushy, who now commences his operations. He is anxious to exhibit himself as if inspired, and to satisfy them that he has succeeded in getting the deity Heerobbah to enter into his person, he writhes his body about, casting his arms backwards and forwards, screaming and groaning, and shaking himself violently; in fact it might be supposed he was seized with strong convulsions; his hair is loosened, and hangs over his face and shoulders, so that he has much the wild, yet drowsy, appearance of a person overcome and exhausted from the effects of some powerful narcotic. The drummers carry on a dinning noise all this time, and, as the deity is now considered to have taken complete possession of his body, and the oil is boiling hot also, the audience preserve a dead silence, and the master of the house informs the Deolushy that the pot is ready; upon which he gets up and calls out to the people to stand clear, as he is anxious that the proceedings should not be interrupted in any manner more, especially be polluted by any impure shadow. He then takes a handful of bhundar (consecrated turmeric powder) in his right hand, and in the left he holds a bunch of peacock's feathers (in the end of which the image of Heerobbah is inserted), and resting on his shoulder. After having once or twice passed round the fire place, he sits down, then runs his hand along the edge of the pot two or three times; after which he raises it a little and gradually lets the bhundar fall into the oil. He places the flat of his hand now on the boiling oil, and when he withdraws it, he jerks the oil off his hand into the fire, by which the flame is greatly increased. A portion of the cakes and meat, which had previously been deposited near the fire place, is now taken up by the Deolushy, and cast into the pot, and, when he conceives it is sufficiently cooked, he

* One of the superstitious ideas of the natives, is, that even the shadow of a female, unless when a child or an elderly woman, pollutes their gods.

searches about with his hand in the boiling oil, till he has found all he put in, after which the remaining cakes and meat are cooked in the same way. The guests having seated themselves on the floor, the members of the family, who had been very busy cooking breakfast for all the people present, are now ready to serve it out, and only wait to do so until the Deolushy presents each person with a small quantity of that which he cooked, and which is considered consecrated. When the feast is finished, the master of the house requests the Deolushy to say, if every thing has been properly conducted; the Deolushy remarks that, as the sickness has disappeared, and the peace offering has been suitably tendered and accepted, they ought to show their gratitude to the deity, and be most particular in making him a similar offering every third year—at all events once in every four or five years. He particularly impresses on them the necessity of their acting conformably to this advice; he then presents them with some ashes from his censer, and tells them to rub a little of them on the forehead of the person that had been unwell, and to put a little into his mouth; he now receives a small fee, or is presented with a turban worth a rupee or a rupee and a half, and takes his departure.

If the Deolushy found the oil insufferably hot, when he introduced his hand, he called out in a stentorian voice that their proceedings had been polluted, and that they must recommence the operation. He would likewise show symptoms of disappointment and of great displeasure. If a spectator expresses his surprise at the Deolushy's hand not being burnt by the oil, the Deolushy takes his hand, telling him not to be alarmed, but to allow him to prove that the danger is not great. The man, to his astonishment, finds the boiling oil perfectly innocuous, and not warmer than fresh milk from the cow.

The Deolushy, being considered possessed with the god Heerobbah during this ceremony, and therefore gifted with oracular powers, if any present should have left relatives ill at home, or cattle sickly or dying, or should they have incurred any very serious loss or injury, they ask the Deolushy, to inform them of the cause for such misfortune. He tells them that Heerobbah is offended with them, or that they made a vow to Bhoany which they have neglected to fulfil; or he may say that his god is not displeased with them, so they had better consult some other deity.

The Deolushies are considered to possess specially the power of detecting the evil practices of witches and conjurers; but, as they are not all equally talented and cunning in their art, their answers are not always received with implicit faith; therefore if the conduct of a person is to be searched into, several Deolushies are in the course of time questioned, and if their answers corroborate each other, it is concluded that the conduct of the suspected person is such as to justify their shunning his society. They are also consulted about absent friends, and thieves, and the recovery of stolen property. The thief sometimes

throws himself on the mercy of the Deolushy, offers to bribe him to silence, and to restore the property, for which the owner also tenders a present. When a Koly has lost one of his cows, he sometimes goes to ask a Deolushy where he is to find the animal. The Deolushy, after consulting his deity, tells him to go in some particular direction, and that he will find the animal.

The following may be considered a singular case of apotheosis, and I relate it here as a Deolushy was consulted on the occasion.

A short time before the Mahomedans relinquished possession of the hill forts in the western Ghauts, there were two Kolies of the name of Dharrow Assallah and his son-in-law Dharrow Sablah, who had rendered themselves very notorious and troublesome by the daring robberies they committed in the Mahomedan camps. Orders were at length issued for apprehending them, or putting them to death, but, both of them being extremely active and cunning, it seemed a most difficult undertaking. Chappajee Bhauggrah, the Koly Naik of Sukurwary, was then employed at Joonere, and he was urged to exert himself to capture Assallah, and that he would be rewarded for his trouble if he succeeded. After many hair-breadth escapes, Assallah was surrounded, in the vicinity of Koomsett, near Hurryhundurgur, and stoned to death, as he was considered invulnerable to arms of all descriptions.

It is said Bhauggrah was much troubled after Assallah was put to death; a Deolushy or Bhuggut was therefore consulted to ascertain the cause of his distress. This man stated that the Naik was the principal instrument employed to put Assallah to death, and that the ghost of the deceased had on this account haunted him, and would continue to do so till measures were taken to pacify it, which would ensure peace and quietness to himself and his family. The Deolushy recommended to Bhauggrah to have two silver* images made, worth three or four rupees; the one to be a likeness of Assallah and the other of Sablah. After these were consecrated he was to worship them, and place them with his household gods. Two stone images were also to be made and painted with red pigment; these were to be erected on the different spots where the two Kolies were killed. Bhauggrah acted in conformity with the Deolushy's recommendation, and the eldest son of the chief representative of the family, worships these images and presents offerings to them on all festivals; and on the 2d of Magh offerings are sent to be presented to the stone image at Koomsett. At the celebration of a marriage in the family, the bride and bridegroom go to Koomsett, and prostrate themselves before the image of Assallah, and supplicate for a blessing.

* The image in possession of the family is a small one of gold.

(To be concluded in our next).

XI.—*Essay on the Metrical Compositions of the Persians.*—By Lieut. T. J. NEWBOLD, Aid-de-Camp to Brigadier General WILSON, C. B. Member of the Asiatic Societies of Bengal and Madras.

With the view of affording the general reader as concise and plain an outline of the art of versification among the Persians, as it will admit of, preparatory to a future more extended analysis, I will preface this paper with a few remarks on the structure of their metrical compositions, digested from several of the most approved Persian treatises on the subject, and divested as much as possible of those technicalities and over refined subtleties, with which their authors love to obscure and mystify the theme under discussion.

Poetry they define as a discourse that has been weighed, *Kalám-i-Mouzún*. The balance by which the due proportion of its component parts is ascertained is prosody. It must be composed in one of the fixed *Bahúr* or measures, and must rhyme.

The *Arkán* اركان or poetical feet.

The *Arkán* form the poizes against which the words forming a metrical line are weighed. They are eight in number, and are composed of long and short syllables according to their vowels. By variety of arrangement and repetition they form,

The *Bahúr* بحر

The *Bahúr* are the fixed measures in which all Persian and Arabic poems are written. The original measures are nineteen in number. From these have sprung various others minutely specified by the Persian grammarians: with an enumeration of these varieties I will not here fatigue the reader.

The subjoined note (a) will shew the names and order of the 19

(a.) The 19 original measures—*Bahúr-i-Núazdah*.

1 Tawíl	طویل	11 Makzab	مقضب
2 Madid	مدید	12 Mohtabis	ماحتبث
	بسط	13 Sari	سریع
	وافر	14 Jadid	جدید
	کامل	15 Khaff	خفیف
	درج	16 Karf	قریب
	رجز	17 Mushákil	مشاکل
	رمل	18 Mukárib	مقارب
	منسرج	19 Matadárik	مقدارک
	منصارع		

th and 15th of these measures are peculiar to the Persians

original measures—the 8 *Arkân* or feet of which they are composed—the sounds or syllables forming the feet—and the mode of constructing a metrical sentence or verse on this treble base—together with the application of the *Arkân* in scansion.

The 8 poetical feet *Hush' Arkân*—composing the measures.

1 Fa-u-lan	فاعول	5 Mu-fa-i-la-tun	مفاعلتن
2 Fa-i-lan	فاعلن	6 Mu-ta-fa-i-lun	متماعلن
3 Mu-fa-i-lan	مفاعيلن	7 Fa-i-la-tun	فاعلاتن
4 Mus-taf-i-lun	مستفعلن	8 Ma-f-u-la-tu	مفعولات

The sounds—*Asûl* (lit. the repts) composing the feet.

Of these there are three denominations—viz. *Sabab*, *Watad*, and *Fâsilah*. Of the first there are two kinds—viz. *Sabab-i-khafif* and *Sabab-i-sakil*—*Sabab-i-khafif* is a word of two consonants, the first of which is accented with a moveable vowel (*Mûtarrik*) and the last quiescent (*Sâkin*) as کم *kam*. *Sabab-i-sakil* is when both are accented, as ازو *Azo*.

There are two classes of *Watad*, viz. *Watad-i-majmû* and *Watad-i-maf'rûk*—*Watad-i-majmû* is a word of three consonants, the two first of which are accented with moveable vowels leaving the last quiescent, as علن *Alan*. *Watad-i-maf'rûk* is also a word of three consonants, the first and last of which are accented and the medial quiescent, as راس *Rav-a*.

Of *Fâsilah* there are also two classes, viz. *Fâsilah-i-soghra* and *Fâsilah-i-kubra*. *Fâsilah-i-soghra* is a word of four consonants, the three first of which are accented with moveable vowels and the last quiescent as حبلن *Habalan*. *Fâsilah-i-kubra* is a word of five consonants, the first four of which are accented and the fifth quiescent as سمكتن *Samakatan*.

The method by which the Persians form the light feet from these roots is based on the principle of equalizing quiescent by quiescent and vowelized (if I may so express myself) consonants.

For example—the foot *Mu-fa-i-lan* (No. 3) مفاعيلن as denoted by its vowel and quiescent marks, is composed of one *Watad-i-majmû*, followed by two *Sabab-i-khafif*—that is to say, it comprizes in all seven consonants, the two first of which are vowelized; the third quiescent or gezimated (*Watad-i-majmû*); the fourth vowelized, the fifth quiescent (*Sabab-i-khafif*); the sixth vowelized; the seventh quiescent (*Sabab-i-khafif*).

The feet thus composed form in their turn, as above stated, the various measures in which poems are written. These are all minutely laid down and examples of the different metres separately adduced in the Persian treatise on the *Arspoetica*. For example, the measure *Hazaj* (No. 6.) consists of the foot *Mu-fa-i-lan* (No. 3) repeated 4 times in the hemistich; and the measure *Mutadrik* (No. 19) of the foot *Fa-i-lan* (No. 2) the same number of times. The 2 following hemistichs, written in the above measures, may suffice to exhibit the use of these standards in versifi-

The *Misra* مصرع or hemistich, is a single line composed in one of the nineteen measures.

The *Beit* بيت or distich, consists of two *Misras* rhyming together (*Mukaffa* مقفئ). Two *Misras* not rhyming are called a *Fard** فرد. For instance:

بيت

خداوند بخشنده دستگیر
کریمی خطا بخش پوزش پزیر

Beit.

Khudâwand, Bukshindah wa Dastagîr
Karîmî, Khatabuksh pozish pazîr.

cation, and the application of the feet in scansion or *takti* تقطیع (lit. cutting in pieces).

مصرع

ولا وصف میانے نازک جانان من گفتی

Hemistich—Measure *Hazaj*, or *Mufailan Mufailan Mufailan Mufailan*.
Dila wasf-i-miyani nazuk-i-janan, i man gufti.

Persian mode of scansion of the above.

Dila Wasfî—*Mufailan*—Miyani na—*Mufailan*
Zuk-i-janan—*Mufailan*—ni Mau gufti—*Mufailan*.

مصرع

حسن و لطف ترابنده شد مهر و مه

Hemistich—Measure *Mutadrik*, or *Failan, Failan, Failan, Failan*.
Husn o lutfi-tora bandah shud mihr o mah.

Scansion.

Husn-o-lut—*Failan*—fi-tora—*Failan*
Bandah shud—*Failan*—Mihr-o-mah—*Failan*.

Rules for the quantity of the syllables are laid down with great minuteness in the Persian and Arabic treatises. Sir W. Jones's Persian Grammar contains a short though lucid article on the subject, to which the reader is referred.

* Poetical compositions, by the early Persian writers, were classed under three heads, viz. the *Kasideh*—the *Masnavi* and the *Musammât*. In after times they have been divided into eight—viz. the *Fard*, the *Rubâi*, the *Kita*, the *Masnavi*, the *Ghazal*, the *Kasideh*, the *Musammât* and the *Tarji*.

فرد

به پوش گر بخطابی رسی و طعنه زن
که هیچ نفس بشر خالی از خطا نه بود

Fard.

Ba posh gar ba khatái rasiwa tána mazan
Kih héch nafs bashar kháli az khata na búd.

The first word of the first line of a *beit* or distich is termed the *sadr* صدر, its concluding one the *aruz* عروض. The first word of the second line is called the *Matla* مطلع and its last the *Ajuz* عاجز. The two last are by some styled the *Ibtida* ابتدا and the *Zarab* ضرب. The intervening words are called the *Hasho* حشو.

For instance, in the preceding *beit*, the word *Khudáwánd* is the *Sadr—Dastagir*, the *Aruz—Karim*, the *Matla*, and *Pazir*, the *Ajuz*. The words in the centre of the lines enclosed by these four, constitute the *Hasho*.

The *beit* has sometimes a double rhyme—in such cases the penultimate is termed *Kafiyeh* قافیه and the ultimate *Radif* ردیف. In the subjoined distich *Hasti* and *Pasti* form the *Káfíyeh*, and the two *Toi* the *Radif*.

بیت

پناهی بلندی و پستی تویی
همه نیستند آنچه هستی تویی

Beit.

Panah i bulandi wa pasti Toi
Hamah nestand án chih hasti Toi.

رباعی
The Rubai

or quatrain, consists of four *misras*, the two first of which rhyme with the fourth—for instance :

رباعی

ایدل طالب کمال در مدرسه چند
تکمیل اصول و حکمت همدسه چند
هر فکر که جز فکر خدا و سوسه است
شرمی ز خدا بدار کین و سوسه چند

Rubai.

Ai dil talab kemál dar Madrasah chand
Takmil-i-asúl wa hikmat-i-hindrasah chand
Har fikr kih juz fitr-i-khuda waswasah ast
Sharmi az khuda badár kih in waswasah chand.

Sahibi is celebrated for the beauty of his *Rubaiyât*. A *Rubai* resembles in rhyme the four first *misras* of the *Ghazal*; and is generally written in the same measure, viz. the *Bahr-i-Hazaj*, or in one of its varieties. According to the *Dustûr-i-nazm*, a measure for the *Rubai* has lately arisen composed from the measures of the *Muzâria* and *Mushakil*, and called the *Bahr-i-Ruba-yat*.

قطعه
The Kita

Never comprises less than two couplets—in the *Kita* the two last lines of each distich are most frequently made to rhyme, though there is no fixed measure for this class of composition. The first *Kita* in the *Divan* of *Haftiz* is written, like a *Masnavi*, in rhyming couplets.

قطعه

ای کریمیکه از خزانه غیب
گبر و ترسا و ضیفه خورداری
دوستانرا داجا کنی ماکروم
تو که با دشمنان نظر داری

Kita.

Ai karimi kih az khazanah-i-ghaib
Gabr wa tarsi wazifah-i-khud dâri
Dostânra kûja kani mahrûm
To kih bá dushmanân nazer dâri.

The *Kitas* of *Sâdi* are in the highest esteem. This class of composition rarely exceeds twenty couplets.

مشدوی
The Masnavi

In the *Masnavi* both lines of the distichs rhyme together—for instance:

مشدوی

الهی غنچه امید بکشایی
کلی از روضه جاوید بنمایی
باخذن از لب آن غنچه باغم
وزن گل حطر پرور کن دماغم

Masnavi.

Ilahi ghunchah-i-umaid bakushai
 Gali az ruzat-i dawid banūmai
 Bakhandan az lab-i-an, ghunchah-i-bāgham
 Waz-in gul-attar parwarkan dimāgham.

Compositions written in this style never contain less than 15 couplets and are often of great length—romances, love-tales, histories and epic poems—the *Shah-nameh* of Firdousi, the *Makhzen al Asrar*, the *Shirin wa Khusro*, the *Secunder-nameh* of Nizami and numberless others are of this stamp, which may be truly called the heroic verse of Persia. The term *Masnavi* is more strictly confined however to poems bearing this name—the productions of Jami, and Moulana Rumi—its rhymes are generally double. The measures in which it is most frequently written are seven in number—viz. 1st the *Bahr-i-Sari*—2d, the *Hazaj Ajzab*—3d the *Makbuz Makhzuf Musaddas*—4th the *Mukarib Maksur Musamman*—5th the *Khafif Maktua*—6th the *Hazaj Ramal Musaddas*—and 7th, the *Ramal Majnun Muktua Musaddas*.

It is also termed *Muzawwaj*, paired, from its rhyming couplets.

The Malays have a species of verse resembling the *Masnavi*, known under the generic term of *Sayer*, in which their romances and moral poems are written.

The Ghazal غزل.

Is a short ode, generally on the delights of wine, love or beauty, comprising from 5 to 18 distichs; or, according to some writers, from 3 to 25. Under the outward symbols of sensual delights and terrestrial pleasures, are frequently concealed metaphysical meanings and allusions to divine love and spiritual beatification.

In *Ghazals* the two first lines must rhyme with the second line of each succeeding couplet—for instance in the following extract of an ode from Akhsangi:

غزل

ای شمع زرد روی کدبا اشک دیده
 سرخیل عاشقان مصیبت رسیده
 قرها دوقت خویش و می سوز و می گداز
 تا خون چراز صحبت شیرین بریده
 یاری به باد داده ار نه چرا چو من
 بدرنگت و اشک بار و نزار و خمیده

Ghazal.

Ai shama zard rui khibâ ashk didahi
 Sar-khail-i-âshikân-i-masibat rasidâhi
 Farhâd-i-wakt khêsh mësöz wa megudâz,
 Ta khud chira az sohbat-i-Shirin baridâhi
 Yâri ba bâd dâdâhi ar nah chira chû man
 Bad rang wa ashk bâr wa nizâr wa khamidâhi.

The first distich of a *Ghazal* or *Kasidah* is called the *Matta* مطلع or the *Mabda* مبدأ. The second, the *zeb Matta* زيب مطلع or *Husn Matta*, حسن مطلع and the concluding distich the *Makta* مقطع or *Khatimah* خاتمه. The poetical title of the poet is often introduced in the *Makta*—as in the odes of Hafiz.*

Ghazals are set to music and are composed in the measure *Hazaj* (No. 6).

The Sâki nameh ساقی نامه.

The *Sâki-namehs* of Hafiz, though rhyming like the *Masnavi*, rank next to the *Ghazal*. They comprize from eight to forty verses, in praise of wine and bacchanalian enjoyment, addressed to the cup-bearer (*Sâki*). Like the *Ghazal* they not unfrequently conceal a mystic meaning. The *Sâki nameh* may be styled the Persian dithyrambic.

The Kasidah قصیده.

Is longer than the *Ghazal*, although rhyming generally in the same way. It comprises from 15 to an unlimited number of couplets, commonly ranging however between 70 and 170. The subject of the *Kasidah* is of graver and more serious import than that of the *Ghazal*, though it sometimes condescends to embrace forms aerial and creations of the imagination in its numbers, at the expense of its name. For instance should it dwell upon the budding pleasures of spring—its refreshing verdure—or, butterfly-like, revel a moment in the full blown charms of the blushing rose, it loses the name of *Kasidah*, and is called *Bahariyeh* (from Bahar بهار spring). Should it treat of love it becomes an *Ishkiyah*, and when of the poets own renown—a *Fakhriyah* (from Ishk عشق love and Fakhrr فخر glory).

It sometimes happens that the name is given with reference to the letter in which the *Kasidah* terminates. For instance, should the last *misra* conclude with the letter م *Mim*, it becomes a *Mimiuh*—if with ج *Jim*, a *Jimiah* and so on.

* This practice has obtained, according to the author of the *Zu'âbil i'azim*, from the time of Sâdi.

Amrulkais, one of the seven early poets of Arabia, whose compositions were written on silk in letters of gold and suspended in the temple at Mecca, is the reputed inventor of the *Kasidah*.

Under the head of *Kasidah* may be classed the *Hajo* or satire—the *Madah* or encomium, and the *Wáz* or *Pandnámahs*—ethic poems.

مستزاد The *Mustazad*.

This is a stanza, each line of which has a shorter one appended. According to the author of the *Dastur-i-nazm* the *Mustazad* is written in the measure *Bahr-i-Rubayat*, and sometimes in that of the *Muzária*. The stanzas consist generally of four long and four short lines. The following example is from the *Zuwabit-i-Azim*:

مستزاد

ان باد شاه اعظم

یعنی خفیف ما

در بسته بود ما حکم

یعنی نه بود پیدا

ناگاه دلق آدم

یعنی لباس اسما

پوشید و بر در آمد

یعنی که شد هویدا

Mustazad.

An Badshah i ázam

Yani khaffi ma

Dar bastah búd Mahkam

Yani nah bud paida

Nagah dalk i Adam

Yani libas i Asma

Poshid wa bar dar amad

Yanikih shud huwaida.

مسمط The *Musammát*.

Moulána Wahid uddin Tabrizi defines the *Musammát* as comprising from four to ten *misras* or hemistichs, all rhyming together except the last. Should the *Musammát* consist of four *misras* it is hence styled a *Murabba*—if of five, a *Mukhammas*—of six a *Musaddas*—of seven, a *Musabba*—of eight, a *Musamman*—and if of ten, *Múasher*.

Of these the *Mukhammas* is most in vogue. The following is a specimen of the *Murabba* from *Sádi*:

مرج

من مانده ام رنجور ازو

در مانده ام مهجور ازو

کوی که بدین دور ازو

در استخوانم میخلد

Murabba.

Man mándah am ranjúr az ó

Dar-mándah am manjúr az o

Gói kih bini dúr az o

Dar ústakhánam me khalad.

The subject of this class of composition is most commonly the pains of love—separation from its object—expostulation and entreaty. The five *misras* of the first *Mukhammas* in the *Diwan* of *Hafiz* rhyme all alike in *am*, in which also terminate the concluding *misras* of the succeeding nine. The following is a specimen:

مخمس

گو بخت که از سر نیازی در حضرت چون تودل نوازی

معروض کنم نهفت رازی هیهات که چون تو شاه بازی

تشریف دهد در آشیانم

Mukhammas (Hafiz).

K'o bukht kih az sar nujazi Dar hazrati chún to díl nuwázi

Máruz kunam nahaft rázi Haihat kih chún to shabbázi

Tashrif dihad dar ashianam.

The *Musuddas*, the *Musamman* and the *Múasher*, terminate with a couplet rhyming differently from the preceding ones.

مرثیه The *Marsujah*.

Is an elegy or dirge, consisting generally of upwards of 50 stanzas, arranged like the *Musamman*.

تاریخ The *Tarikh*.

Is a stanza frequently used for inscriptions on edifices and tombs—from the numerical value of the last letters of the last *místra*, the date of the building is known. It is also used in historical and biographical treatises. The *Diwan* of *Hafiz*, contains a number of *Taríkh*s; as also the *Tazkirat-i-Serkhúsh*. The numerical value of letters is ascertained from the *Abjad*.

The *Tarji band* ترجیع بند

Must not comprise less than five, or more than twelve, couplets. It derives its name from the recurrence of a line or distich at fixed intervals (*Tarji* ترجیع signifying receiving back).

The *Terji*, or refrain, at the end of each of the 7 bands or sets of verses in the *Diwan* of *Hafiz*, is as follows :

آن به که از صبر رخ نداهم

باشد که مراد دل بیابم

An bih kih az sabr rúkh-na tabam

Báshad kih murád i dil biyábam.

The *Terji*-bands of *Hafiz* rhyme like the *Ghazal*, with the exception of the concluding couplet or *terji* as above, which is a rhyming distich. They contain severally from 7 to 9 couplets.

The *Tarkib*-bands are more irregular in their rhymes, sometimes commencing like a *masnavi*, but generally like the *Ghazal*, and terminating in a rhyming couplet. Those in the *Diwan* of *Hafiz* turn chiefly on the praise of kings—kingly qualities, &c. The *Terji*-band has been selected as the vehicle for conveying lamentations on separation from friends.

The *Chistán* چستان

Is an enigma in verse and prose.

The *Diwan* دیوان

Is a collection of *Ghazals*, corresponding in order and number with the letters of the alphabet, *Haráf-i-tahji*, in which their *radifs* rhyme in regular succession. The term *diwan* is not confined to an assemblage of odes, but is also applied to posthumous collections of an author's works either in prose or verse.

The *Khamsah* خمسه

Khamsah in Arabic signifies five, and is a name given to collections of poems five in number—generally *Masnavis*. Among the most noted are the *Khamsahs* of *Nizami*, *Jami*, *Hafiz*, *Katibi* and *Amir Khusro*. That of *Nizami* (of which I possess a beautiful copy) comprises the *Makhnan al Asrar*, the *Khusro wa Shirin*, the *Hafz Paikar*, the *Leila wa Majnun* and the *Secunder Nameh*.

The substance of these remarks has been almost entirely extracted from Persian treatises on prosody and versification, modified by the result of a careful examination of the compositions of some of their best poets. With the latter the numerous discordancies and perplexing opinions expressed in the former have been compared and considered, and the result alone, for the sake of brevity, communicated.

The treatises on prosody consulted were those contained in the *Zurabit-i-azim*, the *Chuhar Gulzar*, the *Mukhtasar al Fuaid* and the *Dastur i Nazm*.

A brief notice of some of the Persian Poets.—By Lieut. T. J. NEWBOLD.

(Continued from No. 13, Vol. IV, P. 389).

Jami Moulana Nur-uddin.

جامی مولانا نورالدین

A famous poet born at the town of *Jami*, near *Herat* in *Khorassan*, whence he derives his surname, about A. H. 817. His proper name is *Abdur Rahman Bin Ahmed*. The date of his demise is said to be A. H. 898. He repaired at an early age to the splendid court of *Sultan Abu Syed Merza*, a descendant of *Tamerlane*, who ruled in *Khorassan* until 873, A. H., when he was defeated and put to death by the Turcoman leader *Hassan Beg*. *Sultan Hussain*, who eventually succeeded *Abu Syed*, extended his protection to *Jami*, and treated him with greater favour even than his former patron. The Sultan's vizier, *Mir Alli Shah*, entertained for *Jami* the greatest friendship and attachment. These circumstances, and the numerous lively anecdotes related of him by various Persian writers, stamp him to have been a man of ready wit, engaging disposition, and a keen observer of men.

A native of *Ispahan*, who was accustomed to boast of the productions of his own provinces, and to regard with contempt any thing foreign or extraneous, told *Jami* one day that there were melons at *Ispahan*, of such an extraordinary size, that if a person sat on one he could not touch the ground with his feet, the poet retorted, "We have not in truth, at *Herat*, melons as large as those you have been at the trouble of describing, but we have turnips several cubits in length."

Another of *Samarcand* was one day extolling a species of grape peculiar to his country, called *Resh-i-Baba*, the beard of one's father. *Jami* asked him whether that grape was more delicious than a sort growing in *Khorassan* called the *Khayeh-i-Ghuluman*. The man of *Samarcand* answered in the negative; when *Jami* observed, "in that case you must admit that the *Khayeh-i-Ghuluman* of *Khorassan* are of more value than the beards of your fathers, *Resh-i-Baba*."

One day a poetical aspirant read to *Jami* a wretched poem of his own composition; of which, he boasted, not a single word contained the letter *Alif*. *Jami* dryly remarked that he had better have left out all the letters of the alphabet.

It is said that, on one occasion when *Jami* had set out for the purpose of paying a visit to his patron *Sultan Abu Syed*, on his way to the palace he heard that the monarch was immersed in the pleasures of the

* This pleasantry ill bears translation: the pith of *Jami's* jest will be sufficiently obvious to the Persian scholar.

banquet: on this he retraced his steps. When the *Sultan* was apprised of the circumstance, he despatched some of his attendants to recall him. On this, *Jâmi* composed a *Ghazel*, extempore, and sent it to the *Sultan*, in which *Jâmi* excuses his *mal-a-propos* intrusion. The two following couplets are extracted from the ode in question:

رباعي
نه زهد آمد مرا مانع نه بزم عشرت ایشان
غم خود دور میدارم ز بزم عشرت اندیشان
بکجایی کا طلس شاهان نشاید فروش کرد حاشا
که رادقرب یابد دلق گرد آلود درویشان

Rubai.

Neither abstinence, nor the banquet of the votaries of pleasure, are obstacles to me.

I keep my sorrows apart from the feasts of the gay.

It would be improper to spread my humble carpet on the place where shine the satins of princes.

The dust-soiled garment of the dervise finds a nearer way to God.

The compositions of *Jâmi* are extremely numerous. The *Anthologiu Persica*, printed at Vienna, in 1778, contains a list of upwards of forty. *Mahomed Bukhtawer Khan*, one of his biographers, declares them to be innumerable.

Jâmi's principal works are:—

سلسله الذهب
The *Silsileh uzzahib*—a poem in three books.

قصه سلايمان والسال
The *Suliman-wa-Assal*.

رقعات جامی
The *Kukaat-i-Jâmi*—a collection of epistles.

سبحة الابرار
The *Subhet-al-Abrar*.

سکندرنامه
The *Secunder nâme*—an epic on the exploits of Alexander the Great.

دیوان جامی
The *Diwan-i-Jâmi*—an elaborate collection of poems, containing many of the mysticisms of Mahomedan theology.

بهارستان

The *Baharistan*—a descriptive poem dedicated to *Sultan Hussain Baicarra*.

لایلی و مجنون

The *Laila wa mejnun*.

یوسف و زلیخا

The *Fusuf wa Zuleikha*—two celebrated love tales.

تحفة الاحرار

The *Tohfet al-ahrar*.

Besides these are many dissertations in prose on theological subjects. He dedicated a work on ethics, called the *Irshad*, to *Mahomed Khan*, second *Sultan* of the Ottomans. His seven principal works form a collection styled the *Heft Aurung*, the seven thrones.*

In the epistles of *Jâmi* is introduced so much pure Arabic that, to the mere Persian reader, they are in many places utterly unintelligible. Mr. Lumsden in his elaborate grammar of the Persian Language, has adduced a remarkable example of the unlimited intermixture of the two tongues (Vol. I. P. 398), and has strongly recommended, what I believe most orientalists concur in, that the study of both languages should go on together. The introduction of Arabic to this extent is of modern origin, subsequent of course to the conquest of Persia by the Arabs. *Sadi*, whose study of Arabic in the college at Bagdad, was not confined, has done a great deal to render that tongue fashionable among Persian poets.

The *Bagh-i-Iram* and *Silsilah uzzahab* of *Jâmi* are both written in the measure *Khafif Mukhta*. The *Leila wa Majnun* in the *Hazaj Ajzab Makhzuz Makhzuz Musaddas*; and his *Fusuf Zuleikha* in the measure *Hazaj Makhzuz Musaddas*.

Ibn khatib,

ابن خطیب

Surmaned *Kaikhosro*, or *Taj uddin Ahmed*, flourished in the time of *Sultan Mahmud Ghaznavi*, in the 4th century of the Hejira.

Jelal uddin Atiki,

جلال الدین عتیقی

Was living at the time the *Tarikh i Guzideh* was written, by the author of which work, *Bin Aber Bekr-Bin Ahmed-Bin Nasir Al Mastoufi*.

* M. Antoine Galand, in his "Paroles Remarquables," speaking of *Jâmi*, remarks "Il a composé un grand nombre d'ouvrages, tant en vers qu'en prose, et l'on compte cinq Divans parmi ses Poesies, c'est à dire, cinq recueils complets de Gazels par ordre Alphabetique."

Al Cazvini, he is mentioned. The *Tarikh i Guzideh* was completed in 730 A. H. *Atiki* is noted for the beauty of his *Ghazels*.

غزل
از خاک کف پایت هرگز که برخیزد
جانهایش فرو بارد دلهاش فروریزد
آن برقی که سوز دغقل از ابرغمت تابد
آن بوی که جان بخشد از خاک درت خیزد
سودای توام در خاک سر مست بخورا باند
بویی تو ز خاکم باز دیوانه بر آمدنیزد
از تو بزم صدره چون عود گرم سوزی
دود دلم آید باز در دامن آویزد
ای جان عتیقی که با عشق بر آید دل
باشاه کجایا یارا هر سغله که بستیزد

Ghazal.

From the sole of thy foot every particle of dust which arises,
Scatters the lives (of the beholders) and strews around their hearts.
The lightening that scorseth up wisdom, flashes from the cloud of
thy grief.
Odours imparting life, perfume the air from the dust of thy threshold.
It is the love of thee, that causeth me to slumber intoxicated in the dust;
And thy perfume that again arouseth me thence to madness.
Though thou wert to consume me with fire, I should not fly a hundred
different ways like wood of aloes;
But the smoke of my heart (my sighs) would come and cling to the
skirt of thy robe.
O my life! when can the heart of *Atiki* separate itself from love of thee?
O my friend! how can a beggar contend with a king?

Jelal Beg,

جلال بیگ

Surnamed *Bakāi*, was a poet of some merit, who lived in the time of the emperor *Akber*, by whose order he was put to death for having poisoned his father. He was a native of *Cashmir*.

Jelāl uddin Cāshi,

جلال الدین کاشی

Or *Syed Jelal Uddin*, cotemporary with *Abaka Khan*, flourished

in the 7th century of the Hejira. His *forte* was satire. In answer to some reproaches cast upon him by *Sādi*, he wrote a *Terzi*,* of which the first couplet is given by *Al Cazvini*: it runs as follows, and has a mystic meaning:

بیت

منم مست ورنه لالایی

واین شدیده مرا هست لایزالیی

Beit.

I am a drunkard and a debauchee I allow; but what matters it?
Such is my habit and constant practice.

Jelal Diwāni,

جلال دیوانی

Styled the second Aristotle. Notwithstanding *Diwāni's* skill in rhetoric and his enlightened expositions of abstruse subjects, his Persian historian declares him to have been mad; i. e. a poet. His works abound with metaphysical subtleties. He died A. H. 903 aged 70.

Jelal uddin Mēilla i Rūm,

جلال الدین ملا روم

Author of the celebrated *Masnavi* bearing his name, and which comprises upwards of 30,000 couplets, was born at *Balkh* towards the commencement of the 7th century of the Hejira: he died A. H. 672, on the fifth day of the month *Jemādi al Akhir*, at sunset. He is called by some, *Bin Mahomed al Balkhi ar Rūmi*. *Jāmi* relates that from his fifth year this high priest of the *Sūfis* was accustomed to discern spiritual apparitions; and forms from the other world, of beings usually veiled from human gaze—the recording angel—good genii—and the select spirits of mankind who are concealed under domes of glory—all became visible and assumed a definite shape.

The *Moulāna*, as he is often styled, like a pious Mussulman performed the *Haj* or pilgrimage to Mecca. On his travels he fell into the society of *Shaikh Ferid uddin Attar* at *Nishapore*, who gave him his *Asrar-Nameh*, or book of secrets: this the *Moulāna* always kept by him.

Seraj uddin Kounawi was one of the most learned men of the time, but as his ideas and those of our poet on theological subjects did not agree, sought every opportunity of mortifying him. Some persons reported to him that the *Moulāna* had been heard to say that he agreed with all the opinions entertained by the seventy-three sects into which

the followers of Islam are subdivided. On this *Kounawi* sent one of his friends, a person of great acquirements, to the *Moulāna*, in the midst of a large assembly, to ask whether this were true; and, if so, to disgrace him publicly. He went, and on the *Moulāna's* acknowledging it, commenced a violent harangue filled with abuse and invective. The *Moulāna* patiently allowed him to go on until he was fatigued. When he had concluded, he smiled and calmly observed—"In all that thou hast just been saying I also agree." His reviler abashed and confused, retired.

The following anecdote, from a number of others of the same stamp, may suffice to shew the manner in which these dreaming visionaries are accustomed to apply the external impressions of this sublunary world to the subjects of their own abstruse meditations. One day the *Moulāna*, seated among his pupils, observed, on hearing the sound of a *Rebab*, "the sound of that instrument is the melody of the gate of Paradise." A bystander of little faith, remarked, "I too hear the very same sound, but do not experience these glowing sensations." The *Moulāna*, in allusion to the scepticism of his adversary, exclaimed, "God forbid that you should! What *we* hear is the melody of the portals of Paradise opening for us: what *you* hear is the grating of them closing upon you." In his last illness *Jelat-uddin* thus addressed his intimates—"Be not sorrowful in that I am now about to depart from among you: inasmuch as *Nur Mansur* (the mercy of God on him), a hundred and fifty years after the termination of his mortal career, became visible to *Shaikh Ferid-uddin Attar*; and remained with him continually as his spiritual guide. Under every circumstance be ye with me, and keep me in remembrance, in order that I may extend your welfare in every state of existence (lit. in every dress) in which my destiny may place me. There are now only two links that bind me to this world: the first, obedience to the will of God—the second, yourselves. When, through Almighty grace, I become a simple elementary being, and the world of indivisibility shall have opened on my view, the tie which attaches me to you will still remain."

When *Shaikh Sadi Uddin* (may God purify his inward state) came to see the dying poet, he ejaculated, "May Allah grant you a speedy recovery and advance your dignity." *Jelat-uddin* replied, "May God also effect your cure. Between the lover and his mistress there now remains nought but a thin garment. Would ye not that light unite with light?"

بیت

من شدم عریان ز تن و از خیال
میخراهم در نهایت الوصال

Beit.

I am emancipated from the body and from vain ideality—and walk erect in the reality (of the joys) of union. On hearing this the *Shaikh* and his friends began to weep. The *Moulāna* consoled them and said,

چہ دانی تو کہ در باطن یارے ہم نشین دارم

Misra.

Do you not know that I possess inwardly a constant friend?

His last injunctions to his disciples and friends are as follow: "These are my last precepts to you—Be ye pure before God both in private and in public—eat sparingly—sleep sparingly—and speak sparingly. Flee from wickedness and crime—be constant in fasting, and assiduous in uprightness. Abandon fleshly lusts, and endure with patience the tyranny of men. Shun the society of the ignorant, and cultivate that of the virtuous and meek; for assuredly the best of mankind is he that benefits his fellow creatures, and the best of language is prayer and praise to God.

On his disciples desiring him to appoint a successor, he said, "Appoint *Chelbi Hussain Uddin*." He repeated this three times. On their asking him his wishes with regard to *Sultan Walid*, "Walid is a warrior and needeth not advice." *Chelbi* then asked who should perform his burial service—he answered, "*Sadr-uddin*." His last words were these—"My friends draw me one way and *Shems-uddin* another. Listen, O my tribe to him that calls upon the Almighty. I now am compelled to quit you." The poet then placidly yielded up his spirit into the hands of Him that gave it, just as the sun went down. The beauty and pathos of his dying injunctions, and the Socratic composure of his last moments, will scarce be excelled by aught that modern or ancient history can offer.

The following are the opening lines of his celebrated *Masnawi*, elegantly paraphrased by Sir William Jones:

مشنوی

بشنو ازانی چون حکایت میکند

وز جدایه شکایت میکند

کز نیستان تا مرا ببریده اند

از نفیرم مر و زن نالیده اند

سینه خواحم شرحه شرحه ازفراق
تا بگویم شرح درد اشتیاق
هر کس کبود ورم اند از اصل خویش
باز جز پدید وزگار وصل خویش

"Hear how yon reed, in sadly-pleasing tales,
Departed bliss and present wo bewails!
With me from native banks untimely torn,
Love-warbling youths and soft eyed virgins mourn.
O! let the heart, by fatal absence rent,
Feel what I sing, and bleed when I lament:
Who roams in exile from his parent bow'r,
Pants to return, and chides each ling'ring hour."

The *Masnari* is written in the measure, *Ramal Musaddas Maksûr*.

Jelal uddin Rouzet-i-Bahar,

جلال الدین روضۃ بہار

Flourished during the reign of *Yacûb*, king of Persia. He is author of a poem, entitled the *Temârat al Ashghiah*.

Jehangir Padshah.

جہانگیر بادشاہ

This monarch is included by the author of the *Tazkiret-i-Serklûsh* in his catalogue of poets, and no doubt possessed considerable talent for poetry, as numerous couplets and stanzas, quoted as his extempore effusions, attest; though it does not appear that the royal amateur ever achieved any thing like a regular poem.

The memoirs of his life penned by himself are well written and evince much observation and ability. *Jehangir* ruled in Hindustan from A. H. 1014 to 1037, when he died, according to Dow, on his way to *Cashmir* in the 58th year of his age.

Tavernier speaks very highly of his "illustrious queen," the *Bégum Nûr Mâhal*, and gives an engraving of the pieces of money coined by her command, during the twenty-four hours of imperial sway granted her by the emperor. She could read, write, and compose in Arabic, Persian and Hindi. One day seeing the emperor in a vest fastened by a ruby of uncommon lustre, she improvised this couplet:

ترانہ تکمہ است بر لباس حریر
شدہ است قطره خون منبت گریبان گیر

Beit.

That is not a ruby that sparkles on thy silken vest;
But a drop of my blood that clings there.

Nûr-Mâhal was the daughter of a poor Tartar chief named *Khajeh Arase*. She was eminently beautiful and accomplished, and possessed great influence over *Jehangir's* councils. After her marriage her original name *Mîhr-unnissa*, or the sun of women, was changed for the appellation—*Nûr-Mâhal*, light of the Haram—which was subsequently laid aside for the more imposing title of *Nûr-Jehân*, light of the world.

Jemaluddin Abdul Rizak,

جمال الدین عبد الرزاق

Cotemporary with *Khacani* and *Assir Uddin* celebrated poet *Kemal uddin Ismail*.

Jemal uddin Astozi,

جمال الدین استیزی

Of *Tabriz*, where he died.—his remains were interred at the *Mukbarat-us-Shôra*. He was accounted a good poet.

Jemal uddin Ben-Ishak,

جمال الدین بن اسحاق

Author of a poem entitled, *Ganj al Ishtika*, the treasure of desire.

Jemal Dehlawi,

جمال دہلوی

Was one of the courtiers of *Sultan Secunder Bin Behlol*. After this monarch's death, he turned traveller and visited many regions, performed the pilgrimage to *Mecca*, and stayed some time at *Herat* with

Moulavi Jâmi, "by whose spiritual advice he profited much." Subsequently he visited Hindustan, and entered into the service of the emperor *Humâiûn*. The *Sair al Arifein* was compiled by him. He was called the *Khusro* of Hindustan.

Jemal Resek al Ghaten,

جمال را سنج الغطن

Al Ghaten is a quarter of the city of *Cazivin*, in the dialect of which this poet's works are composed. He died in the reign of *Abaka Khan*, at the advanced age of ninety. No mention is made of his works.

Imâmi,

امامی

A native of *Herat*, his proper name is *Abdullah Mahomed Ben Aher Bekr Asman*—he sung the praises of the sultans and viziers of *Kirman*. He died during the reign of *Abaka Khan*.

Jaffer or Asef Khan,

جعفر

He flourished during the reign of the emperor *Akber*, to whose court he repaired from his birth place *Cazivin*. His works are a *Mâsnavi*, entitled *Khusro-i-Shirin*, and a *Diwan*. There is another poet of this name, who flourished in the time of *Altungir*, and composed a *Diwan*.

Judai.

جدایی

This is the surname of *Mir Syed Ali*, who was "one of the wonders of the age" during the reign of the emperor *Akber*. He completed the historical romance of *Amir Hamzeh* in sixteen volumes; every volume of which, according to his biographer *Mahomed Bukhtau Khan*, is as large as a chest—every leaf, a cubit in length, and every page adorned with a likeness of the *Amir*.

XII.—An Essay on the Relationship of Languages and Nations.—By the Reverend BERNHARD SCHMID.

The idea of ascertaining the relationship of nations by comparing their languages, is peculiar to the learned of modern Europe; and, if carried on in a philosophical spirit, and according to sober and well substantiated rules of etymology, it cannot but afford most important clues, and lead us to very unexpected historical and antiquarian discoveries. Such a study of languages may well be compared to the equally modern branch of human inquisitiveness, the study of fossil remains of a former world, of which the examination of the *Sivotherium*, in the 12th number of the *Madras Journal of Literature and Science*, contains so instructive and interesting a specimen.

The design of the present paper is merely to suggest some authenticated hints, in what quarter and by what methods philologico-historical discoveries may be made; in hopes that those who have more leisure and literary means, will pursue these inquiries, and communicate their remarks to the literary public.

I.—Those who have directed their attention to the study of a comparison of languages are agreed, that a conformity of the grammatical part (the inflexions of the conjugations and declensions), is the most infallible proofs of the near relationship of languages. If this is correct, the *Armenian* language will be found to occupy a most important place in our inquiries; as will be apparent from the following statements:

Armenian Auxiliary Verb.	First Conjugation.	Terminations of the 4 Conj. in Armenian.
em, I am	es sirem, I love	em, active
es, thou art	tu sires, thou lovest	am, neuter
é, he is	na siré, he loves	um, reciprocal
emk, we are	mek siremk, we love	im, passive
ek, you are	tuk sirek, you love	
en, they are	noka siren, they love	

Before I proceed, I would just observe that the *Armenian* auxiliary, although preserved only in fragments in other languages, seems to have been the basis of all the Indo-European conjugations; the terminations of the *Armenian* conjugations, or rather modifications of the verb, are remarkably simple, regular, consistent, and evidently formed by the same people who formed the other inflexions, without interference and immixture of other languages.

2.—But there are also various words which throw an important light on the question, and prove that the *Armenian* is a very interesting middle-link between several Indo-European languages; e.g. mietz

(great) preserved in Greek, in the form of *μεγας*, and in Latin, in the superlative *maximus*;—*ail* = *αλλος*, *alius*;—*akarah** (a ploughed field), in German *acker*, *αγρος*, *ager*;—*kuh* (a cow), in German *kuh*, and (what is remarkable) the plural of it, in the Thuringian, and high (or mountainous) Saxon provincial dialect, is *Kühe** (in Sanscrit, Tamil and Persian, *ko*); *ör*, pronounced *wur*, (fire), *uro*, *comburo*, (the Armenian pronunciation of *or*, viz. *wur* or *eur*, explains how the letter *h* could come into the Latin compound); from *wur* comes the Dutch *wur*; the *uu*, or long *u* being sounded in Dutch as the French *ü*, the similarity with *πῦρ* in Greek, is the more striking; *feuer* in German is merely another modification of the same sound; hence, the English *burn*, = *brennen* in German. Not to mention, that the Armenian *or* and *ur* will strike every one as being identic with the Hebrew *אור* (*ur*, fire) and *אֶסְתֵּר* (*ör*, light)—*asth* (a star) = *αστηρ*, *aster*;—*m* in Armenian means 1st. one — *mu*; 2d. lest, = *mu*;—*gin* = *γυνή*;—*nyn* a woman, always in the signification of *nubere*, or *nupta*: (the derivation of *nubere* from *nubes* always appeared to me far fetched and unnatural). Also in Chinese, I am told, the same root means a woman. *Sineur* (*Shinar*) = an assemblage of men; *kar* (a stone) *χερμαδιον*; *mort*, means 1. a man (= *mas*, *maris*); 2. a battle, 3. the god *Mars*, (*Martis*).

Comparison of Conjugations.

Armenian.	Hungarian.	Bohemian.	Latin.	Greek.	Brettany.
Luanam	irok, irom	wolam	do	τιμω	kanann
luankas	irsz, irod	wolash	das	τιμας	kanez
luanae	ir, irya	wola	dat	τιμα	kan
luanamk	irunk, iryunk	wolame	damius	τιμαομες	kanomp
luanak	irtok, iryatok	wolate	datis	τιματε	kanit
luanan	irnak, iryak	wolagi wolau	dant	τιμαοντι	kanont
Aw	I write, I write it	I call	.....	.....	cano
Javo					

* It is undeniable that the Greek termination of *as* corresponds to the Sanscrit *ah*, and also that the sound of the Greek *χ* and of the Scotch *ch* is often originated from the single aspirate sound of *h*, or substituted for it; hence the propriety of using the *h* with some diacritical mark, to express the Greek *χ* or Scotch *ch*. seems to be evident. — In cases like the present, where it is important to inform the reader of the exact pronunciation of foreign words, it is evident that diacritical marks are necessary, and *h* with two or three dots underneath, is doubtless the most suitable, to intimate the near relationship of the sounds of *h* and *χ* or the Scotch *ch*.

Remark 1.—The general agreement of the Armenian with the Hungarian conjugation, especially in the plural, is surprizing. It evidently shows that the Hungarians must have come from the Himalayan range, and it must powerfully draw the attention of the public to the Tibetan researches of Körös, the learned Hungarian.

Remark 2.—The Bohemian appears to be an equally remarkable middle-link between the Armenian and the Sanscrit tribe (Greek and Latin). To save room, I have omitted in this synopsis the Sanscrit; the similarity of which with the Greek and Latin is well known, as *dodami*, *dodasi*, *dodati*, with *διδωμι*, *δίδως*, *δίδωσι*, and with *do*, *das*, *dat*; especially if we remember the subjunctive, *dem* or *legam*, where the original letter of the first person, *m*, re-appears. (It scarcely needs mentioning, that I have purposely put *τιμαομες* or *τιμωμες* and *τιμαοντι* according to the Doric dialect, instead of *τιμωμεν*, &c., in order to make the uniformity more evident).

Remark 3.—The agreement of the conjugation of the language of Basse-Bretagne may be owing to Latin immixture, unless other facts prove this language to be an independent Celtic dialect.

Remark 4.—The other tenses of the Armenian conjugation, having the letter *z* as a distinctive mark of the first past tense, and of the future, agree with the Greek in a remarkable manner. I add also the perfect tense of the dialect of Basse-Bretagne, as being analogous.

4. Armenian Conjugation of the other Tenses:

1 Past.	Sirezi, sirezir, sireaz, sirezak, sirezik, sirezin.
2 Past.	Sirealem, sirealés, sirealè, sirealemk, sirealek, sirealen.
Plup.	Sirealéï, sirealèir, sirealèr, sirealéak, sirealéik, sirealéin.
Fut.	Sireziz, sireszis, sireszè, sireszuk, siresjik, sireszen.

Conjugation of Brettany.

Perfect.	Kaniz, kanzoud, kanaz, kanzomp, kanzot, kanzont.
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Remarks.—In the Bohemian language, as well as in the Armenian, the participle of the past tense terminates in *t*: e. g. *wolal gsem*, I have called (strictly, I called having am). Every where a remarkable analogy! Neither can I omit mentioning, that the letter *r* of the 2d person of 1st past tense, and the 2d and 3d persons of pluperfect, *sirezir*, *sirealèir*, and *sirealèr*, reminds one of the Latin subjunctive, as: *audirem*, *docerem*, *docuerim*; as also the third person plural, *sirezin*, *sirealin*, of *docuerint*, *riserint*. I cannot believe that this is mere accident; but whether a tribe, nearly related to the Armenians, imported into Italy these fragments of their conjugation, or whether the Romans, being a branch of the great Caucasian, or rather Himalayan race, after having settled in Italy, through congeniality of mind and language, formed their conjugation so analogously, I am not prepared to say.

5.—Also the Bohemian, Greek and Latin *declensions* are very analogous to the Armenian; e. g.

Armenian.	Bohemian.	Armenian.	Latin.	Greek.	Bohemian.
Sing. (Thing) (door)	(Seed)	.....	.....	.....	(a young cat)
N. Pan brána	sermn	semen	σπέρμα	kotyé	
G. pani brány	serman	seminis	σπέρματος	kotyete	
D. 'ipan branyé	'isermn	semini	σπέρματι	kotyeti	
Acc. z pan branu	z sermn	semen	σπέρμα	kotyé	
Abl. 'ipaniv	'isermene	semine	.....	.....	
Local. 'ipani u brányé	'iserman	.....	.....	.....	u kotyeti
Circum-ferential } z pani	z serman	.....	.....	.....	.....
Instr. 'ipani s bránau	'iserman	.....	.....	.....	s kotyatem
<i>Plural.</i>					
N. Pank brány	sermank	semina	σπέρματα	kotyata	
G. panitz bran	sermanz	seminum	σπέρματων	kotyat	
D. 'ipans bránám	'isermans	seminibus	σπέρμασι	kotyataum	
Acc. z pans brany	z sermans	semina	σπέρματα	kotyata	
Abl. 'ipanivk	'isermanpk	seminibus	.....	.....	
Loc. 'ipanitz u branah	'isermantz	.....	.....	.....	u kotiateh
Circ.—z panitz	z sermantz	.....	.....	.....	.....
Instr. 'ipans s branami	'isermans	.....	.....	.....	s kotiatam

It seems scarcely credible that nations, so remote from each other and living in so very different climates and countries, should have preserved so great an analogy in their dialects. Even if the similarity of some inflexions of the Armenian and Latin verbs were granted to be merely accidental, it is impossible to fancy that these declensions, also are thus similar to each other by mere accident. The nations who speak, or spoke, these languages *must be branches of one and the same tribe.*

The *v* in the Armenian ablative, changed into *p* in the plural, by its position between two other consonants (in 'isermanpk) shows clearly that the ancient Greek *φι* (in *στρατοφι*, *κεφαληφι*, *στηθεσφι*), and the Latin *bus* (also in *deabus*), are identical inflexions, as well as a quite similar form in Sanscrit; and grammarians need tell us no longer with their wonted gravity and confidence, that *φι* is a "particula enclitica," unless they are prepared to maintain, that *bus* in Latin, and *pk*, are also enclitical!

6.—The *Numerals* are likewise an important means of ascertaining the relationship of nations, although not equally infallible; since one tribe may be induced to adopt them from a quite foreign nation; as is the case with the Tamulians, who have borrowed the Sanscrit numerals, although they use *commonly* their own original ones, and thus cases may likewise occur, of tribes losing their own numerals entirely and exchanging them for those of foreigners.

As a comparison of the numerals, however, may be useful to suggest various other instructive philological observations, a list of them follows here, adding the personal pronouns in opposite columns, for reasons which will appear immediately.

The numeral <i>One</i> —the pronoun <i>I</i> .		Numeral <i>Two</i> —pronoun <i>Thou</i> .	
Ici, Japanese	Russian,	Ui, China	ni, Tamul.
ye, Chinese	ya Polish.	ni, Japon	ni, Pehl., Mul.
djigh, Tibetan	Wendish.	gniy, Thibet	tu, Bengal, Gip.
yak, Persian		do, Persian	tu, Atm., Latin.
yek, Gipsy	ick, low Germ.	dua, Afghan	
hek, Multan	eyw	dui, Gipsy	tui, Russian.
ök, Bengal	ego	dwa, Sanscrit	ty, Pol., Wend.
egam, Sans.	aham Sans.	ty, Sanscrit	ty, Bohemian.
or according to	ich German,	tuvi, in Tamul	tu, Doric.
eliam, Tamil	pron. ih		
orthog.	ga or ya, Bohem.		
eka, Sanscrit			
egy, Hungarian			
ahad Hebrew			
ahad, Arab.			
geden or yeden	Boh.		
unus, Latin	cn (I)		
one, English,	om (we)		
in, ihn, Welsh	of		
ein, eins, Germ.	Neilg.		
	ana Arabic,		
	Abyss.		
	en, Hungarian.		
es, en	es, Armenian.		
ma,	ma, (we) Pehl.		
	mi, (we) Hung.		
	mi, Armenian.		
	my, (we) Bohem.		
oru, ondu	mö, amö, Gipsy.		
vonnu, onnu,	ammi, Hindost.		
	amues, Doric.		
	ημεis,		

Remarks 1.—I do not think, that the Chinese numeral, *ye*, and the Slavonian pronoun *ya*;—that the Arabic, *ana*, or the Hungarian pronoun

en, and the numerals *ein* or *én*;—that the Tamul pronoun *ni*, and the Japanese numeral *ni*, have any connexion together. Many similarities in this list may be accidental, but the general analogy of the numeral and the pronoun is very curious. Should we not nearly be led to form the hypothesis, that the two or three most ancient languages had had each only one identical word for the numeral *one*, and for the pronoun, *I*,—and another word for the numeral *two*, and for the pronoun *thou*—but that in a subsequent revolution these words were confounded, just as the fossil bones and shells of widely different creatures, have been thrown together confusedly at Montmartre? The Sanscrit *egam* or *éham*, a numeral, has in Greek, Latin and German been employed not as a numeral, but only as a pronoun. The same is the case with the Greek *éis* and *én* and the Hungarian and Bohemian *en* and *es*; *an* is the root of *unus*, *éis*, *ein* and *one*; but it looks as if indeed the Arabians and Abyssinians had employed it for their pronoun, and as if the Hebrews had joined it to the root of their own numeral *ahad*, and formed *anohi*.

2. If it is true that human language is a faithful mirror of the human mind, and that scholars well acquainted with different nations, can trace the characters of a nation in their language, and draw often striking parallels between the idiom of a language and the peculiarities of the nation, it must be acknowledged also, that the above list exhibits an intuitive exemplification of the humiliating truth that man, in all ages and climes, considers his dear self, (his *ego*) as *Number one* (or *egam*), and the neighbour with whom he has to deal (*tu*) as *Number two*? Even the best of men, the most noble-minded and most generous, will catch his heart frequently at the attempt (although a hidden and refined and disguised one), to exalt *ego* over *tu*, and to transgress the great law of Him, greater than Solomon, who said, "love thy neighbour as thyself;" "do to others as thou wouldst be done by;" or "look not every man on his own things, but every man also on the things of others."

3. Gellius has a pretty remark on the pronoun (L. X. Ch. 3): "*Nomina verbaque non posito fortuito, sed quadam vi et ratione naturæ facta esse* P. Nigidius in grammaticis commentariis docet, rem sane in philosophiæ dissertationibus celebrem. Quæri enim solitum apud philosophos, *φύσει τα ονοματα ή θεσει*. In eam rem multa argumenta dicit, cur videri possint verba naturalia magis quam arbitraria; ex quibus hoc visum est lepidum et festivum: VOS, inquit quum dicimus, motu quodam oris conveniente cum istius verbi, demonstratione utimur et labias sensim primores emovemus ac spiritum atque animam porro versum et ad eos quibuscum sermocinamur intendimus. At contra quum dicimus: NOS, neque profuso intentoque flatu vocis, neque projectis labiis pronunciamus, sed et spiritum et labias, quasi intra nosmetipsos coercemus. Hoc idem fit et in eo, quod dicimus Tu, et Ego, et Tibi, et Mihi. Nam

sicuti quum adnuimus et abnuimus, motus quidem ille vel capitis vel oculorum a natura rei quam significat non abhorret: ita in his vocibus quasi gestus quidam oris et spiritus naturalis est. Eadem ratio est in Græcis quoque vocibus, quam esse in nostris animadvertimus." If these observations are correct (of which I have no doubt), the pronouns have been formed first, and then made use of (mostly with a modification of the sound and of letters) as numerals likewise.

4. It is evident that the word, *doubt*, comes from the word *two*; for just as the Tamulians changed the Sanscrit *dwa* into *tui*, the Latins changed *duo* into *dubito*, i. e. to be or to hesitate between *two* things; and, according to the same analogy, the Germans have derived from *zwei*, the word, *zweifeln* i. e. *dubitare*, to *doubt*. The word *between* comes from the same root (*zwei* or *dwa*), pronounced in Nether Saxony, *tween* or *twén*.

7. Numeral, 3.	Numeral, 4.	Numeral, 5.
San, Jap. China.	Xi, su, Jap. China	U, China
súm, Thibet	ji, Thibet	go, Japan
se, si, Zend, Pers.	catverè, {Zend	nga, Thibet
tri, Sanscrit	etro, {	panj, Persian, Gipsy.
tiri, in Tamul orth.	chatur, Sanscrit	panjam Sans. in Tamul.
trin, Gipsy	sadur, Sanscrit	besi, Turkish
traí, Multan	Tamul orth.	pet, Bohem.
tri, treh, Bohem.	chahár, Pehl. Pers.	πεντε
τρεις, tria	chár, Multan, Beng.	pump, pimp, Welsh
tres, tria	shtar, Gipsy	fiinf, German
drei, German	styri, Wendish	fimm, Icelandic
three,	ctery*, Polonian.	five,
dri, Welsh	ctyrei, Bohem.	hing, Armenian
tritioh, Sanscrit	shors, Armen.	quinque
dritte, German	dört, Turk.	öt, Hungarian
τρίτος,	τεσσαρες	hamash, Hebrew
tertius,	τεττοpes	hamsa { Arabic and
third,	πτοpes } Doric	Maltese
shelosh, } Hebrew	πταupes } ancient	summus, Berbers in
shloshah, } Greek and	Aeolic.	Africa
selaset, Arabic	pedwar or } Welsh,	rima, { Moses Isl.
thieta, Maltese	peduor } Tahiti	
tola, N. Guiana	florer, Icelandic	lima, Solomon and
tolu, Solomon &	four,	Cocoa-Isl.
Cocoa-Isl.	vier, German.	seindu, Tamul.
toru, Tahiti	negy, Hung.	anju, vulgar Tamul.
harom, Hung.	arba, Hebrew	eidu, Karnataka.
erek, Arm.	nánku, } Tamul	
múndru, Tamul	nálu, }	
máru, Karnataka	nálku, Karnataka	

* In the Bohemian, and other Slavonic dialects, the English sound of *ch* and *sch* is expressed by a *c* with a diacritical mark, and in the Italian, by a simple *c*; the *c* with a circumflex appears the most suitable letter to express the sound, and to avoid ambiguity in a treatise on foreign languages.

Remarks referring to the numeral 3.—Also this numeral has in a few of these languages some similarity with the 3d person of the pronoun.—*Ur* (we) in Hungarian, may possibly be the root of the numeral *harom*, as well as *har* (= her) in the Thüringian provincial dialect; and *ér* (he) in German, may perhaps, as well as *ur*, be the root of *erck*.—*Sie* (= she) German, may be identic with the Zend and Persian numeral *se*, *si*.

*Trin** in the Gipsy language seems to form the transition from the Sanscrit *tri*, to the Hindostani *tin*.

Remarks on the numeral, 4.—The forms τεσσαρες, πυτορες, peduor and quatuor, shew us evidently, how the same root may be diversified and corrupted in different languages and dialects. Even the forms, *flor*, *four* and *vier* (pronounced *fir*), appear to be corruptions of *πυτορες* by dropping the letter *τ*, just as the Persians have changed the *t* into *h*, (we might as well say, dropped it) in the Sanscrit, *çatur*, or the Zend, *çatveré*; or in a similar form of the same word in some other cognate ancient dialect.

Busbeck, a learned Dutch ambassador at the court of Constantinople, has in his operibus (Epistolis Turcicis) Amst. Elzev. 1660, an account of some men, whom he met with at Constantinople, and whom he believed to belong to a very ancient German colony in the Crimea. He gives a list of words of their dialect, many of which are evidently Teutonic, others belonging to quite a strange language. The numerals are: 1, ita, (in Icelandic: einr (masc.) ein (fem.) eitt (neuter); 2, tua; 3, tria; 4, syder; 5, synf; 6, seis; 7, sevene; 8, athe; (Icelandic ath).—*Fyder* is an important middle-link between *πυτορες*, *peduor*, *flor*, *four* and *vier*, and shews that the Teutonic *four* and *vier* are corruptions of *πυτορες* as well as the Persian *chahar* (*çahar*) is a corruption of *chatur* (*çatur*).

Remarks on the numeral, 5.—Just as the English have dropped the letter *n*, in the German *fünf*, and say *five*, so the Turks have dropped *n* in *panj*, and say, *bes*; and the Bohemians, according to the same analogy, have dropped the *n* in *πεντε* and formed *pet* (or rather *piet* the *pi* being *p* mouillé), neither can I doubt that *panj*, *πεντε*, *pimp*, *fünf*, and *five* on the one hand, and *hing* and *quinque* on the other, are all of them, modifications and corruptions of one and the same root. The change, in sound, from *quinque* into *cing* in French, makes this very probable.†

* I am not sure, however, whether my manuscript is here correct; perhaps the Gipsy word might be *trina*; for the materials contained in this treatise were collected more than 20 years ago, in Germany. Since that period, I had more important duties than "to ask every word for its passport, to know, whence it comes, and whither it goes."

† I do not mean to say that the Bohemians have borrowed their form of *pent* or *pet* (*piet*) from the Greeks; but the Bohemians, as well as the Greeks, have either received this word from a tribe of middle Asia, from which both these nations branched out, or they (the Greeks and Bohemians) changed the (probably) original word *panj* (after their separation) analogously into *πεντε* and *pent* or *piet*. This remark is applicable to many similar cases throughout this essay.

The English word, *pinch*, i. e. 1st, what can be (or is) taken with the five fingers; 2d, a squeeze with the (five) fingers, comes evidently from the Sanscrit and Persian word, *panj*: and if this is granted, it cannot be so very improbable, that also the word, *bunch*, i. e. a number of things tied together or united, (a cluster of dates, plantains) *like fingers*, comes likewise from *panj*. I must not omit mentioning that the word, *pinchers* ("frequently mispronounced *pinchers*," as Walker says in his pronouncing dictionary), comes from *panj* likewise, and that the pronunciation *pinchers* is consequently etymologically correct, since the French have changed the word *panj* into *pince*, *pincée* and *pincer*, in all which words the idea of a *pinch* with the (five or less) fingers is prominent; e. g. *les pince*, the hands of a crab; *une pincée*, 1st, what is, and can be, taken with some fingers, 2d, the little foot of an animal, &c.

If we consider that *panj*, *πεντε*, *fünf* and *hing*, are links in one chain of modifications of one root, we shall not think it an extravagance, to consider the word, *finger*, as a link of the same chain, and to believe that it means nothing else but *fire*. Just so *δακτυλος* comes from *δεκα*, and in German, the word *Dachtel* (pronoun. *Dahtel*) means a slap in the face with the open hand, or with the fingers, not with the fist, *Δακτυλος* means also, fructus palmæ, i. e. a bunch of dates. *Digitus* is only a softer pronunciation of *δακτυλος*, viz. *δακτ* (*υλος*) or *δαγμ* (*υλος*), and comes likewise from *δεκα* or *decem* (correctly pronounced *dekem*).

8. Numeral 6.	Numeral 7.	Numeral 8.
Lo, rocu Ch. & Japan. dhruh, Thibet	Tsie, xici, Ch. and Jap. dum, Thibet	Pu, faci. Ch. and Jap. ghia, Thibet
alty, Turkish	saptam, Sanscrit and sattam, Sanscrit Tamu- lized	ashta, Sanscrit hasht. Pehlvi & Pers.
vietz, Armen. shashta Sanscrit shest, Bohem.	septem, Latin (saptomoh, a, on, Sauscrit septimus, a, um	
shash, Persian sex Latin êç	çitta haït Persian esta, Gipsy sept, French sedm, Bohem.	ohito, Gipsy οκτω octo, Latin acht, (pron. aht) Ger- man.
sechs (pron. sex) Ger- man chwch (pron. huah) Welsh bat, Hungar.	sais, Welsh hét, Hungar.	eight, Engl. with, Welsh huit, French

shesh	} Hebrew	yoth, Armenian	shmini, Hebrew
shishah		yedu, Turkish	samāniyat, Arabic
shedesh,	} most ancient Hebr.	hetu, Tahitian.	tmegnia, Maltese.
{ sittat, Arabic		fitu, } Cocoa Isl.	niölz, Hungarian.
	{ sādīsa (the sixth)	fitu, } New Guinea	
} Arab.		wythou, Moses-Isl.	osm, Bohem.
	sitta, Maltese,	shibah, Hebrew	utn, Armen.
{ aru,	{ Tamul and Karnat.	sabrat, Arabic	
		sebgha, (sebha) Malta	
		sieben, German	öttu } Tamul.
		seven, Engl.	entu, Karnataka.
		siö, Icelandic	
		öru, } Tamul	
		ölu, }	
		eliu, Karnat.	

Remarks—1. I have compared the numerals of other nations, certainly not related to the Caucasian race, and have not found the least approach to an analogy, except those few which occur in the South-Sea-Islands. Some such numerals are the following :

Chili. 1.	Agga 2.	Eppo. 3.	Quita. 4.	Meli. 5.	Queeku. 6.	Cuyn.
Mexico : Ce.	Ome.	Iei.	Nahny.			
Viginia : Negut	Neesi	Nish.	Yau.	Napan	Negutta	
Karonas } t'r ko.	{ t'r koam. t'n nonna. hakka.	natahshe	tahshe			
Hottentots } eit						
Africans near the river } Mo. Ba. Melella. Meleg. Matan, cet.	{					
Camerones. }						

2. The preceding list of the numerals of the Caucasian race, shows that the roots of the numerals *three* and *seven*, have spread farthest, even to the South-Sea-Islands. It is remarkable that just these are the sacred numbers, and this fact may be considered as a collateral proof that Noachic traditions were preserved long in the minds even of nations so remote. Moreover we find that the root of the numeral *seven*, or *shibgha* (Heb.) occurs in several Indo-European or Caucasian languages, expressing sacred actions; e.g. *sevyoti* in Sanscrit, and *svetit* in Slavonic, mean, *he worships*; *σεβειν* in Greek means the same; *sebam* (שבת) in Sanscrit and Tamul means *prayer*; even *sabbath* appears to be derived from the same root and to have meant originally "*the seventh day's rest, the sacred rest*;" although in the Hebrew, as far as that language has been preserved to us in the Old Testament, the verb

shabath with some of its derivatives means merely *to cease from work, to rest*, likewise *to come to an end*.

9.—That also with respect to a variety of other words, there exists a close connexion between the Sanscrit, Greek, Latin and German languages, is well known to those who have made this branch of human knowledge the particular object of their enquiries, but I shall add here a list of Sanscrit words with their derivatives, in order to convince the uninitiated of this, and to draw the attention of scholars more generally to the comparative study of languages and dialects, especially of those in India, or connected with this country, principally Sanscrit, Armenian, and the provincial dialects in the north of India or in the Himalayan and Caucasian range of mountains; because by such studies much unexpected light may still be thrown on ancient history.

Onto* (Sanskrit), andam (அந்தம், Tamul), das ende (Germ.), the end, oshono,—, asanam (அசனம், Tamul), das essen, the eating. vidova, veduvei (வெடுவைய, Tamul), vidua, widow, wittwe (Germ.)

vohoti, vchit;—hence:

vahanam, vaganam or vahnam (வாகனம், Tamul), wagen (Germ.) = waggon.—Vagnam, corresponds exactly to the Latin, *vehiculum*, consequently this last word and *waggon* must be allowed to come from the same (Sanskrit) root.

vindoti, er findet (German) = he findeth.

valo, (Sanskrit) strength, = bala (Karnataka,) palam (பலம், Tamul), validus, valde;—bold,—balde, (quick, in German).

Likewise osti=οστεον=os, ossis;—oshion=os, oris;—vortute=vertitur; yunkte, = jungit and jungitur;—nidhi = nidus = nest;—modhyoh, medius, = μεσος = mid, middle = mitte and mittel (Germ.).

Ondani, die enten (German) ducks. Tandovo = der Danz = dancing. Torsho = thirst = durst (Germ.) the root of which is probably, dürre (Germ.) = dry.—Ognih = ackini (அக்கினி, Tamul)=ohén (n mou-illé, Bohem.) = ignis.—Rotho = radam (ரதம், Tamul) = das Rad

* The Sanscrit words occurring in the whole of this treatise, have been taken from the ingenious and elegant work of Frederick Schlegel "On the Language and Wisdom of the Hindus" (adopting his orthography). This work first directed my attention to the treasures of Sanscrit literature; whilst another acute and eloquent philological writer, the Rev. Mr. Breidenstein, Ecclesiastical Councillor, and Chaplain to the Landgrave of Hesse-Homburg, led me to the comparative study of languages, and I gladly seize this opportunity to acknowledge that nearly every idea contained in my former treatise "On Original and Derived Languages," I owe to the latter gentleman.

(Germ.) = rotha.—Yann = γονυ = genu = knie (Germ. pronouncing the k.) = knee, (Engl.)—Rohito and roktoh = roth (Germ.) = red; hence *rosar* = rosa; hence *russus*, *rouge* (French); also *rutilus*.

From *rohito* and *roktoh* comes likewise *rottam* (ரத்தம்) and *rektam* (the blood) in Tamul;—*naso* = *nasus* = *Nase* (Germ.) = nose; *nasi* (நாசி in Tamul) = nostrils = nares.—*Blauvo* = brow (of the eye) = *braue* (Germ.) = *οφρυς*. *Namo* = *namam* (நாமம், Tamul) = *nomen* = *name* (Germ.) = *name* (Eng.) = *ονομα*.

Monushyo = *manushen* and *maniden* (மனுஷன் and மனிதன் Tam.) = *Mensch* (Germ. pron. *mensh*). The root of it, *man* = *mann* (Germ.) exists perhaps also in Sanscrit; it is disguised in *homo*, *hominis* or in ancient Latin, *hemonis*, the *he* and *ho* being prefixed just as the Greeks do in some preceding instances; and the root, *man*, re-appears clearly in the compounds *immanis*, *communis* (i. e. what belongs to all men) *nemo*, *neminis* = *niemand* (Germ.) and probably in *humanus*.

Purushen or *burushen* (புருஷன், in Tamul, also in Sanscrit.) a husband, also *un homme fait*, has preserved itself only in the German word, *bursche*, pron. *burshe*, a young (strong) man.

Yugun, = *jugum*, = *joch* (Germ. pron. *yoh*) = *yoke* = *ζυγον*.

10.

Etymological Rules.

The science of Etymology has been ridiculed as “changing consonants at pleasure and disregarding vowels entirely,” but *then it is no science*, and I should be sorry if the present essay contributed to increase the attempt into which etymology has been brought by the dreams and hallucinations of some scholars, who have (e. g.) boldly derived *Mareschal* (i. e. *Mareschalkus*, the servant of horses, or the overseer of the royal stables), from the Hebrew, *marshal*, to govern.

Change of Vowels.

Every Hebrew or Arabic scholar knows how greatly the vowels change in all Shemitic dialects, but still according to certain rules, which science ascertains and scrupulously regards. In dialects which have not suffered from intrusive intermixture of strangers, the vowels interchange with as much regularity as in the Hebrew and Arabic, but in a different manner, and the words differ consequently in sound from those cognate dialects, so that they are unintelligible to the uninitiated, but he who has attended to the rules of those changes, can translate one dialect into the other, (as far as the vowels are concerned), almost without committing a mistake. Thus in the Thuringian provincial dialect, the Italian *a* of the classical German pronunciation, sinks into *aw* (as in *crawl*); *o* into *u*; *i* into *e*; and *ö* and *ü* become *i*. But if the inhabitants of one province settle in another, and form by intermixture

a new dialect, this regularity and consistency is disturbed and broken. Thus we find it in the English language and its dialects;—and thus we find it, if comparing Sanscrit, Persian, Greek, Latin and German words, which doubtless are identic, but where the changes of vowels are subject to no rule, and vary as much as the colours and hues of flowers transplanted into foreign climes and submitted to different treatments.

Change of Consonants.

11.—Those who observe how children, who just begin to speak, form their sounds, will remark that they, in their attempts to pronounce a consonant, are little guided by the ear, but they appear rather to have a distinct idea by what organs of speech each particular consonant is to be pronounced, and try to pronounce it accordingly. Hence a (German) child whom I requested to say after me, *kappe* (a cap) said, *happe*:—because he was aware that *k* must be produced by some operation of the throat, but being as yet unacquainted with the manner of contracting that organ of speech, produced the simple aspirate *h*. Many similar remarks I have made with respect to other consonants; and the following rules are but exemplifications of one general observation.

Consonants which regularly interchange in different truly cognate Languages and Dialects.

12.—The labials *w*, *v*, *b*, *p*, *f*, *pf*; but not *m*, it being of a nature different from the others of this class.—Examples: It is a fact that all words which in Tamul begin with *u* or *o*, begin in the Karnataka provincial dialects with *wu* and *wo*, (or *vu* and *vo*), and must in many cases, also be written and printed so; just as in the modern English the words, *one* and *once* (anciently pronounced in the same manner as *on* in *only*) are now pronounced as if written, *won*, *wonv*.—The Canarese, having once begun a change, carry it regularly through, and pronounce the Tamul *v*, as *b*; e. g. *Vadugen* (வடிகுண), in Canarese: *Badugen* (from *Badugu*, north).—*B* in Tamul is *p* in Canarese; e. g. *kobam* is *kopa*.

Pf in the dialects of the mountainous parts of Germany, is always pronounced as *p* in the flat countries; e. g. *pferd* is pronounced *perd*, *pard*, *part*, in Nether-Saxony. Thus *pfennig* in German, is *penny* in English.

13.—The linguals, *th*, *d*, *t*, *s*, *sh*, and *tz* interchange, but not *n*;—*r* and *l* seldom.

The English *th* is mostly *d* in German; * e. g. *the* is in German *die* (der, die, das);—*this* is *dieser, diese, dieses*; *than* is *dann*; and vice versa, *do* is *thue* in German;—*door* is in German both *thür* (door) and *thoor* (a gate).

T in German is invariably changed into *d* in Nether Saxony, and mostly also in English; e. g. *saat* is *seed*; *blät* is *blood*.

S and *ss* in German is regularly *t* in the Nether Saxon dialect, and in English; e. g. *wasser* is *water*; *gross* is *great*, and in low Saxon, *groot*; *was* is *what*; *das* and *dass* is *that*; *zu wissen* (to know) is in English, *to wit*; *er weiss, er wusste* is *he wot*; *weiss* is, *white*.

Tz changes likewise invariably into *t*;—*hitze* is *heat*; *sitz, sezt*; *witz* is *wit*.

Sch in German (pronounced *sh*) is mostly, if not always, *sk* in low Saxon, but seldom changed in English; e. g. *fisch* in German, *fish* in English, is *pisk* in low Saxon; thus *schiff* = *ship*, is *skip* in low Saxon.

14.—All the gutturals *y, g, k, h* (or the German and Scotch *ch*), interchange with the simple aspirate *h* frequently, as well as amongst themselves. *G* (according to the Romanizing system always pronounced like *g* in: *give*) is pronounced in many German dialects, either like *k* or like *h*, softer and harsher; and that *h* is always pronounced, in Nether Saxony, and mostly also in England, like *k*, is well known.

15.—In other languages and dialects other changes of the consonants are observed with equal regularity. *Grimm* in his German grammar gives a specimen, and remarks that, if any word is found in these three German dialects, not changed in conformity with this specimen, it is certain that such a word is an intruder and not originally belonging to that dialect. (See Edinburgh Quarterly Review, No. xcix. Oct. 1833).

Greek and Latin. Gothic. Old High German. Modern German.

πες	fotius	vāoz	fuss.
πισεις	fisks	visk	fisch (pron. fish).
frater	brōther	pruoder	brader.
τρεις, tres	threis	dri	drei.
οδης, οδους	lunthus	zand	zahn.
γερως	kuni	ehunai	.....
χορτος, hortus	gards	karto	garten.

16.—To show what great changes vowels and consonants undergo in a language, I cannot but transcribe two specimens of valuable remains of the old Saxon dialect preserved in the archives of Goslar, and which will prove particularly interesting to the English reader.

* For brevity's sake I use in this treatise, the word *German* for the classical, commonly received, polite dialect of Germany, which usually is called *high German*.

Vow of the Saxons against Charlemagne.

1. Saxon Hilli kroti Woudana; ilp osk un osken pana
 2. Eng. transl. Holy great Wodan; help us and our banner lord
 3. Mod. Germ. Heiliger grosser Wodan; hilf uns und unserm banner herrn
- { Unittikin ok kelta of ten aiskena Carlevi ten slaktenera.
 { Witukin (ac) against the (αἰσχος?) Charles the slaughterman.
 { Wittekind und gegen den Karl den schlähter.
 { Ik kif ti in our un tou scapa un tat rofe.
 { I give thee an ox and two sheep and the robbed (prey).
 { Ih gebe dir einen Auerochsen und zwei schaaf and das geraubte.
 { Ik slaete ti all fanka up tien iliken Artisberka.
 { I slay for thee all captives upon thy holy Hercynian mountain.
 { Ih schlähte dir alle Gefangenen auf deinem heiligen Harz (berge).

Baptismal Vow of a captive Saxon Chief.

- { Hilken maktik koning Karelo, ick tin fanken Oddo,
 { Holy mighty king Charles, I thy prisoner Oddo,
 { Heiliger mähtiger könig Karl, ih dein Gefangener Otto,
 { pana of thousand, forsaki ten krotten Woudanabelta up
 { banner lord of thousand, forsake the great Wodan's image upon
 { banner herr über tausend, entsage dem grossen Wodan's bilde auf
 { artis barko. So ok all min godmanni ok kriskneeti
 { the Hercynian mountain. So also all my vassals and war-servants
 { dem Harz (berge). So auh alle meine gutsmänner and kriegsknechte
 { to kerstene. All min sittoma ok recto is in thin unil
 { to Christians. All my possession and right is in thy will
 { zu Christen. All mein besitzthum und recht ist in deinem willen
 { ok anda. Wi bid di otmode um levens ok fridoms. Uui unil
 { and hand. We bid thee humbly for life and liberty. We will
 { und hand. Wir bitten dii demüthig um leben and freiheit. Wir wollen
 { oldena bi Gotto almaktik ten vater, ten son, ten iliken ost,
 { hold by God almighty the father, the son, the holy ghost,
 { halten an Gott allmähtig den vater, den sohn, den heiligen geist,
 { so wi nu lernet, ok an di, us nadik konnink.
 { whom we now learned, also on thee, our gracious king.
 { so wir nun gelernt, auh an dii, unserm gnädigen könig.*

Anomalous changes of Consonants occurring constantly in certain languages.

17.—In consequence of the change of the labials occurring in the Canarese language mentioned in paragraph 12, there would be in that

* This second piece, by the way, shows the manner how the church of Rome made proselytes, and how people were baptised in those dark ages. In our days no Christian would do so.

language too great a number of words with *p*, and probably many misunderstandings would be occasioned. That nation has, therefore, been driven to an uncommon expedient, viz. to change the letter *p* into *h*, in all words which they have in common with the Tamilians. Thus the Tamul word, *pon* (gold), is pronounced, *hon* in Canarese; and *Ponnur* or *Ponnatur* is pronounced in Canarese, *Honnatur*, (generally pronounced *Honore* by the English); *patti* (பட்டி) a shepherd's hut, in Tamul, is *hatti* (butti) in Canarese; hence the places *Guzul-hutti*, *Dim-hutti*, and many others.

Y (the consonant) in Tamul words is in Canarese constantly pronounced and written *s*; hence *பெயர்* or *பேர்* (*peyer* or *pér*) is in Canarese changed into *heseru*. Also in some Tamul provincial dialects this change takes place, and some words of this class have come into the Tamul dictionaries; e. g. *yamam* (யமம்) is also written *samam*. Attention paid to such peculiarities makes the acquirement of a language more easy and amusing.

18.—*S* and *r* exchange.—*Iron* is *eisen* in German;—*hare* is *haase*;—*I was*, thou *wast*, is in German, *ich war*, du *warst*;—*dur* is *dur* in Sanscrit, hence *turasei*, *turichei* (evil desire) and *turyosenci* (evil thought, evil advice) in Tamul; *auris* is in ancient Latin, *ausis*, hence, *auscultare*; *nasus*=*nares*?

*19.—The letter *h* becomes not only *h* and *k* (as mentioned before), but also *s*; frequently it is dropped, sometimes it is softened down into the semivowel *w* and occasionally into *y*.

Mankind in their first stage of cultivation expressed their feelings and thoughts with unshackled freedom, warmth and energy; hence the simple aspirate *h* abounded in their dialects;—thus we find it still in a great measure in the remnant of those languages which were most anciently fixed by writing, as the Hebrew (with the Arabic), and the Sanscrit.

But when, by the increase of ideas, more words were required, and perhaps also merely in consequence of the greater exercise of the organs of speech, these aspirates were variously modified, in order to produce more words differing from each other in form and sound; and also when those tribes, by more frequent intercourse in different circumstances, found it necessary to give more substance, more body and bones, to their language; it may be supposed that the simple aspirate was in many cases changed into *ch* or *h*, *k*, *g* and *g*. More particularly those tribes who removed to, and remained long in, wild mountainous countries, where the continual noise of the winds shaking the trees, made it necessary to produce still harsher sounds, as *j*, *sh*, *ch*; whilst those

who removed to delightful plains, and became comparatively mild in their manners and finally subdued by conquerors, changed the *h* into the milder *s*, (and subsequently into *t*) or into *w*, or lost it entirely. Hence in some European languages *h* occurs seldom, and the Tamilians have none at all, since they were, from the most ancient times, by various succeeding mountaineer-tribes, pushed to the southern plains of India and subjugated.

It is strange that the Greeks retained the *h* in most words, where even the northern mountaineer-tribes have an *s*; e. g. *ἑξ*, *sex* in Latin and German; *ἑπτα*, *septem*, *seven*;—*ἅλς*, *salz* (German)=*salt* (Eng.)=*Sal*=*Saul* (Bohemian);—*ἄμα*=*ham* (Armenian)=*cum*; but in this case the Greeks have likewise changed *h* into *s*, as *σύν*=*syn*, (as well as into *z*, e. g. *ζύν*), *σύν*, *samt* (together) in German.

Another remarkable exception is that the Teutonic nations retained the *h*, where even the Hebrews and other nations living in milder climates and countries, have a *k*; e. g. *horn*=*cornu*=*kärän* (in Hebrew);—*halm*=*calamus*; *house*=*casa*; *heart*=*Herz* (German)=*καρδία*=*cor*; *hollow*=*hohl* (German)=*κοίλος*, (hence, *coslum*).

Mountaineers change frequently the *s*, into *sh*; hence this sound abounds in Sanscrit (which language was certainly formed in the Himalaya-range*). Hence the Swiss and the Swabians (the inhabitants of the mountainous country of the black forest) say, du *hasht*, instead of du *hast*; *isht*, instead of *ist* (=est); and the Tamul, being a language of a flat and even country, has even a grammatical rule, according to which such Sanscrit words must be softened down; e. g. instead of the Sanscrit word *nashitam*, they write grammatically, *nattam*; instead of *rakshiden*, they write and say *rakiden*; instead of *sodisham*, *sodidam*; &c.

But since most tribes of the human race—before they finally settled where we now find them, and resided for centuries in very diversified climes and soils, until they were expelled, or emigrated of their own accord, since they intermixed with various other tribes (at least in many cases)—experienced numberless changes in their circumstances, we find now in their languages very many exceptions from the general rules here laid down. But I doubt not that, if those who are engaged in studying any language, kept these ideas constantly in view, comparing the words of such a language, with those of other languages and dialects with which they may be acquainted, and committing their observations and remarks to paper, they would be able

* Cellarius says: Brachmanes tandem commemorandi in hac India sunt. Non autem philosophorum modo generis et sectae id nomen fuit, sed et gentis diffusivum, cujus marini pars in montibus degit, reliqui circa Gangem.—The Brahmins, according to their own tradition, originally came down to the plains of India, by way of Hinduear.

eventually to draw up such instructive lists as in paragraph 15;—they would not only be able sometimes to throw light on history, but would also make the drudgery of learning languages more easy and interesting to themselves. Much is still to be done and to be discovered by means of comparative study of languages. Somewhere in the Asiatic Researches, for instance, is a remark that a certain number of identic words, not apparently derived from the Sanscrit, seems to exist in all the languages and dialects of India.* If by the united endeavours of scholars in the north and south of India, a list of such words was produced, it would afford useful hints to the philologist, historian and antiquarian;—and attention bestowed on the rules according to which consonants change, would greatly assist therein.

20.—I now proceed to substantiate the preceding remarks, and select for this purpose the word $\delta\lambda\eta$, which means, 1st, a forest or wood, silva, and 2d, branches, sarmenta (as in Anabasis, 3, 5 and 6) from which root, in each of these meanings, various derivations exist. Even the word *silva*, (more correctly *sylva*) comes from $\delta\lambda\eta$, and the identity becomes more evident, if we remember that the Romans pronounced it also *sylva* (the u as a vowel, as in Horace, Ep. 13, 2).

$\delta\lambda\eta$ { Sylva = saltus = wald (German) = wood;—wild (English and German), sylvestris.
 αυλη (a lost middle-link), hence ξυλον.
 Holt (Spencer) = helz (German) wood, in the meaning of lignum and saltus.
 καλον, (lignum);—κηλον (jaculum, the shaft being of wood).

21. It is mentioned above, that the words *horn*, *cornu* and *karan* are identic, but before I proceed to give a list of the derivations, I must remark that it is evident both from Revelation and from the nature and history of the languages now in our reach, that mankind formed them by the exercise of their mental faculties. A limited number of very simple (perhaps mostly monosyllabic) words was the common property of the primitive races. The Caucasian tribes, after their separation from the others, continued to multiply their words, partly by merely modifying the sound of a vowel or a consonant of a word already in use†

* I suppose kotel (a fort) is such a word; also *ir*, *vâr* and *bur*, with their variations, *beram*, *veram*, *bêre*, *pêre* and *pûr*, meaning a village or smaller town.—After having written this, I find in the Madras Journal of Literature and Science, No. 13 page 293, the following statement: "There are in it" (in the Pali or Magadhi dialect), "words common to Telugu and Tamil, but not Sanscrit; lending some force to an opinion that a common dialect, not Sanscrit, once ran through the whole of the continent of India."

† An instance of the change of the vowel is $\kappa\acute{\alpha}\lambda\omicron\nu$ and $\kappa\eta\lambda\omicron\nu$; instances of the change of the consonant are frequent; e.g. the word *waffen* is pronounced in Nether Saxony *wappen*, (hence the English word *weapon*), and means, 1st, arms of offence and defence; 2d, the figure painted on the shields of the old Germans. But subsequently the word *wappen* was likewise received into the high or classical German, and means now exclu-

or partly by adding a letter or syllable (not to mention the prefixes), and partly by inventing new words, many of which were certainly onomatopoeitic. Words which were formed by modifying the primitive root, always expressed ideas related to the meaning of that root; e.g. the original meaning of the primitive root of the Hebrew word *karan* קָרַן

or in Greek, *καρηνον*, seems to have been, *skull*; but this root (*kar* or *har*) variously augmented, was applied to all which is about the skull, e.g. the hair, the horn (of animals) &c. and then, secondarily, such a modified and augmented word was used to express cognate ideas; as, hardness, strength, confidence, superiority, &c. If it is remembered that the dual and plural forms of *kārān* (in Chaldaic also *karnah*) are, *karnayim*, *kranayim* and *kranoth*, the correctness of the following etymologies will appear still more evident.

The primitive root, then, is *har*, and one of the first modifications is *καρη*; further modifications of *har* are *hārān*, *kārān* and *kran*, and a modification of *καρη* is *κρας*. From these modifications the following families of words have sprung:

Har	{	Hair (English) = haar (German).	
		(Hārān) horn (G. and Engl) = cornu; hirn (G.) = brain.	
		corn = korn (G.) = grain;	
		καρη.... } καρτιαρ and κρατια; cerebrium;—	
		κραν } κρατος, κρατος and κρατος.	
		Kārān... } <i>καρηνον</i> ;— <i>κορωνη</i> = (summitas et) corona.	
		Kran... } <i>κρανον</i> , <i>κρανο</i> (galca); <i>κρανιον</i> = cranium.	
		<i>κρανιον</i> } <i>κραντια</i> = cornus, (having hard stones),	
		<i>crinis</i> , (only used of the hair of the head)	
		<i>κρηνη</i> , a spring, or head of a brook.	

From *κρας*, *κρατος*, the horn, the symbol of strength, are certainly derived those words in the Greek and other languages, which denote strength, superiority and government; as, *κρατος*, *κρατω*, as well as the word, *hard*, (Eng.) = *hart* (German).—The word *κρατος*, comes most probably from *karan*; and *κρηνη* from the simpler root, *kar*; just as *herus* in Latin, and *herr*, the lord, (in German), come from the still more primitive form of *hār*; and I should have placed these two words in one line with *hair* and *haar*, had I not feared that this association would have appeared, at first sight, too extraordinary

sively. the root of arms; whilst the word *waffen* means solely arms. *Knabe* means any boy, and was, like the softer English word (*knave*), originally used for the companions of knights, but subsequently the intensive pronunciation of this word (viz. *knappe*) was used to express this second meaning; as: *schilt-knappe*, i.e. armoured bearer; miller's *knappe*, i.e. servant of a miller, (pronouncing the k).

and nearly ludicrous. Reviewing all these various, but certainly correct, derivations, I cannot doubt that also *κραλῆς* (a king), and *král* in Boheimian, with exactly the same signification, and the German word, *kerl* (a young strong man), Latinized *Carolus*, and *Charles*, come from the same root.

I hope I shall be pardoned, if I add here a question, the decision of which I leave to Hebrew scholars:—Did Job (16, 15) really intend to say, I have defiled my *horn* with dust, (as Luther and the English translators have it)?—I think it appears very evident from the above etymological genealogy of the word *král*, even if there were no other proofs that it had in the original Hebrew two or three different meanings, viz.: 1, the head; 2, the horn which grows upon it in certain animals, and 3, strength or glory (See also Ps. 89, 17—92, 11). And it is a fact that in the Hebrew as well as in the Arabic languages, there are many words which have two distinct (sometimes opposite) significations, where the connexion alone must decide; e. g. *hattaath* (חַטָּאת) Deut. 9, 21. Lev. 6, 25, 30, and Zach. 14, 19. Every translator should surely strive to divest himself most carefully of the prejudices and mistakes of his predecessors, and to do justice to his author, so that the real meaning and context, as well as clearness, good taste and the modern idioms, be regarded. Job certainly meant to say, "I have covered my head with dust." The vulgate has, *Operui cinere carnem meam*, but the Septuaginta have understood the figurative expression better, and have the word *σθενες*; and De Sacy, *J'ai convert ma tête de cendre*.

22.—Some other etymologies, both regular and anomalous, illustrative of paragraph 20, are the following:

El (אֵל, *él*) a strong one; God; from this, the Greeks have formed, consistently with the above mentioned rules, *ἑλῖος*, and the Latins the word; *sol*;—and *αὐλή* seems to come from the same root;—*ἐρκος*, = *kerker* (Germ.) = carcer;—*ἀλλομαι* = *salio* = *sally*;—*ἐσπερος* = *west*? = *vesper*;—*adim* (Armenian) = I hate = *odi* (*odium*) = *ich hasse* (Germ.) = *kosten*; in this series of words, the aspirate is quite anomalously employed; *Hind*, *Sind* and *Indus*, where the Greeks have rejected the *h*;—*διννος* = *sofnadi* and *svefn* (Icelandic), = *shvopno* (Sanskrit). In Latin the *π* has been changed into the nasal letter *m*, on account of the following *n*, equally nasal, and thus the word *scimus* was formed; but on the other hand also they dropped the *n*, and thus, *scipio* and *scopor*, arose.—The Quarterly Reviewer, in the number above alluded to, derives the word *equus* from *ἑππος*, but this is not a scientific derivation, I would much rather compare the word *equus* (in

* Most probably the original Latin translation was: *cornu meum*, which a very early copyist changed into *carnu meum*.

Gælic) *och* (oh) with the word *ἄκρος*, and derive from *ἑπ* (*pos*) the syllable *cab*, which is the root of the word, *caballus*.*

23. The intimate connexion of the Japhethitic and of the Shemitic languages, as demonstrated in some of the preceding etymological deductions, is surprising, and deserves the attention and further inquiry of scholars. To prove that they are not quite solitary instances, I shall add here some more.

<i>kol</i> (כֹּל Hebrew) <i>καλῶ</i> to call	كَل (dixit), Arabic; = <i>calo</i> (ancient Latin, e. g. <i>comitia calata</i>,—nomenclator or nomenclator) = <i>clamo</i>; <i>κλαγγῶ</i>, <i>κλαζῶ</i> = <i>klang</i> (the sound), Germ.; <i>klingen</i> (to sound);—<i>kalladi</i> (he called,) Icelandic; <i>kallen</i>, to speak, (in the provincial dialect of Aix-la-Chapelle);—<i>hallen</i>, (to sound, resound,) Germ.; <i>gällen</i> (to sound unpleasantly) Germ.
<i>kara</i> (Hebrew)	<i>crier</i> (French) = <i>shreien</i> (Germ.); <i>kreishen</i> (to cry or weep); cry; <i>κραζῶ</i> = <i>krichteti</i>, pron. <i>krichteti</i>, (Bohemian).
<i>epa</i>, <i>επαζε</i> Hesiod. <i>εργα</i>, 419	<i>ar</i> * <i>a</i> (Chald.) אֶרֶץ and אֶרֶץ <i>äretz</i> <i>ar</i> * <i>a</i> (Hebr.) = <i>Hertha</i>, <i>Dea Terra</i> (Tacitus Germ. 40) = <i>earth</i> = <i>erde</i>, Germ.;—<i>wurzel</i> = <i>ρίζα</i> = <i>radix</i>. <i>apis</i> = (herba, Hesychius);—<i>επιθῶς</i>;—<i>aro</i>; <i>arvum</i>; <i>ervum</i> = <i>οσφοβος</i> = <i>erbse</i> (Germ.)

Gib * *ah* (Hebr. collis); *قبة* (Arab) = *cupola* = *kuppel* (G.); *gabal*, (Hebr. to finish):
κuppe (summit, Germ.); *caput*; = *kappe* (Germ.) = *cap*;
κεφαλή; *capitulus*;—*giebel*, (summit of a house) Germ.;
gipfel, (summit of trees) Germ.
kopf (head, Germ.) = *haubt* (ancient G.) = *haupt*, (modern German) = *head*.

The derivations from *kol* and *kara* might be owing to onomatopoeia; but not so those from *epa* and *κεφαλή*. Some others of the latter kind are, *shen* (Hebr.) = *zahn* = *dens* = *οδῶς* = *tooth*.—*Manah* (Hebr. to count, arrange, apportion); hence, *μνα*, *μνη* = *mina*; *money*, *mon-*

* I cannot but transcribe from Professor A. W. von Schlegel's "Indischer Bibliothek" the following pretty French lines:

Alfana vient d' equus sans doute,
 Mais il faut avouer aussi,
 Qu' en venant de là jusqu' ici,
 Il a bien changé sur la route.—Ind. Bibl. Vol. II. No. I.

But notwithstanding the great change, I think it is evident, that the relationship of *ἑππος* and *caballus* is quite legitimate.

is pronounced by them *bulu* or *pullu*, perhaps adopting in this case the pronunciation of the Badugers), their own original pronunciation is bursh and pursh* as if written in Tamul, புரஷ் ;—*nilam* நிலம் is *neûlne*,†—*vanam* வானம் is *pône*; *vittu* or *vidai* வித்து or விதை is *pott*; *varugirên* வருகிறேன் is *vashkenn*, or *vaykenn*; *tarugirên* தருகிறேன் is *tashkenn*; *irukkirên* இருக்கிறேன் is *ûshkenn*.

Instances of rejection of consonants are the following: *Irul* இருள் is changed into *ûlu*; *raûru* வயறு into *bîr*; *veiyil*, வெய்யில into *bîr* or *bîrsh* (thus they call the sun); *mapei* மழை into *mâ*;—*maram* மரம் into *meunu*; and *param*, palam பழம் into *pôm*—(this is the only instance which I have met with, where the Pali or Tamul termination of *m* is preserved); *சமுத்திரம்* is *sotara*. This word they have certainly received through their intercourse with the low country; and it shows how they assimilate many foreign words to their idiom. Another clear instance is *kâhotz*; so they pronounce the Tamul word காகிடம் or காயிடம் (*kagidam*). More easy foreign words they leave unchanged; e. g. the Hindustani word, *turi* (a kife) and the Canarese word, *bara*, to write, which is evidently also the root of the Tamul *varî*, வரி; it is consequently not even certain that they have borrowed the word, *bara*, from the Canarese. It is remarkable, that they have adopted scarcely any Canarese word, as far as I can ascertain, although they have so much intercourse with the burghers or budagers.

Their grammar contains the rudiments of the Tamul, with several forms of their own; e. g. *nan* *pûrandiruckiren* நான் பிறந்திருக்கிறேன் is in their dialect *ôn* *pêrdsh bimi*—and in plural, *om* *perder humi*, where the auxiliary, *I am, we are*, is expressed by *bimi* and *humi*. Whether this is the case in any other Indian dialect, I do not know. They say also, *bini* instead of *bimi*. Their pronouns are, *ân* or *on*, I; *ni*, thou; *atham* and *ath*, he; *ôm*, we; *nûnma*, you; *atham*, they, *athu*, (neuter); the forms of the dative are for *enacku*, *enk'*; for *unacku*, *nink'*; for *avenucku*, *ânk*.

Some phrases are: *on* *ûshkenq bokena*? Shall I stay or go? *Ishenirkasu barkena*? Must I (do I) write like this? *Ninnûr per-*

* Dr. Zenker says in his work entitled "Plante Indica" as follows: Ut Specimen nomenclaturæ vagæ aboriginum Echtheanus, hanc arborem (Rhododendron alagiriense) ab ipsis *Pulukumaris* nominari, adjici licet. Cl. Ritter vero in opere suo geographico insigni (Wûrkunde &c.) nomen *pursh* ab indigenis accepisse monet. Mara means, tree, in the Canarese. No alphabet could express the word *Pursh* correctly, as well as many other *Todaver* words, except the Roman with diacritical marks according to Sir William Jones' principles.

† *Eu*, according to the French pronunciation, as in *peur*; the pronunciation of *û* is somewhat different.

wudi ettodu? *unnôdu purandavergel ettenei*? *Ninku kinnudu ettodu*? *unacku sinnavergel ettenei*? *Tôlim enku kinnodu*. *Ellârum enacku sinnavergel*. These specimens will suffice to show the great similarity of this dialect with the Tamul, although by no means its identity.

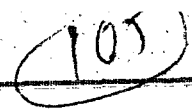
Some words, the origin of which I have not ascertained, are the following: *teckl*, or *teckl moh*, a man (*nioh* is the same with *mahen*); *tuj moh*, a woman; *kuh*, a girl, a daughter; *ên*, father, (*ennên*, my father); *avv*, mother; *tûru* (if written in Tamul: தூறு,) a plant; *poh*, red; *tûvi*, a feather; *tashk*, above; *erk*, below; *wûldi*, pleasant, good; *ufn*, the back; *nobkôde*, shoulder; *mît*, chin; *mithu*, whisker; *moi*, beard;—*pevvêl*, thumb, (*vêl* and *veld*, is the Tamul வீரல்); *polvel*, 3d finger; *uûndôri*, (if written in Tamul: ஊழ்த்தோழி) 4th finger; *erk koi*, left hand (lower hand); *parsh koi*, right hand, (வலதுகை). Also the names of the week days may perhaps afford a clue, to discover this tribe's relationship with others; they are: *Otsôm*, or *Ossôm*, Sunday; *Tuvôm*, Monday; *Om*, Tuesday; *Pudiom* or *Puduvom*, Wednesday; *Ta-âm*, Thursday; *Pûlsh*, Friday (வெள்ளி); *Thunni* or *Etnat*, Saturday (சனி); *Emor*, a week (எட்டுநாள்).

The identity of *Puduvom* and புதன்கிழமை, (Buddhu's day), is remarkable, and seems to be a proof that they are a branch of the ancient Buddhists. This idea seems to receive support by the fact, that they call the week *etnor* (i. e. eight days), just as the Teutonic nations, which coincidence intimates very probably an identity of ancient tradition or opinion. *Puduvôm*, *Pûlsh* and *Thuni* are the only days the etymology of which agrees with the Tamul. They call also the star, *Venus*, *Pûlsh* or *Pûrsh*. *Om*, (Tuesday) being apparently the first day of their week, may likewise afford a clue to trace their origin, if any tribe in India, or elsewhere, should be ascertained to consider this day as the first of the week. This word is strikingly similar to the Hebrew word: *yôm*, a day. But this is the only word in their language which I have as yet observed to be similar to any of the Shemitic dialects. Their temples, (at least that of the five Cairn-hills near *Peycâri*), are called: *Gudimana*. Is this as much as *Gudi's* or *Gaudama's* (Buddhu's) court-yard, corrupted from, *Gudamamanei*?—since *manei* (மனை) means court-yard in Tamul and Canarese. The termination of the verb in *â* as in *bini*, *bimi*, before mentioned, as also the negative form of the verb, as; *kâneni* (காணேன்), *kâtteni* (காட்டுகேன்), *âreni* or *âriani*, (அறியேன்) reminds one of the Sanscrit forms of *dodami*, *dodasi*, &c. Their numerals also, and the manner in which they have altered and abbreviated the Tamul ones, may afford a clue, if any other Indian dialect exists in which they are similarly pronounced. They are: 1, odd; 2, *âtu*, (or *ait*); 3, *muthu*, *mud*; 4, *nalk* (Canarese) and *nank* (ancient Tamul); 5, *ûj*; 6, *ôr*, *ôd*; 7, *ôr*, *ud*; 8, *ôthhu*; 9, *unbôth*; 10, *pothhu*;

11, ponnod; 12, ponnät; 13, ponnudshu; 14, pānk; 15, poyj; 16, par;
 17, pōr; 18, pottsh (in Tamul characters, ᱵᱟᱨᱟᱝ); 19, pōnboth;
 20, övröth; 21, övröddhu; 30, muppoth; 40, narboth; 50, cūboth;
 60, arroth; 70, övvoth; 80, ötvöth; 90, önböth; 100, önböru;
 101, önnur odd, &c.*

The little I could as yet ascertain of their traditions is the following—How the earth came into existence, they confess themselves ignorant of. The first God, named öönu, came out of the earth like mist. His wife is called, *Pinnar'wush*. His son, *Tökershi*, is the governing god, before whom marriages and all other solemnities are performed; he is the same, they say, who is called, *Karin*, by the burghers, and in the Konkani language. (The similarity of the words öon and *avon* I think to be accidental, as I have found no other similarity between the dialects, or nations, of the Todavers and of the Greeks). One of the five kinds of Neelgherry-bees is called *pētēn* (*ten* means in their dialect both the honey and the bee); it once stung God, and therefore he decreed, that that kind of bees should never have much honey. Others relate that "god asked once the bee to show him, how it made honey; the bee refused compliance; and god tied it with a thread, and kept it prisoner for six days; the bee was obstinate, and god let it go again." When I could not suppress a smile at the narration, the Todaver who related it to me, added: "this is certain; I shall bring you a bee; you will see how narrow it is in the middle; that comes from the thread." I have not yet been able to understand sufficiently, what they relate about their own history; thus much I ascertained—They believe the first couple who resided on these hills was a man of the Iruler tribe and a Todaver woman; then came another couple, a Todaver and a Iruler woman, from the mountain *Cuppara* (which, they say, can be seen from Coimbatore towards the western sea); but returned again to *Cuppara*; and when the first couple sent them an invitation to return, they refused to come."—The Royal Asiatic Society of Great Britain and Ireland, in a series of questions circulated many years ago, state that a kingdom of Jews in the south of Arabia was destroyed by Mahomed, and that many fled to the Malabar coast; and the question is added—whether any trace of the remnants of that people could be found in the adjacent countries? The striking similarity of the features of the countenance of the Todavers with those of the Arabians or Jews, as well as their own tradition of their having come from the western region, deserve attention, but nothing can be decided without a much more intimate acquaintance with their dialect, manners and traditions, than we at present possess.

* I am preparing a Vocabulary of the Todaver dialect with the explanations both in Tamul and in English, to serve as a primer and elementary book for schools to be established amongst them, and which I intend putting to the Press.—Since the Tamul alphabet is not suited to express many Todaver words intelligibly, it is necessary to adopt for this purpose the Roman alphabet with diacritical marks, whereby this work will, at the same time, become more generally accessible to the literary public.



XIII.—EXTRACTS.

1.—*Sketch of the Geology of the Bombay Islands.*—By ROBERT D. THOMSON, M. D.

Although Bombay has been known to Europeans since the year 1509, when the Portuguese Viceroy Ameyda captured a vessel in what the historian of the time has termed "the River of Bombaim,"* no connected view of the geological nature of the islands and antiquities in its neighbourhood has hitherto appeared. It is with a view of contributing to supply this omission, that the facts contained in this paper, which were acquired by observation, in the course of a short residence in that presidency in 1832, were drawn up.

The mean of fifty-nine observations in May, June, and July, 1832, gave me $83^{\circ} 14'$ for the temperature of the harbour of Bombay. This includes twenty-seven observations made after the setting in of the monsoon, on the 14th June. But a period of thirty-two days, immediately previous to this date, affords $83^{\circ} 43'$ for the mean temperature of the hot season; and twenty-seven observations gave for the commencement of the rainy season a mean temperature of $82^{\circ} 85'$. The average temperature for 1803 was $81\frac{1}{2}^{\circ}$, and for 1804, $80\frac{1}{2}^{\circ}$; and the number of rainy days for these years 102.†

The quantity of rain which fell in June, July, August, and September 1817, was 104 inches.† On the 23d June 1817, no less than 9·3 inches of rain fell in one day. In fact, the inhabitants of temperate countries can form no idea of the quantity and force of the rain which falls between the tropics. The mean barometrical height for half of 1816 and 1817, was 29·986 inches.

The harbour of Bombay, situated on the Concan, or Pirate Coast of the western peninsula of Hindostan, is possessed, as its name implies, of peculiar excellence and capaciousness,§ and has, therefore, been considered of great value ever since it became part of the British possessions. It may be described as forming the southern portion of a rectangular bay or recess, which lies between Tull Point in N. lat. $18^{\circ} 47'$ and Basseen, in N. lat. $19^{\circ} 19'$, and between the parallels of E. long. $72^{\circ} 47'$ and $73^{\circ} 3'$, possessing, therefore, an extreme length of thirty-two miles, and an average breadth of sixteen miles. The island of Salsette occupies seventeen miles in the length of the northern part of the bay, acquiring a breadth of from fifteen to seventeen miles, while its circumference has been computed at seventy miles.

* Sousa's "Portuguese Asia," Tome, ii, p. 146.

† Ann. of Philosophy, xiii. 145.

‡ Ann. of Philosophy, xii, 212.

‡ From the Portuguese *Buon-Bahia*, good bay. The accompanying chart of the harbour and islands of Bombay. I have enlarged from that of Laurie and Whittle.

A considerable proportion of the remaining part of this bay is occupied by Bombay, Caranja, Elephanta, Butcher, Woody, and Cross Islands, which, being disposed in a crescentic manner, form the harbour of Bombay, an open and extensive basin eight miles in diameter, affording good anchoring ground and secure shelter for fleets of ships of the largest burthen. It is these insulated portions of land, that I have designated the Bombay Islands. The appearance presented by these islands is highly picturesque, as they are in many places adorned with thriving woods, which, between the tropics, always produce rich and refreshing scenery. But, in the Island of Bombay, the present trees appear of recent origin; for, we learn from older writers that the land was formerly swampy, and afforded no plants or trees worthy of mention. At present the higher parts of Salsette and Caranja are nearly destitute of trees, but they are for the most part thickly clothed with straggling jungle.

The general contour of these islands corresponds closely with that of the adjacent continent, and far as the latter has been investigated, the formation appears identical. The altitude attained by the rocky masses in these insulated lands is never great, although they are all considerably elevated above the level of the ocean. The dark hills of Salsette reach the greatest height, next to them in order come the rugged masses of Caranja and Elephanta, but Bombay and the remaining islands approach more nearly the character of plains.

Before taking a separate view of each of the more considerable of these islands, it seems satisfactory to present at one view a description of the rocky masses and minerals, which form their essential constituents, and here it may be premised, that the rocks belong all to that class which has been termed trappean, or, theoretically, volcanic, as distinguished from the granitic series, or plutonic rocks.

1. Basalt, occurring *in situ* at the ruins of a chapel in Salsette; colour, dark-gray, or blackish, with numerous crystals of olivine and augite interspersed; fracture, irregular, dull. The upper portion of the ridges in Salsette appears to consist of this rock, or modifications of it.

2. Black basalt, in Elephanta, often presenting a homogeneous aspect when fractured, but frequently containing minute portions of olivine, sometimes in rounded granules, at other times crystallized; texture highly indurated. This and the former variety, fuse before the blow pipe *per se* into a mass, resembling pitchstone. The celebrated figure of the elephant, close to the village of Gallipooti, consists of this rock but it appears to be of limited extent.

3. Amygdaloid, appearing at the great temple of Elephanta, possesses a hard wacké basis, containing cavities filled with rock crystal and zeolites, &c., some of which are often met with enclosed in the strong mass in the form of rounded nodules, whose crystalline structure is not

apparent until they are transversely fractured. The rock has a purplish aspect, and is evidently decaying in many situations, by the readiness with which the atmospheric influences act by the medium of the amygdaloidal cavities. Before the blowpipe *per se* this rock simulates fused basalt.

4. Yellowish gray claystone porphyry, at the lower cave of Elephanta. The predominating particles have a yellow resinous appearance, with a black basis.

5. Green claystone porphyry, appearing at Babaola Tank; fine-grained, and admitting of a good polish, interspersed with dark-coloured soft particles, which have an even fracture, and appear to be small masses of indurated clay.

6. Amygdaloid, with a light coloured porphyritic basis and green cavities, accompanied generally with large crystals of calcareous spar, from the neighbourhood of Parell. The calcareous spar is sometimes dark-coloured, probably from the effect of reflected light upon it in its impacted situation.

7. Numerous large fragments of shell conglomerates may be observed on the shore of Elephanta, consisting of a nucleus of porphyry, or amygdaloid, closely surrounded by adhering bivalves, which afford means of extending the limits of the growth of the mangrove.

The amygdaloidal cavities contain numerous species of various classes of minerals, but those which are of very common occurrence are included under these genera.

CLASS I.—ACIDS: GENUS, SILICA.

1. Rock crystal—termed *Palunca* in the Malabar language, *Spudika* in the Grantham dialect—occurs very abundantly in each of the islands, in the form of crystals, varying from the most minute size to half an inch in length.

2. Common quartz.

3. Milk and Rose quartz.

4. Chalcedony.

5. Amethyst.

6. Agate.

7. Carnelian, rare in the immediate neighbourhood of Bombay.

8. Oriental jasper, or blood-stone, also rare, but abundant in Guzarat and Cambay.

CLASS II.—ALKALIES:

I. GENUS LIME.

Calcareous spar.

II. GENUS ALUMINA.

I. Mesollite, whose composition is expressed by the formula $3 \text{ Al}_2\text{S} + (\frac{1}{2} \text{ C} + \frac{1}{2} \text{ N}) \text{ S}_3 + 24 \text{ Aq.}$ *

* The result of an analysis by me. *Jamerson's Journal*, 1831.

2. Henlandite, observed frequently in Caranja and Elephantia, appearing in the form of large white crystals.

Of this last genus the number of species in India will be found extremely numerous; indeed there can be little doubt that this country will afford an immense field of discovery for future mineralogical investigators, nor is the scantiness of our mineralogical knowledge of India so much to be wondered at, when we reflect that, as yet, scarce a single addition has been made to our lists from the British possessions in the East, where, of all portions of the globe, geological facts point out the certainty of the greatest mineralogical stores.

The agate occurs in the form of round nodules, as well as in flat waterworn cakes. The chalcedony forms a basis generally upon which the rock-crystal and amethyst are seated, and in one beautiful specimen procured in Caranja, fine crystals of henlandite are similarly placed. The mesolite occurs in large radiated crystals, and likewise in the state of a lump-sugar appearance, which, when fractured, exhibits minute, slender, silky-like crystals, disposed in a radiated form.

Carnelian may be procured in the bazars, brought from Cambay, where it seems to exist in considerable abundance. It appears that the specimens of this mineral which are worked into ornaments, are principally obtained from the neighbourhood of Broach, by sinking wells in the dry seasons in the channels of torrents, at the bottom of which they are found lying in the form of round nodules, intermixed with other rolled pebbles, probably forced by the impetuosity of the mountain streams from greater elevations, and generally weigh from a few ounces to two or three pounds.

Some of them are red, others pink, but the most delicate and beautiful is certainly the colourless or opaline variety. There can be little hesitation in affirming that similar sources of this mineral exist in the beds of the numerous streams which abound between Bombay and the Ghauts, and which add so materially to the grandeur of this romantic region.

A beautiful variety is brought to Bombay, containing elegant arborizations resembling the ramifications of inclosed mosses, a phenomenon which in many instances appears to be justly attributable to such a cause.

Bloodstone, or oriental jasper, as sold in the town by the Parsees, appears also to be imported from Guzarat, and the adjacent territories. It is characterized by presenting a greenish appearance, with numer-

* The remark of Pliny, "Infestantur plurimis vitis—nullis capitamentum rimum simile," with regard to rock-crystal, refers to the presence of Titanite. *Hist. Nat. Lib. xxvii. c. 3.*

The same naturalist observes of rock-crystal, "Optima et hanc mittit, sed Indica nulla profertur." *Hist. Nat. xxxvii. 2.* Which is ignorantly denied by Garsin, ab. Otto, who was for several years Viceroy of India. He says "Nulla autem exprobrata loco crystallus invenitur quoadmodum nec per Indiam." *Ann. drom. de Sieppis Lib. 1. c. 21, p. 171.*

ous blood-red streaks or veins traversing it in various directions. It is to the latter species, or to the mock pearls so frequently employed as ornaments by the inferior castes, that we are to refer the expression of the historian of Alexander: "lapilli ex auribus pendunt."† But with regard to the "Gemmas margaritasque mare litoribus infundit," it is not easy to give a satisfactory explanation, although the latter obviously relate to the pearls of the Indian seas.

We proceed now to a separate sketch of the islands, in the order of their importance.

BOMBAY ISLAND.

The whole island may be considered as a plain, variegated on the east with considerable undulations, which form the small eminences termed Mazagon, Parell, and Oblong Hills. The southern part divides into two necks of land, of which the eastern portion, a low and flat surface, affords the site for the Fort and Dungere, or the Black Town, and leaving an intermediate space called the Esplanade, terminates at Mendam's Point, the commencement of the Colaba Causeway. The western promontory is considerably elevated, consisting principally of Malabar Hill, which lies near the entry of the harbour, and terminates at Malabar Point. Included between these points, with a crescentic outline, as between the prongs of a fork lies Back Bay, a considerable portion of water, with a sea communication, occupying a span of 2½ miles, the total mean breadth and length being about 1½ and 1½ miles respectively. The water is shoal, having a depth of 2½ fathoms in the centre, and contains several sands, sunken rocks, and others exposed at low water.

The essential composition of this tract is claystone-porphry and amygdaloid, and in some places, as on Malabar Hill, basalt shews itself, each corresponding with the varieties described, but seeming to vary with regard to the proportion of the basis and the magnitude of the cavities, and consequent quantity of the mineral contents. From Mendam's Point, a ledge of amygdaloid runs out south-west by south, to form a junction with Colaba or Old Woman's Island, a flat and rocky mass, thinly covered with soil, which barely conceals the subjacent rocks, bearing every mark of having been at some period a continuous portion of that promontory of the island of Bombay upon which the town is situated. Advantage has been taken of this ledge to form a connecting causeway between the two islands, which is left quite dry at low water, so that a free land communication may be kept up in such circumstances. The prevailing rocks in this little insulated land are the same as those already mentioned, with the occasional appearance of basalt as if in dykes. At the southern point a dangerous rocky mass extends out to sea.

nearly three miles in length, assisting, with the aid of Tull Reef, in rendering the mouth of the harbour extremely narrow, for, if we deduct these obstructions to navigation, its span is not above four miles, although the distance from Coulaba to the nearest point of the continent equals seven miles.

The Coulaba Reef has been termed, from its forked figure, the Prongs, and appears to consist of the general rock, in a highly indurated form. The same series occurs at the New Bunder, by the Apollo Gate, where the amygdaloid appears to lie over the porphyry, which is very hard when first exposed, and is employed as a building material. The New Bunder is formed of it; but notwithstanding the excellent quality of the stone for enduring the effects of aqueous friction, it is remarkable that an effectual plan has not been fallen upon to render the building of the jetty durable, as it is continually undergoing displacement from the action of the tide. The utility of the Bunder cannot be disputed for the numerous ships which annually increase in frequenting this excellent port, and the situation of this quay, from its being exterior to the fort, is very important, and is perhaps safer than the old Bunder during the height of the moonsoon.

To the north of the town the surface begins to rise gradually until the small eminence of Mazagon is formed. Beyond it are Parall and Oblong Hills, all preserving a rounded outline, thinly sprinkled with cocoa-nut trees (*Cocos nucifera*), and affording some pasture land. At Baboola, a tank has been cut out of the solid rock, supplied with a road flight of steps, to enable the inhabitants to have free access to the water, which they employ for all purposes. It is from similar reservoirs that the principal supplies of water for domestic purposes are obtained, and for the use of the crews of ships visiting the harbour.

As much discussion has taken place with regard to the influence which water procured from such sources may have upon the health of seamen, by affecting the alimentary canal, and, as the solution of the difficulties of the inquiry are very closely connected with the geological nature of the country, a few words upon the subject may not be out of place here. The whole of the soil which covers the island being extremely thin, it is obvious that the bottoms of the tanks, which are several feet below the level of the surrounding surface, must consist of solid rocks, and the margins being fortified with artificial building, we see that the water can have little opportunity of acting upon the soft soil, so as to produce a mixture of the earthy particles, and hence, that the substances of a saline nature in solution must derive their origin from the disintegrated rocky mass. A muddiness, however, generally exists in these waters, which appears to be produced by the agitation excited by the natives entering for the purpose of carrying off the water, and for bathing; but the proportion of mechanical mixture thus occasioned does not necessarily exist in general to any greatly appreciable amount, because, when the cause of excitement is removed,

the commingled matter speedily subsides. The temperature is always equal or above that of the atmosphere, and in the dry season may be rated at from 80° to 86°. It affords the following results with re-agents:—

1. A solution of acetate of lead produces a copious white flocky precipitate.
2. A slight precipitation with oxalate of ammonia.
3. A muddiness with muriate of barytes.
4. A milkiness with lime water.
5. A precipitate with nitrate of silver.

From these facts we may deduce that the water contains in solution (1.) a quantity of vegetable or animal matter. Judging by the eye of the relative proportions of the precipitate by acetate of lead in the Thames and Bombay water, we should be inclined to refer the maximum to the former, and no one will affirm that the water procured from the Thames is pernicious to health.

- (2.) Small quantities of
 - Chloride of sodium
 - Sulphate of lime
 - Carbonate of lime.

The animal and vegetable matters are derived, there can be little hesitation in concluding, from substances which readily gain admittance in consequence of the exposure of the tanks, and the presence of the saline matter must be attributed to the same sources as in other similar situations, their small proportions being explained by the want of free communication between the water and the soluble portion of the earth.

The rock of Baboola is close grained, and is extremely hard, approaching in some measure to a green stone, as it appears sometimes in Scotland, with the aspect of an aqueous deposit. It affords an excellent material for mending the roads, which for their smoothness cannot be surpassed. This rock appears limited in its range; for at Parrell, amygdaloid occurs with very large cavities, filled with the usual mineral. The northern portion of the island is similarly constituted, presenting nearly a level surface, thickly clothed with a great variety of trees and shrubs,* which afford a grateful shade from the over-

* Among the trees of the island, the *Ficus religiosa* and *Indica* are the most stately, which appear to have attracted the attention of Europeans, as early as the time of Alexander the Great, if we may judge from the admirable description of Quintus Curtius, "Pierique rami instar ingentium stipitum flexi in humum parvas, quae se curvaverant, erigebantur, adeo ut species esset non rami resurgentis, sed arboris ex sua radice generatae."—*Q. Curt. Ruf. lib. ix. c. 1.*

"Branching so broad and long, that in the ground
The bended twigs take root, and daughters grow
About the mother tree."—MILTON.

The variety of trees and shrubs is great, but perhaps, the finest ornaments are, *Morinda citrifolia*, *Capparis acuminata*, *Artocarpus integrifolia*, *Terminalia alata*, *Cecropia floribunda*, *Micheia champaca*, *Mimusops elengi*, *Grewia microcarpa*, and *Crotonalis*, *Annona reticulata* and *quamosa*, and *Tamarindus Indica*, which if any members of the vegetable kingdom can be considered as indigenous in this island, must hold the highest rank.

powering influence of the solar rays, "*vini solis umbræ levant.*" The coast is low and rocky with the water gradually shoaling to the land, which at ebb tide leaves a dry and pleasant beach. The amygdaloid shews itself frequently in the form of half sunk rocks and dangerous ledges, especially along the Colaba shores, but suffering in the lapse of time from the action of the sea, and occurring remarkably in conjunction with the clay-stone porphyry, the latter often rising up between two rounded masses of the former, sometimes placed above it, at other times under it, both being traversed frequently with basaltic dykes. All these rocks at the shore may be observed "covered with shells, and their surface with a decomposed powdery matter, which on inspection turns out to be the basis of the rock crumbling into dust. At the distance of two miles from the town, many of the shells which abound so profusely on the sea-shore are calcined, by which process, they are converted into caustic lime, which the natives term *chunam*, a substance in great request, both as a mortar, and as an edible rolled up in the *betei leaf*. The latter habit, which has been denominated by some writers a luxury, ought rather to be termed a necessary practice, as we find it prevailing wherever the sole articles of diet are procured from the vegetable kingdom, the different substances employed fulfilling the same end, whether it be on the coral rocks of the Pacific, the arid deserts of Africa, or the interminable forests of America.

SALSETTE ISLAND.

The description of the geological structure of one of these islands, may be said to include almost the particulars of the whole, but for the sake of greater perspicuity, we have ventured to consider them separately. The essential composition of Salsette, is clay-stone porphyry and amygdaloid, corresponding with those rocks in Bombay, but basalt occurs in very considerable tracts, and assumes more decided forms. The island is very irregular in its surface, consisting of ridges and intervening valleys, which in combination afford agreeable scenery.

The basalt forms two ridges which run parallel to each other, the one on the west and the other on the east of the narrow strait which separates the island from the continent, appearing above the amygdaloid which forms the base of the hills; and therefore, leading us to conclude, that its ejection has been subsequent to that of the amygdaloid.

The alteration which the eruption of the basalt has produced on the masses through which it has been forced, by rendering the two rocks at the point of contact similar, and as if passing into each other by a gradual transition, are sufficiently obvious, but at the same time, the two varieties are as distinct as any of the projected scuffs in general appear, so that in a theoretical nomenclature (the establishment of which, it

must be admitted, is not for the advantage of science), not only the varieties of the trap formation should be discriminated, but the whole group should have an appellation, indicative of its production at a distinct period, and under different circumstances, from modern volcanoes. The term subaqueous volcanic rocks, expresses the hypothetical nature of their ejection.

In the centre of the island are situated the celebrated temples of Salsette, or rather their remains, since they have received great mutilation, not from the influence of natural causes, which from the hardness of the rock of which they are formed, they are calculated in a great measure to withstand, unlike the polished remnants of Greece and Rome, which are daily dissolving in the very rains which nourish the earth,* but from the hands of barbarous men.

It is not our purpose to describe them; it is sufficient to refer to accurate details respecting their appearance and size, which have afforded subject of admiration to numerous ages.† They are literally caves in hills, composed of porphyry and amygdaloid, thus differing from the pagodas on the coast of Malabar which consist of black basalt.‡

The Portuguese, who were the first European settlers in this country, justly merit the high degree of reprobation, which has been attached to their conduct, in the destruction of these extraordinary antiquities, for they must have been infatuated with the most determined intention of mutilation. The date of this dilapidation may be reckoned about the year 1564, as we learn from the historian of that period; that D. Antony de Noronha, the 9th Viceroy, and 23rd Portuguese governor of India, who succeeded John de Mendoça in 1564, and held the office till 1567, finding the people incorrigible, notwithstanding the exertions of the religious of the society of Jesus, who had laboured indefatigably for the conversion of infidels, and had sent some of their number into the island of "Salsette," which contained 66 villages of pagans; destroyed all their pagodas to the number of 200.§ The soil in this neighbourhood is highly improvable, if we may judge from the flourishing appearance of the gardens at Powey, and the quantity of produce raised. In the low valley which runs towards the centre

* Davy's *Consolations in Travel*, Dialogue vi. p. 266.

† Gemelli Careri, vol. iii. p. 36. Asiatic Society Trans. vol. iv. Sousa notices a tradition that a subterraneous passage exists between "Canari," and Cambaya, running under the sea, which was the work of Bimilamansa, who was king of all that country in the third century. Others attribute the work to the holy prince Josaphat. F. Antony de Porto, a Franciscan, is said to have travelled for seven days in this passage, without arriving at its termination. Sousa's Asia, tom. ii. 258, 265.

‡ Sonnerat *Voyage aux Indes*, tom. ii. c. 4.

§ Portuguese Asia, by Manuel de Faria y Sousa, translated from the Spanish by Capt. John Stevens. Lond. 1693, 3 tomes 8vo., tome iii. p. 14, tome ii. p. 253. The original title of the work is Asia Portuguesa, 3 tom. fol. Lisboa, 1666-73.

of the island, the surface is completely covered with a coating of salt, left by the evaporation of the sea-water, which periodically inundates the low ground. This salt in its impure state is employed as a condiment by most of the natives and naturalized inhabitants of the neighbourhood. Without drawing any very general or sweeping conclusions, from the fact of the existence of a recent salt deposit in this situation, we cannot fail to remark, that an extensive formation is actually in the course of being produced, for the product of the disintegrated rocks, will obviously be spread successively over each saline residuum, and as each new bed is laid, the substrata will acquire additional firmness and solidity, combined with the agency of the high mean temperature, which the most trivial observer will detect as a powerful agent in tropical countries, in binding together the most arid particles.*

This valley is formed by a break in the continuity of the basaltic ridge, the southern portion of which terminates here, but resumes its altitude and course near Tanna. The vale is overlooked by the hill which forms the extremity of the ridge. The ruin of a Portuguese chapel crowns its summit, consisting of the basalt, (a gray rock with augite crystals interspersed, which forms its foundation, No. 1). At the base of the ridge near the shore is a similar ruin, built of porphyry, and at each of them there is a corresponding inscription on sand-stone tablets, which must evidently have been procured from a great distance. † The words of the inscription are contracted, and are in the Portuguese language. They relate to some individual of the name of Aquias, probably a priest, as the word *sevesedros* occurs; and the dates of the 2d of April 1620, and 28th November 1630 appear.

Near it is situated a Mahometan garden, neatly laid out in the English style, with grass walks, flower and vegetable borders; and a variety of fruit trees.

The ascent to the summit of the hill is rendered difficult, by the abruptness of the declivity and the loose fragments containing muscolite, chalcedony and quartz nodules, which readily yield to pressure, and roll to the base of the hill. The degradation of rocks cannot better be observed than in this neighbourhood, where we see them comminuting, rolling to the base and assisting in elevating the level of the valleys, and diminishing the relative height of the hills, of which a similarly striking illustration is afforded at the north-west side of the Pyrenees. ‡ The product of this disintegration is well expressed by the German epithet, *geschiebe*, the *ratchull* of the miners, and must necessarily constitute the most recent formation wherever it occurs.

* Some distinguished geologists have attributed the colour of the red sand-stone to the ferruginous parts of the porphyry, from whose disintegration, they consider this formation to be derived. Humboldt *Essai géognostique sur le Gisement des roches*, 2nd Edit. Paris, 1825, p. 293.

† Munk's *Travels in Portugal*, 8vo, 1801, p. 64.

From the summit of the hill the prospect is very fine, the east view being bounded by those extraordinary trap mountains whose configuration is so well expressed by their names, Funnel Hill, and the Queen of Mahratta's Castle, with the connecting ridge of the ghauts. While, to the south, the harbour and islands of Bombay appear as if at the feet, and to the north, the dull high land terminates the prospect, the foreground being enlivened by the rich foliage of the tamarind (*Tamarindus Indica*) and lofty palmyra, (*Borassus flabelliformis*) and the more humble, though not less elegant jungle, consisting of the *Ixora* (*Ixora coccinea*), *Euphorbia* (*E. nerifolia*), and *Lawsonia* (*L. inermis*).

On the north-eastern side of the strait which separates Salsette from the continent, a low basaltic ridge extends for four or five miles parallel with the ridge of Salsette, and with the ghauts, presenting, wherever the rock is uncovered, a columnar structure, and in three places, clusters of columns rise up, some of which are fifty feet high and twenty inches in diameter, the shafts being variously four or seven sided.*

ELEPHANTA ISLAND.

The form which this island presents at a distance is somewhat pyramidal, but on a nearer approach it is found to consist of two distinct hills, with an intervening valley. This vale is profusely studded with trees and bushes, as well as the hills, which are clothed with wood from the water's edge to the summits. Many of the trees are tall and stately, as the brab or palmyra, while others are covered with the densest foliage, as the tamarind, with its rich green leaves and elegant blossoms. In the dry season the island exhibits the best appearance from the summits of the hills, or by approaching it from the sea, for at that time the earth is dry, parched, and as if baked, being crossed in every direction with fissures, which greedily suck up the rain whenever it happens to fall, and, of course, is destitute of that rich vegetable carpet which covers it during the prevalence of the monsoon. Then the soil is one mass of verdure; not a spot is naked; the paddy ground being enlivened with the presence of the rice crop, and the forest waste adorned with grasses and elegant flowers. The rice ground is very limited, and is situated at the lower part of the vale, in the immediate vicinity of the village of Gallipooti. It is divided into parterres, or small inclosures, fenced with impervious hedges of pricklypear (*Euphorbia nerifolia* and *terucalli*). The whole island is one mass of rock, and the thin scattering of soil which hides but scantily the main constituent of the island, is merely derived from

* *Ann. of Philosophy*, vii. 309.

the disintegration of the latter. At the southern landing place there is a ledge of large masses of amygdaloid (of which the cavities have been washed empty, if we except a few nodules of quartz), over which the surf beats high and renders landing dangerous, although it forms one of the few situations in these islands, where boats can reach the shore without grounding.

Near this landing place is a Portuguese ruin, situated on a knoll, and adjoining it, we discover the extraordinary artificial figure from which the island derives its European name, for its Hindoostani name is Gallipooti. The animal represented by this sculpture is evidently an elephant, fully equal to the natural size, and, upon the whole, well executed. The trunk and head have been separated from the body, and lie fractured and prostrate on the ground. Considerable damage has been done to other parts of the figure, for the instrument of which we must have recourse to the tradition current in that neighbourhood, which states that the Portuguese went so deliberately to work as to employ cannon in effecting their barbarous work of destruction, from the idea, as we have shewn, of extirpating superstition! The rock of which the figure consists is a very hard basalt, containing a few minute cavities, scantily supplied with mineral crystals, and is of the same nature as the rock of the adjoining hillock. From this spot the ascent of the western hill is pretty easy, the pathway leading along the bed of what constitutes a torrent during the wet season, formed in the porphyry and amygdaloid, and runs to a considerable depth; a kind of natural walls rising up on each side, which are overshadowed by carissa bushes (*Carissa carandas*), *agnus castus** (*Vitex trifolia*), the garruga tree (*Garruga pinnata*), with its abundant fruit hanging in clusters, like the produce of the vine, and castor oil tree (*Ricinus communis*), while the soil is ornamented with the solanum (*Solanum jacquini*), and the Mexican Argemone† (*Argemone Mexicana*). About half way up the hill, the smaller temple or caves are reached. They are three in number, having the face of the rock polished perpendicularly, and some pillars formed on its surface, with several figures represented flying in the clouds. The inferior part of the rock consists of a variegated porphyry, sometimes reddish, and frequently of a yellow tint, the

* The leaves of this shrub are employed by the Hindoo women in some religious ceremony, as I found a quantity deposited on the convex sume in the lateral square compartment of the great temple.

† The occurrence of this plant, (a native of the New World), wherever the Portuguese have formed settlements, is a striking instance of the agency of man in the distribution of vegetable species. In addition to the habitat here given, I have observed it at Malabar Point in Bombay Island; on the Island of Coulaba; and at the south end of the town of Macao, in China, in all of which localities it is an abundant plant, affording a parallel case with that of the *Chenopodium ambrosioides*, (cited by Lyell, vol. ii. p. 52.) which we observe so abundantly in the Island of St. Helena.

basis consisting of clay, and the inclosed particles of altered quartzose grains, &c.

Remains of painting are still observable, which seems to have originally been of a red colour, but has in some places faded to a purple hue. The upper part of the rock, commencing at the roof of the apartments, is composed of amygdaloid, having a wacké basis, and containing cavities filled with rock-crystal, calcareous spar, zeolites, and many other minerals which a careful examination would readily detect. During the rains these caves are filled with water. The whole face of the hill above these caves is craggy, consisting of amygdaloid, porphyry occasionally appearing, and is covered with thick jungle, and climbers ascending the stems of the numerous trees. Among the former we chiefly remark the *Dalbergia scandens*, and among the latter, the *Geetonia floribunda*, with its bunches of flowers.

The path, continuing to wind up the declivity, conducts, after passing a fine specimen of the tamarind tree, and of the *Asclepias gigantea*, to the great temple which faces the north. Like the lower antiquities, it is an excavation in the solid rock, with, however, a much greater extension of human art, for the space included within the walls of the large apartment is a square of 43 yards*, and 18 feet in height, supported by three rows of pillars, consisting of rounded fluted capitals and square shafts. The walls are covered with gigantic figures, all of which have been mutilated, with the exception of the colossal representation of the *Trimurti* fronting the entrance, and one entire masculine form in the recess to the right. The rock is amygdaloid occasionally assuming a purely porphyritic appearance. The effects of the atmosphere upon the more exposed portions of the rock are obvious, for it is evidently decaying and crumbling to powder, and, combined with the ravages produced by visitors, would, in the lapse of time, prevent the probability of any remnant continuing, had not the foresight of the honourable governors of the country obviated the latter cause in some measure, by stationing a resident sergeant to guard these interesting relics. The rock, when first exposed, is highly indurated, and difficult either to fracture or polish, both of which circumstances add greatly to the wonder and admiration with which we must view the temple and sculptures.

In geological investigations, not the least interesting inquiry consists in observations with regard to the degradation of the rocky masses, and the formation of the soils for the growth of the members of the vegetable kingdom. Such questions, it is obvious, can be most satisfactorily solved on insulated lands, where no agencies save the pure natural causes can come into operation. Coral islands, which are of such

* This number is derived from the resident sergeant. I made it forty-six paces.

recent formation, present the most simple illustration upon this point, where we find the calcareous masses splitting under the action of the sun's rays, crumbling and affording a scanty soil for foreign seeds floated by currents to take root, and thus to extend the formation of the soil, by the loosening power of their roots and the fall of their leaves.*

The heat of the sun alone may be considered, therefore, a powerful auxiliary in the production of soils, and this influence is especially applicable to the Indian climate, where the dark hue of the rocks greatly favours the imbibition of heat; an observation similar to that which was made by Link, with regard to the black slates of Pezo,† and subsequently by Humboldt, was demonstrated in reference to the black bare rocks on the banks of the Oroonoko, whose temperatures were found to be elevated during the day 34° F., and during the night 18° above that of the atmosphere‡. In India, at the termination of the rains in September, the porous stony masses must of course be saturated with moisture, and when the rays of the sun excite their influence, and are imbibed, the water must necessarily be vaporized, and disintegration of the rocky masses ensue. This effect of vapour must be considered as a powerful agent, although not so explosively effective as the freezing of water:

—“cum tristis hyems etiamnum frigore saxa
Rumpet.”‡

Because, in one case the confined body has some means of egress, though far from free, while, in the other, the barriers must yield on every side to the overwhelming mass within. When the soil is carefully examined, all the appearances confirm the idea of its derivation from the rocky mass. It has a black colour, which it may in some measure derive from particles of oxide of iron, which are occasionally observable in the porphyry where it has begun to decompose, and from the vegetable matter derived from the trees. No considerable portions of iron have been detected in this neighbourhood, although the oxide of that metal is found in considerable abundance among the ghauts, and is smelted with some profit at the Mahabuleshwar hills§. In consequence of the mixture of vegetable matter with this light rocky production, the soil has been rendered fit for raising some scanty crops, which serve to

* Dr. R. Forster has well described the structure and mode of formation of coral islands, in Cook's Voyage, of whose accuracy the present writer had ample proofs, while examining similar deposits on the coast of Sumatra. A fuller, but not more distinct, account of coral islands is detailed in Beechy's Voyage.

† Link's Travels in Portugal, 8vo. 1801. p. 64.

‡ Humboldt's Pers. Nar. vol. v. pt. i. 26.

§ Virg. G. iv. 135.

|| “Account of the convalescent station of Malcolm Pait on the Mahabuleshwar hills,” Bombay, 1830, pamphlet. The chemical nature of the ore is not stated in this publication, but it is probably the magnetic iron ore.

support the inhabitants of the island, who amount to about a hundred. It is a curious fact in the history of this island, that no water can be obtained by sinking wells near the beach, and that the sole supply of the inhabitants is procured at the summit of the hill, where a cool spring exists in a dark cave near the great temple, affording a plentiful supply, from which it is conveyed by the Hindoos to their habitations in porous earthen vessels.

CARANJA ISLAND.

This is a large island, situated the most southerly of any in the harbour. It consists of two hills, with an intervening valley. The best landing place is situated on the north-east side of the island, at a fishing village, where, however, the water is very shallow, and where it is necessary, in order to effect a landing, to employ a native canoe. The shore here is bounded by rocks, as at Elephanta, of the amygdaloid species. The shingle consists of bivalve shells (*Arca granosa*) and waterworn porphyritic gravel. The ascent of the lesser Caranja hill is gradual and easy from the village to the summit of the ridge. The rocks have an inclination to the east and west, as if shelving down on each side of the ridge, presenting the appearance of stratification, or successive deposition, and are covered with low jungle of carissa, ixora, euphorbia, and lawsonia. The descent on the west leads to paddy ground, where there is another village, surrounded with neat gardens, and supplied with a tank, fifteen or twenty feet in depth, dug out of the solid rock, with a wheel and earthen pots to raise the water, as is usual in the east. In this valley there is a fine specimen of the *Adansonia digitata*, sporting a colossal trunk, and spreading out its branches to overshadow the circumjacent cultivated ground.* To reach the top of the ridge it is necessary to cross several mountain streams, whose beds are dry except during the rainy season. The rocks are all amygdaloid, on the western as on the eastern declivity, filled with zeolites, &c. and are well exposed in the streamlets, sometimes rising in the form of round masses, at other times shelving out and affording a level run for the water, and then terminating in a small perpendicular fall at the edge of the rock.

On the eastern side, in this manner, a very picturesque waterfall is formed, the height of the vertical face of the rock being at least twenty feet, over which the whole water of the torrent is precipitated in one sheet, presenting altogether, with the rich foliage of the tamarind in the foreground, a pretty scene. Near this a specimen of mesolite was

* In this valley I found a specimen of the *Agaricus campestris*, the identical English Ketchup mushroom, of the existence of which plant, in this part of India, at such a slight elevation above the sea, I have never previously heard.

obtained, among innumerable minerals, which may be observed scattered about on the surface of the island, very frequently covered with a blue coating, produced by the presence of iron. Besides mesolite I observed chalcedony, agates, rock-crystal, calcareous spar, and leucandrite.

The south-east point of the small hill consists of craggy rocks of porphyry, affording, in their numerous recesses, abundance of hiding places for lizards and serpents, especially the cobra de capello, which is extremely frequent in these islands. The cliffs also afford good habitats for the fern *Gymnogramma chylomelanos*, and the *Asparagus sarmentosus*.

The large Caranja hill is similar in its conformation to the smaller hill, and is crowned by the ruins of an old fort, which was a place of considerable note, when Europeans first settled on this coast.

At low water the island is connected with the continent, the intervening valley being quite green, and studded with a few pools of water. The vale which separates the two hills, and divides the island into two parts, is covered with palm trees, amid which are situated cottages and rich gardens, at a small elevation above the level of the sea.

GENERAL OBSERVATIONS.

In the course of the preceding remarks it appears that, on the continent and along the coasts of the different islands, the soundings do not deepen suddenly, but that the water at the shore is shallow, and that it gradually increases in depth in proportion as we recede from the land. The same remark applies to the whole coast, from the Persian Gulf to Cape Comorin, and it is on a careful attention to the depth of water and the nature of the bottom, that navigators in stormy weather must depend. In the latitude of Bombay this remarkable submarine portion of land which can thus be reached with the lead, attains an additional degree of breadth, jutting out to a greater extent into the Arabian sea, and, from its occupying such a considerable space, and affording good fishing ground, although it can only be considered as an expansion of the shoal water along the coast, it has been termed the Bank of Soundings. The deposit generally obtained in the bottom of the harbour, and on this bank near the coast, consists of a blue clay of a stiff nature, and is, therefore, serviceable by affording good holding ground for anchors. A section, representing the relative situations of the sea and the Bank of Soundings, will explain the subject more clearly than can be expressed by detailed descriptions. The horizontal line (See plate 18), represents the sea level, and the inclined one the bottom of the ocean, which is here shewn to be a gradual descent from the summit of the high land. By sounding regularly, we dis-

cover our distance from the coast, as appears from the following table:—

10 miles from the coast	the soundings are 14 fathoms; bottom, mud.
40 do.	40 fms., sand, gravel, and shells of various colours.
50 do.	45 do. do.
160 do.	50 do. do.
170 do.	55 do. do.

We observe, therefore, that soundings extend as far to the westward of Bombay as 2° 50', and that, until the bottom of the ocean begins to ascend, in order to come to the day; the bed consists of sand, mixed with shells, and that then it is formed of mud. An observation with respect to the nature of the shells would be of considerable importance, because it might enable us to decide, whether they are natives of deep water, or belong to the shallower parts of the ocean.

Two explanations occur, to account for the appearances here described: either, 1st. That the land and ocean have retained their positions relative to each other since the formation of the first, the production of the bank being similar to the clay deposit round the shore of the island which so lately appeared, and sunk in the Mediterranean; or 2d., That the harbour of Bombay was formerly a valley, and that the Bank of Soundings was at one time dry ground, both of which have been submersed by the gradual encroachment of the sea. The most undoubted evidence exists to show us that this coast has been, even within the range of a few centuries, subjected to violent convulsions from earthquakes.

In May 1618; six years after the settlement of the English at Surat, "a general and diabolical storm" occurred in the neighbourhood of Bombay (*Bombaim* as it is termed by old writers). It began at Baçaim (Basseen), on the 15th of that month, and continued with such violence that the people hid themselves in cellars, in continual dread lest their dwellings should be levelled with the earth; and at 2 A. M. an earthquake destroyed many houses. The sea, according to the historian of the time, was brought into the city by the wind; the waves roared fearfully; the tops of the churches were blown off, and immense stones were impelled to vast distances; two thousand persons were killed; the fish died in the ponds; and most of the churches, as the tempest advanced, were utterly destroyed. Many vessels were lost in the port. At Bombay, sixty sail of vessels, with their cargoes and some of their crews, foundered.

At Agaçaim, a boat was blown by the force of the wind from the sea into a house, where it killed a woman and her child, and the trees were torn up by their roots.

Besides the presence of a violent commotion in the atmosphere, and the powerful concussion of the earth, volcanic action seems to have occurred, if we may be allowed to deduce such an inference, from the highly embellished representations of the historian, of giants seen in the air throwing great globes of fire at each other, confusions of human voices in the atmosphere, trappings of horses, and the sound of warlike instruments. It is added that much of this nature occurred in "Salsette" and other places.*

The metaphorical figures expressed in the latter part of the description, are strikingly similar to those employed by Dion Cassius† in his account of the eruption which destroyed Herculaneum and Pompeii, where we are told that giants were seen, and the sounds of trumpets were heard in the vicinity.

Frequent mention of earthquakes may be found in the history of the Malabar coast (which extends from Cananore to Cochin, about 42 leagues), where they go under the denomination of *Bhumiculatam*. In 1784, a strong concussion was felt, and in the province of Nagarcotta, as well as on the bank of the river Sarayuva, volcanic appearances are evident. But the most remarkable changes are to be found in the vicinity of Cochin. On its north side we find the Island Vaypi, which was thrown up by the sea about the year 1341. The soil upon this new formation resembles that of the flat districts of Malabar, which consists of sea sand and calcareous matter, combined with clay said to be washed down from the ghauts. The production of Vaypi gave rise to a new era, termed *Pudurepa* (new introduction). In the same neighbourhood, Bartolomeo informs us, that he was witness to the formation of an island, a mile in length, in the course of ten years before the church at Celtiyatti, by the opposite effects of river and sea water, which may be explained in the following manner: During the months of August and September, if the rains have been abundant, the waters of the river clear away from its mouth, those sandbanks which have been formed during the height of the monsoon, in June and July, by the high sea which then rages in a boisterous manner; but if the rains have been scanty, and the force of the river is not sufficient to carry away the obstruction of its junction with the waters of the ocean, an inundation of the adjacent country ensues; the inhabitants are driven from their dwellings, and so frequent is this occurrence, that we are told grandchildren can scarcely point out, with any certainty, the spot where their grandfathers resided, in consequence of the change in its appearance.

* Sousa's "Portuguese Asia," tom. I. l. 1.

† Hist. Rom. lib. 66.

Contemporaneous with the appearance of the Island of Vaypi, the waters which during the rainy season are discharged from the ghauts, broke through the banks of the river Cocei, and overwhelmed a village of the same name with such impetuosity as to sweep it away, and formed in that district a river, a lake, and a harbour so spacious, that very large ships can now lie in security on the north-east side of Cochin, where the river runs into the sea.*

According to the Hindoo records, the ocean has made great inroads upon the opposite shore of India; for, it appears, from the researches, of D. Daante de Meneses, Portuguese governor of India in 1522, among the native writings, that "Miliapore," seven leagues from "Paleacate," the ruins of which were then on the sea shore, was surrounded, according to tradition, 1500 years previous to that date, by 3,300 stately churches, and that the site of that most ancient city was distant twelve leagues from the sea. We are also informed that "St. Thomas dragged out of the sea an immense mass of timber, which all the force of elephants and art of men could not move."†

In the figure which we have given, it is evident that the inclined plain at the land has been comparatively but recently submersed, while the horizontal bed has been for a longer period subjected to the action of the sea, as is evinced by the layer of sand and shells. The whole of this horizontal portion, likewise, we may decidedly conclude, was inundated at the same period, for, after the sea had been raised to the level of forty-five fathoms from the present surface of the ocean, we can see no impediment to its laying the whole plain, extending for at least a hundred miles of longitude, completely under water.

The Hindoos, on the Malabar coast, have a tradition that the sea extended to the foot of the ghauts. There does not appear, however, evidence tending in any degree to prove that such an occurrence has been of recent date; but we are rather disposed to consider the native account, as an indistinct remnant of the almost universal tradition of a deluge during the human era.

The agencies of torrents appear of too trivial a nature, to afford a sufficient source of such an extensive submarine formation, as that which we observe along the Concan and Malabar coasts, although there can be no hesitation in admitting that where considerable rivers do exist, the debris collected by the force of their currents must prove a serious obstacle to the encroachments of the ocean. But at Bombay where the bank is much broader than in other parts of the coast, no remarkable accumulations occur at the mouths of the rivers Panwell and Pen,

* Viaggio alle Indie Orientali da F. P. de S. Bartolomeo, Roma, 1796, 8vo, English translation from the German of Dr. R. Forster, 8vo, 1800.

† Sousa's "Portuguese Asia," tom. i. 270.

whose size, indeed, is sufficient to render such an occurrence extremely improbable, even if actual examination did not demonstrate the fact to be as we have stated; and the extensive portion of land in Salsette, which is dry at low water, is situated beyond the influence of any current save that of the tide, which it must be admitted, however, is extremely powerful.

There seems no reason, then, for supposing that this bank has been formed by matter forced down by the agency of running water from the ghats, as some have concluded, because, it exists where there are no rivers to produce accumulations, and it is broadest at the mouths of the smallest rivers.

In bringing forward proofs of extensive changes and violent convulsions, we have endeavoured to exclude theoretical considerations, and probability is only implied when we observe that the different islands in the bay may have been the continuation of the high land in Salsette and Tull, whose communications have been submersed, and whose basis are now washed by the overwhelming waters of the ocean. *Records of General Science.* April and May 1835.

2.—Catalogue of Plants collected at Bombay.—By JOHN GRAHAM, Esq.

We believe this to be the first attempt at communicating any information with regard to the botanical productions of this beautiful part of the western peninsula of Hindostan. The catalogue constitutes the gleanings of a few occasional minutes snatched by our excellent friend (with whom we have spent many a pleasant hour in botanizing amid the sylvan recesses of India) from the ingrossing avocations of his official duties. He has set an example which those who possess more spare time would do well to imitate.—*Edin. Records.*

1. *Alpinia nutans*.—2. *Achyranthes aspera*. A common weed.—3. *Asclepias gigantea*. Very common throughout India. The natives apply the milky acrid juice to sores.—4. *Asclepias acida*. This is a rare plant; I found it last August (1834) on the plains to the south of Aurangabad; also in the neighbourhood of Poona.—5. *Asclepias annulata*.—6. *Asclepias formosissima*. I have only seen this species in gardens, but, I believe, it is a native of India.—7. *Asclepias odoratissima*. This too I have only seen in gardens, and very rare.—8. *Amaryllis Zeylonica*. A very beautiful plant; I do not think it is to be found within this neighbourhood.—9. *Asparagus falcatus*. Large bushes of this shrubby species are common in the Deccan; it requires support and is generally found overtopping some other shrub; it is rather a pretty plant.—10. *Aloe littoralis*. The fibres of its long leaves

are extremely tough and might be used in making cord, if not cloth; however, I am not aware of its being applied to any economical use.—11. *Anacardium occidentale*. Cashew nut; common in Salsette and on the island of Bombay, &c. The apples are, seldom used, indeed they are not worth eating.—12. *Adenanthera parsonia*.—13. *Adenanthera aculeata*.—14. *Averhoa bilimbi*.—15. *Averhoa carymbola*. Both species are common in gardens, and the fruit is used for making lards. The fruit of bilimbi grows from the thick branches and often from the stem of the tree in a singular manner, like the jack fruit. The carymbola is called *kurmul* by the natives, a word which signifies sour or sharp tasted.—16. *Argemone Mexicana*. A common weed, if not a native, it is, at least, completely naturalized.—17. *Alangium 6-petatum*. Grows on Elephanta.—18. *Anona squamosa*. Custard apple; very common throughout India. The fruit is used as an article of food by the natives in times of scarcity; it is produced in great abundance with the slightest care; the tree seems to grow indifferently on all soils and situations.—19. *Anona reticulata*. Bullock's heart, so named from the shape of the fruit, which is also eaten, though it is inferior to the custard apple. The flowers have a very sweet smell, something like the finest flavoured pears. This species is not nearly so common as the other. It is generally to be found planted near temples along with the other species. They call them *van choal* and *ceta choal*, in honour of a heathen god and goddess; *choal* means flower.†—20. *Adansonia digitata*.—This tree appears to be naturalized. Several of them grow on Bombay Island, throughout the Concan and in Guzerat. I do not think any use is made of the fruit; the tree assumes a very fantastic shape, the trunk very short and rapidly tapering; it attains a great size.—21. *Abrus precatorius*. A climber common in the edges and jungles; when the pods open and display its red bead like fruit, it looks very pretty. The natives use the seeds for weights, and call them *gooneh*.—22. *Artemisia Indica*.—23. *Aristolochia Indica*. This is a rare plant, with dingy looking flowers and leaves. I found it on Malabar hill and Cross Island in the harbour. Humboldt tells us, the South Americans use the flowers of some of their gigantic species for hats.—24. *Artocarpus incisa*. Bread fruit tree. I only know one tree on the Island, it grows well and produces fruit, of some of which I have eaten. In times of scarcity it would be an invaluable tree, and as the soil and climate appear to suit it well, it is a pity that it has not been commonly planted. Its congener the jack fruit (*A. integrifolia*) is in common use among

* This elegant flower (termed the *peacock flower*) forms a prominent part of the *bangsal*, with which the Musselmans present Europeans on Sundays.—*Ed.*

† The author states in a letter to me that "the properties of Indian plants are little known, and no dependence whatever can be placed on native names. In fact very few have any place in their nomenclature. They are *Jungle bushes*, &c. wild flowers."—*Ed.*

‡ There is a fine specimen of this tree in Caranja Island. See *Records*, vol. I., 235.—*Ed.*

the natives, who call it *plumus*, and the wood of the tree is more used than any other for making household furniture. The tree attains a large size in Malabar; I have seen a single fruit larger than the largest turnip at home. When growing on the stem of the tree it has something the appearance of a hedgehog stuck to it.—25. *Amaranthus tricolor*, *tristis*, *oleraceus*, varieties, I suspect; *bajee* is the native name, red, green, and variegated. They are extensively cultivated and eaten like spinage.—26. *Arum campanulatum*. Native name *soorun*. The root somewhat resembles a pine-apple, but it is globular. It is used by the natives instead of yams; I have tasted it; it is rather coarse.—27. *Arum esculentum*. Much cultivated by the natives who make use of the tubers in their curries, &c.—28. *Arum polyphyllum*. Very common, springing up on waste land during the rains.—29. *Acalypha Indica*.—30. *Areca catechu*. A very graceful looking tree extensively cultivated for the nuts (betel) which are chewed by the natives.—31. *Andropogon schoenanthus*. Sweet lemon grass, grown in flower-pots.—32. *A. Ischaemum*.—33. *A. Nardus*.—34. *Adiantum lunulatum*. A fern covering old walls during the rains.—35. *Avidcennia tomentosa*. Very common in salt marshes. I have seen it as large as a middle sized tree; it adorns the banks of creeks and rivers, growing in the water as well as out of it.—36. *Acanthus ilicifolius*. Sea holly. Looks pretty when in flower (dark blue colour); grows common among the *Avidcennia* plants.—37. *Artabotrys odoratissimus*. I have only seen it in gardens; it is a pretty scandent evergreen plant, with very sweet smelling but insignificant looking flowers, as all the *Annonaceae* have. Decandolle calls it *Unona uncinata*.—38. *Aegiceras majus* or candel. Found common in salt marshes; it has pretty dark green leaves with white flowers.—39. *Argyrea cuneata* Sprengel. A shrub with very beautiful bluebell looking flowers. When near any support it is scandent and sends out long slender branches. Roxburgh refers it to genus *Lettso-mia*. I have only found it on a range of hills about twenty-four miles west of Poona, near Wurgaum. It is grown as an ornamental shrub in the gardens at Poona, but I have never met with it here.—40. *Agave America*. I have only seen it in gardens at Seroor and Aurungabad.—41. *Agrostis linearis*. A common grass.—42. *Anthericum tuberosum*. Springs up during the rains on rocky waste land.—43. *Boerhaavia diffusa*.—44. *Boerhaavia erecta*. Found about 30 miles N. E. from Poona. Stems woody, as thick as a man's finger.—45. *Basella alba* and *rubra*. Varieties cultivated as root herbs; the leaves are thick and succulent, and afford an excellent substitute for cabbage.—46. *Bromelia ananas*. Pine apple.—47. *Bambusa arundinacea*. Common and well known bamboo.—48. *Bryophyllum calycinum*. Growing in coconut groves; rather pretty when in flower; grown in flowerpots as an ornamental plant.

49. *Buhinia speciosa*.
50. " *candida*.
51. " *variegata*.
52. " *parviflora*. } Trees with pretty flowers particularly the variegata.
53. *Bergera Konigii*. Cultivated for its leaves which the natives use in curries. The native doctors use the bark and roots as a stimulant.—54. *B. integerrima*. Found near Panwell on the main land.—55. *Bassia longifolia*. A common tree. The intoxicating spirit called mowra is distilled from the flower. Oil is also expressed from the seeds. It is a very common and useful tree. The oil obtained from the seeds is extensively used for adulterating glue.—56. *Bignonia 4-locularis*. Common in the jungles, and somewhat resembling the ash. The white flowers rising from the ends of the branches look showy at a distance, but cannot bear inspection. 57. *Bignonia spathacea*.—58. *Bignonia radicans*. I have only found these two in gardens; both have pretty flowers, particularly the latter; it is a shrub of very slow growth, and was brought from China, I believe.
59. *Barleria prionitis*.
60. " *longifolia*. } Common on waste lands.
61. *Barleria cristata**.—62. *Bombax pentandrum*.—63. *Bombax heptaphyllum*. The first I have only seen in gardens; the latter is a very common tree. Both are deciduous, and the numerous large glowing red flowers of the latter make a very showy appearance when the tree is totally destitute of leaves. February and March are its flowering months. The cotton, I believe, which it produces is of no value.—64. *Butea frondosa*. The immense clusters of red coloured pea flowers which this tree produces, have also a very showy appearance—they come before the leaves,—independent of the flowers, the tree has nothing to recommend it in the way of beauty. It is not very common; several grow in Elephanta.—65. *Butea superba*. A very strong climber, with far more splendid flowers. It grows on Salsette—rare.—66. *Bryonia grandis*.—67. *Bryonia scabra*.—68. *Borassus flabelliformis*. Tall palmyra tree common.—69. *Borago Indica*. A very common annual springing up in the rains.—70. *Bignonia Rheedii*. I have only seen one tree. The flowers grow on a scape five or six feet long, and give the tree a curious appearance at a distance.—71. *Canna Indica*.—72. *Costus speciosus*. Found it on a hill near Wuzaum Poona road.—73. *Curcuma montana*. Very common on the top of the ghats. A species of arrow-root is made from it.—74. *Cissus vitiginea*.—75. *Cissus carnososa*.—76. *Cissus 4-angulata*.—77. *Cissus ripanda*.—78. *Cissus crenata*.—79. *Convolvulus speciosus*. Elephant creeper.—80. *Convolvulus batatas*. Extensively cultivated.

* I have picked specimens of this plant in Dane's Island, Whampoa, China. A very good figure of it is given in Osbeck's voyage to China—a work which those who write of the botany of that country should not fail to consult.—ERR.

81. *Convolvulus turpithum*.—82. *Convolvulus grandiflorus*.—83. *Convolvulus paniculatus*.—84. *Convolvulus pes-caprae*.—85. *Convolvulus tigridis*.—86. *Convolvulus muricatus*. There are several other species of *convolvulus* common, but I have not been able to identify them.—87. *Coſſea Arabica*. In gardens only.—88. *Capsicum annuum*. Commonly cultivated in gardens.—89. *Capsicum frutescens*. Ditto.—90. *Cocculus cordifolius*.—91. *Cicer arietinum*. Extensively cultivated in the Deccan and Guzurat. The grain plant. Horses are fed with it instead of corn.—92. *Celosia margaritacea*. An annual, springing up every where in the rains.—93. *Carissa carandas*. Curwund of the natives; a very common shrub strongly armed, and producing black berries about the size of a sloe, which are eaten raw, or made into jellies, &c.—94. *C. spinarum*. Berries red. This species I have only seen in gardens.—95. *Cerbera thevetia*. Only in gardens.—96. *Ceropegia tuberosa*. Very rare, I have only once seen it on Malabar hill.—97. *Crinum asiaticum*.—98. *Cardiospermum halicacabum*.—99. *Cassytha filiformis*. Common in jungles.—100. *Cassia fistula*. Elephantia and Salsette.—101. *Cassia Sumatrana*. In gardens only.—102. *Cassia auriculata*. Very common in the sterile parts of Deccan.—103. *Cochlospermum gossypium*.—104. *Cochlospermum seratifolium*. In gardens.—105. *Coreopsis tinctoria*. Grown in pots, &c., as an ornamental plant.—106. *Crataeva religiosa*. Commonly to be found in the neighbourhood of temples.—107. *Cactus ficus indica*.—108. *Calyptanthus caryophyllata*. Native name jamb; the fruit is eaten.—109. *Capparis Zeylonica*.—110. *Capparis trifoliata*, or *Crataeva religiosa*.—111. *Capparis sepiaria*.—112. *Capparis acuminata*.—113. *Calophyllum Inophyllum*. A very pretty tree, common in the Concan and Malabar. Oil is expressed from the seeds and used for lamps by the poorer classes of natives.—114. *Corchorus acutangulus*. Annual; common in the rains.—115. *Clerodendrum Siphonanthus*. In gardens only.—116. *Clerodendrum infortunatum*.†—117. *Clerodendrum fragrans* in gardens.—118. *Cleome 5-phylla*.—119. *Cleome viscosa*.—120. *Crotularia verrucosa*.—121. *Clitorea ternalea*.—122. *Citrus Decumana*. Pummalo or shaddock, commonly cultivated.—123. *Citrus Aurantium*.—124. *Citrus Limetta*.—125. *Cacalia sonchifolia*.‡—126. *Chrysanthemum Indicum*.—127. *Cadsuarina muricata*. Common in Bombay, where it is planted for ornament. It shoots up very rapidly.—128. *Coix Lachryma*.—129. *Cicca disticha*. Fruit sometimes used for tarts.—130.

* This fine creeper occurs abundantly on the shore by the race course of Macao in China, occupying the place of the *C. Soldanella* of the Scottish coast.—Edit.

† This plant occurs in Dane's I. China.—Edit.

‡ This plant is also a native of China. I have found it abundantly on a rocky point W. of Dane's Island village, Whampon, and also on the opposite side of the river Tigris. The correspondence of the Flora of Malabar and China is very striking, but the present catalogue shews that the same observation does not apply to the Concan coast.—Edit.

Cocos nucifera.—131. *Caryota urens*. This beautiful palm grows plentifully on the ghauts.—132. *Croton variegatum*. This has obtained the name of laurel, and is very commonly grown in pots. The temporary bungalows on the esplanade are surrounded with it to keep out the glare of the sun. The *C. Tigium* grows in Guzurat. I have never seen it.—133. *Cynanchum extensum*. A common twining plant.—134. *Cucurbita Citrullus*.—135. *Cucurbita hispida*.—136. *Cucurbita lagenaria*. The melon and cucumber family are very generally cultivated, and form a common article of food with the natives.—137. *Cucumis sativus*.—138. *Cucumis Colocynthis*. In the Deccan.—139. *Cucumis Melo*.—140. *Cucumis acutangulus*.—141. *Cucumis Citrullus*.—142. *Cucumis Maderaspatanus*.—143. *Cylista scariosa*. Scarce.—144. *Cannabis sativa*. An intoxicating liquor called bhang is prepared from it.—145. *Cycas circinalis*.—146. *Carica Papaya*. Generally cultivated.—147. *Cassandra undulæfolia*.—148. *Carthamus tenebrans*.—149. *Caesulia axillaris*.—150. *Combretum decandrum*.—151. *Conyza cinerea*.—152. *Cordia Myxa*. A tree much resembling the alder. Fruit sometimes pickled.—153. *Cordia angustifolia*.—154. *Coronilla grandiflora*. Natives commonly plant this tree about their houses. It has large showy flowers and is of very quick growth.—155. *Ceanothus Zeylonica*. Elephantia.—156. *Celtis orientalis*.—157. *Caesalpinia pulcherrima*.—158. *Capparis aphylla*. Common in the barren lands of Deccan.—159. *Careya arborea*. I have seen only one tree on Malabar hill.—160. *Casearia elliptica*.—161. *Chloris barbata*.—162. *Cyperus rotundus*.—163. *Cynosurus indicus*.—164. *Callicarpa lanata*.—165. *Celastrus montana*.—166. *Cynometra cauliflora*. In gardens scarce.—167. *Cookia punctata*.—168. *Cyperus dubius*.—169. *Cyperus compressus*.—170. *Commelina communis*.—171. *Cleome icosandra*.—172. *Cissampelos convolvulacea*.—Records of General Science, July and August 1836.

THE PRESIDENT AND COUNCIL OF THE ROYAL COLLEGE OF SURGEONS IN LONDON, have recently presented to the Madras Medical Society several quarto volumes of an *Illustrated and Descriptive Catalogue* of the contents of their noble Museum, which, it is well known, was enriched by the unrivalled collection of the immortal JOHN HUNTER.

These volumes in themselves form a most valuable work on Anatomy (human and comparative), Physiology and Pathology, and the cause of those sciences cannot but be advanced by their publication, for which the Council of the College deserves the highest praise. The Engravings are beautiful specimens of art, and highly interesting as illustrative of the most important objects in this magnificent and unique collection.

Cultivators and admirers of Science cannot but esteem it a high privilege to be enabled to contribute to the treasures of the Museum, thereby adding to the splendid fabric raised by the genius of the immortal HUNTER; to be associated with whom, in however trifling a degree, in the cause of humanity and science, is an honour and a delight well worthy of the trifling pains and trouble called for on this occasion. As a great number of the medical readers of this Journal boast of the London College as their *Alma Mater*, they possess another motive to induce them to attend to the call made in the following extract from a small volume which accompanied the *Descriptive and Illustrated Catalogue*, in which some admirable directions are given for preserving objects of Natural History; and a list of animals, procurable in the various regions of the globe, is appended, specimens of which are desired to complete the collection—of these we have given here only those found in Asia. The Editor of this Journal will be very happy to receive and forward to the College any contributions that may be sent to him for that purpose.—*Editor Madras Journal.*

3.—DIRECTIONS for COLLECTING and PRESERVING ANIMALS; addressed by the BOARD of CURATORS of the MUSEUM of the ROYAL COLLEGE of SURGEONS in LONDON to Professional, Scientific, and other Individuals, with an invitation for Contributions to the Museum of Animal and Vegetable productions, Fossil remains, Anatomical preparations, Casts, Models, Paintings, Drawings, or Engravings, which may conduce to the illustration of the Animal Economy in its healthy and morbid conditions.

ROYAL COLLEGE OF SURGEONS IN LONDON. The Council being desirous not only to maintain and preserve the Hunterian Collection, but also by suitable additions to make it as conducive as possible to the illustration of the structure and physiology of organized beings, and to the advancement of Surgery and the Art of Healing generally, solicit contributions to the Museum from Professional, Scientific, and other individuals, of such Preparations, Casts, Models, Paintings, Drawings, Engravings, and Chirurgical Instruments as may promote these objects.

The following DIRECTIONS, principally drawn up by JOHN HUNTER, are proffered to facilitate the endeavours of those friends to Science who may be inclined to further the designs of the Council, and who may not be familiar with the art of preparing and preserving animal substances for anatomical purposes.

Of the methods of catching and preserving animals.—All animals are naturally wild, and in many instances it requires considerable art to catch them. The more perfect animals, which have much progressive motion, require to be taken by means which generally produce some degree of injury to their different parts; and often to their external form; this injury will be in proportion to the difficulty and mode of capture.

Quadrupeds are in general either caught in traps or shot, and consequently some parts of the body are injured; but this is unavoidable. Birds are usually shot, to the injury of their plumage and often of their internal structure.

Snakes, Lizards, and indeed Reptiles in general, are commonly caught without being previously wounded, and therefore suffer less in their external form than birds; but even these may be considerably damaged if care be not taken, for as they are generally caught in the breeding-season, it is very possible that the organs of generation, and the parts contained in them, as eggs, &c., may be crushed; it is therefore proper to seize them by the neck, and immediately to immerse them in spirit, so as to drown them, or to keep them in a bag until spirit* can be procured.

Turtles, Crocodiles, Fishes, Crustaceans, and Insects are liable to little or no injury to their form or structure from the mode of capture.

The softer animals, most of which inhabit the sea, suffer very little from the manner of catching them; but as their shape and size admit of considerable variation, their form may be much altered from the manner in which they die. Animals without internal hard parts to determine their shape or locomotion, yet having a considerable quantity of muscular contraction, vary their shape according to circumstances; of this kind are the Sea Anemones (*Actinæ*), Priapi or *Holothuræ*, Shell-fish, Slugs, Medusæ, &c.: these should be allowed to die gradually in the water they are accustomed to; by which means they die in a relaxed state, and display more of their natural external form: but it is desirable to have specimens in the different degrees of expansion or contraction. When dead they are immediately to be put into spirit, for fear of putrefaction, which otherwise rapidly takes place.

A sketch or drawing of Molluscous or other animals of which the form and colour are materially altered by death or when put into spirit, will greatly assist in rendering a description more intelligible. The admeasurements, also, of an animal where parts only are preserved, are very necessary; and the sex should be noted where it is not obvious from the parts preserved.

* Colourless alcoholic spirit rather above proof is the most fit.

Animals, of whatever class, which are small enough to be preserved whole, should be kept in that state.

Those which are too large to be transmitted entire in spirit, should be divided into such parts as characterize them. When this division into parts is requisite, it will be necessary previously to take notice of all the external appearances, the number of nipples in the female, and their situation, whether between the anterior extremities, as in the Monkey tribe, Bats, Elephant, Dugong, &c.; or all along the belly, as in the Sow, Bitch, Rat, &c.; or between the hind legs, as in the Mare, Cow, &c. If the female cannot be procured, then examine the nipples of the male; and indeed it is proper to examine every male, for it sometimes happens that these parts are concealed, as in the Horse. It is hardly necessary to describe the external parts of the female, as, generally, the whole of them may be preserved.

The situation and external appearances of the penis in its natural state must be observed, whether it extends along the abdomen, as in the Dog; or point backwards, as in the Cat, Rat, Rabbit, &c.; whether covered by the common skin, as in the Bull, Deer, Bear; or by a proper skin, and only attached to the belly at the upper side, as in a Dog, Horse, &c. And any other external appearance which cannot be preserved, or where the parts are too large to be kept whole, should be particularly noticed and described.

When the examination has proceeded thus far, the dissection is to be begun, by opening the abdomen, &c., to see what internal parts are worthy of preservation.

When the animal is opened for this purpose, it will be proper to take a general view of the viscera in their natural situation; to ascertain the number of lobes of the liver, whether there be a gall-bladder, &c., the situation and form of the stomach, spleen, cæcum, kidneys, &c., also to make such observations upon them as may be thought necessary; after which the parts may be separated and severally distinguished by appropriate labels.

Animals whose food is not exactly known should have the contents of the stomach and intestines examined, to ascertain, if possible, what food they had last taken: the kind of faeces contained in the colon and rectum should also be noted.

The stomach and alimentary canal of Fishes, and other marine animals merit particular examination, as frequently containing not only animals and parts of animals which inhabit great depths, and other situations equally beyond the reach of ordinary observation, but also singularly formed intestinal worms.

Memoranda should be made of the localities from which specimens have been obtained; whether at sea or on land; the period of the year when taken, as material to determine the breeding season, &c.; the vernacular names, and the meaning thereof, if any, in the language of the country. If there be no name for a specimen, a number should be attached to it, corresponding with that of the description or memorandum respecting it. A wooden tally or label should be attached to each specimen, where several are put into the same bottle; as tallies of sheet lead, parchment, leather, &c. are liable to be defaced or obliterated.

Such tallies are preferable also for dried specimens, as those written with ink are liable to be defaced by moisture or insects during the voyage.

The bottles being numbered, little trouble will be required to keep an account of their contents, which will add greatly to their value. If this be neglected, much confusion and uncertainty may ensue.

A description should be taken of form, colour, &c. while the animal is alive, or immediately after death, before it be put into spirit; which frequently produces a collapse or contraction of parts, and changes or destroys the colours, particularly those which are delicate or evanescent.

Of Quadrupeds.—The head should be preserved on account of the teeth; but if too large for a cask or bottle, that part in which the teeth are placed may be cut off; but this will seldom be necessary.

The feet and tail may be kept attached to the skin and dried; or if the skin is not preserved, the feet and tail only, either dried or in spirit.

The oesophagus and stomach should be preserved in spirit, with a portion of the duodenum, and the cæcum, if any, with a small portion of the ileum and colon. If the animal be not too large, it will be preferable to cut off from the mesentery the jejunum and ileum, which (after their length and circumference, and the nature of their contents have been ascertained), may be thrown away, and then to strip down from the spine the contents of the abdomen, beginning at the diaphragm, so as to have the liver, stomach, spleen, pancreas, colon, &c., all with their attachments, taken out together as low as the rectum, where it lies in the pelvis, and, after being cleansed and the contents examined, put into spirits.

The heart and lungs may be preserved together, or, if too large, the heart alone with the large blood vessels.

The contents of the pelvis, viz., the bladder and rectum, with the internal parts of generation both male and female; also the external parts not separated from the internal, with a large portion of the sur-

rounding skin, should be left attached in their natural state, and preserved in spirit.

If the female parts are in a state of impregnation, the whole are to be taken out as before described, without opening the uterus unless for the purpose of admitting the spirit for the preservation of its contents, where of large size.

The young of very large animals, as Whales, Seals, the Walrus, Elephants, &c., and all abortions, should be preserved entire: but if a young cetaceous animal be too large, the tail may be cut off below the anus, and the body put into spirit; and if this should be too big for one cask, the head may be taken off and preserved in another.

Of a full-grown whale or other large animal the following parts should be preserved.

The eyes, with the surrounding external skin, their muscles and fat, in an entire mass. The organs of hearing. The brain. Sections of the spinal chord. The supra-renal glands. The ganglions of the sympathetic nerve. The beginning of the aorta and pulmonary artery, for the valves.

The mammæ of the female, with part of the surrounding skin; also the ovaria and uterus. The fœtus, when found in the belly, to be taken out with the whole of the uterus, vagina, ovaria, &c.

The penis of the male taken off as far back as to include the anus with it.

The bones of animals are to be preserved; and, if possible, those of full-grown specimens, both male and female, distinguishing each.

The flesh should be stripped off, and the bones either boiled, or put into a cask with water, and securely headed in, if the time and circumstances will not allow of maceration.

To preserve the bones of an animal for a skeleton, it is desirable that as much of the flesh should be removed as possible while quite fresh, without cutting or defacing the surface of the bones; and, if opportunity allows, it is advisable to soak them for several hours in water, frequently changed, to separate the blood; and the brain may be broken down and extracted by means of a small flattened stick, otherwise the skull will be discoloured.

The bones should be allowed to remain connected as much as possible, and, when dried in a tolerably straight position: they may be packed in saw-dust, or shavings of deal, or any other white wood, which will not cause discolouration.

Besides an entire set of bones, it is desirable that a skull or two, shewing the teeth in various stages of growth, be preserved. The teeth to be as perfect as possible, and if any becomes loose or fall out, they may be fixed in their sockets with strong gum-water or glue,

but never with paint or putty; or the loose teeth may be tied up in a piece of linen, and securely attached to the skull.

Delicate specimens of skulls, or sets of bones, should be inclosed in small separate boxes, to prevent their being crushed by larger specimens, and many may then be packed in one large case.

All the parts of one Quadruped should be kept together, and separate from those of another.

Of Birds.—Some birds are too large to be preserved entire; therefore it becomes necessary to observe and describe or delineate their external appearances before the parts are separated.

Birds have few internal parts which are necessary to be preserved. The heart and kidneys are nearly the same, I believe, in all birds.

The liver, stomach, intestines, ovary, oviduct, &c., may all be taken out as low as the anus, and preserved in spirit.

The bills and tracheæ, with the lower larynx, should be preserved in spirit by themselves; and when many specimens of a rare or curious bird are procured, the heads of a few of them should be taken off and preserved in spirit.

The legs and feet should be preserved, but they may be dried.

Of Reptiles.—When Alligators, Crocodiles, Turtles, or Tortoises are too large to be preserved whole, some parts, as the head, the whole viscera stripped down from the neck to the anus, and also the anus, should be put into spirit. The bones of such specimens are especially desirable. The eggs at different stages of development should be preserved in spirit, as also the young animals.

Lizards are to be preserved whole.

Snakes may be preserved whole, or in part, especially the heads, both of the poisonous and innocuous species, for the examination of their teeth and fangs.

Of Fishes.—In a fish the external appearances should be attended to, its length, depth and thickness, the number of fins, their shape, where placed, the number of hard and soft rays supporting the fins, &c.

In very large specimens of the Shark or Ray kind, &c., the abdomen should be first opened, then the head taken off by dividing the fish below the heart, across the upper part of the liver, by which means the mouths of the oviducts, if it be a female, the heart, and head are all preserved together.

The tail, if a thick one, as that of a Shark, may be taken off a little below the anus, and the trunk alone preserved for examination. If the trunk be too large, it should be cut through above the pelvis, and the

parts contained in the hinder portion, as the claspers of the male, should be preserved in spirit.

If a female, separate the two oviducts through their whole length, where they run along the abdomen, on each side of the spine; but keep them attached to the pelvis in front, and preserve the whole.

If with young, or eggs, take the whole out in the same way, without opening the oviducts.

The peculiarities of the fœtus in these animals should be attended to.

If not of the Ray or Shark kind, take out such parts from the abdomen as are uncommon or singular.

If fish of the roe-kind, (i. e. Osseous and Cyclo-stomous Fishes), then cut transversely through the fish near the lower part of the roe, some way above the anus. This saves part of the roe, with the connexion between it and the anus, the principal parts concerned in generation.

The tail may be cut off some inches below the anus.

The stomach and intestines may be saved, if any thing particular is observed in them.

Eyes of fishes are proper objects of preservation.

Separate and preserve the heads of such fishes as have any thing singular about the teeth or gills, and are too large to be preserved entire.

If there should be small ones of the same kind, they are to be kept whole; but still preserve such parts of the large specimens as are curious.

Of Crustaceans and Insects.—Lobsters, Crabs, Beetles, Flies, Butterflies, &c., may be dried, because their external covering is their hardest part, and alters little by shrinking. This is to be done when the external form only is required for examination.

In preparing them for drying, great care is to be taken to preserve all their external parts as perfect and as expressive of the natural progressive action as possible.

Crabs, Lobsters, and Crawfish, when dried, should be wrapt in very soft paper, and then packed in cotton so as not to allow of their being displaced in the case, nor to touch one another.

Insects should be pinned down upon a board or piece of cork, or upon wax which has been melted and poured along the bottom of a flat box: the pin should be greased or oiled, to prevent rust, which would render it difficult to take off the insect. If the pins were pointed at both ends, they would the more readily admit of being turned. The pin must be made so fast in either of these substances as to allow of the motion of the box in all directions, and the fastening must be in proportion to the weight of the animal. To preserve them for anatomical examination they should be put into bottles with spirit.

Lobsters, Crawfish, Crabs, Beetles, may be put into a bottle all together; or if each order be kept separate, yet several specimens may be kept together.

Butterflies, Moths, Bees, should be kept by themselves; for if put into the same bottle with the above, they would be injured.

Of Eggs.—To preserve the eggs of Birds with their nests, each nest should be put into a round box just large enough to contain it. After having made a small perforation at each end of the eggs, and expelled their contents, some cotton should be laid upon them to keep them from being moved about, and the whole covered with the lid.

Large eggs, as those of the Ostrich and Cassowary, at different periods of incubation, should be preserved in spirit.

The eggs of Turtles, Lizards, Crocodiles, Snakes, &c., should be collected, and similarly preserved at different periods after being deposited, until the fœtus be excluded.

A perforation should be made at each end of the egg, by which the spirit will have access to the inside, and the contents be more effectually preserved.

The eggs of all sorts of insects should be preserved in spirit for the same purpose.

Various observations on the means of preserving Animals.

An animal of the firmest kind, in a temperate climate, will generally require a quantity of proof spirit nearly equal to its own weight, to preserve it from putrefaction.

Animals of the mixed kind, neither hard nor soft, such as many of the soft fishes, require rather more spirit than their own weight.

Soft or watery animals, such as many molluscous and other sea animals, require rectified spirit, and nearly the same quantity as the above. But these are relative circumstances, which will vary according to the climate, and the state of the animal at the time. If the climate be very hot, and the animals are to be kept in that climate for some time, or if the parts are not very fresh, more spirit will be required.

This proportion of spirit should be particularly attended to when parts are large; for a very small animal or part will generally have more spirit added to it than what is here directed, while a large animal or part obtains less.

Animals which I call firm are those of the Quadruped kind, as rats, mice, &c.; and indeed snakes, lizards, and all insects (as far as respects the quantity of spirit) may be considered in the same class.

In the mixed kind I would include most sorts of fish; however, there are many fish that may be included with the first.

Of the watery or pulpy kind, I reckon Sepiæ, Medusæ, Echini, Starfish, and likewise all those that appear to be gelatinous, for their internal structure is extremely tender.

If the animal is small, as a rat or mouse, it may be preserved by immersing it in its own weight of spirit; but if some spirit is thrown into the abdomen, so much the better.

If it is a large animal, as a dog,* it ought to have the thorax and abdomen filled with spirit; for before the spirit can penetrate through the cutis, the internal parts will become putrid.

A treacher and syringe will answer for filling both these cavities.

Large-fish should be preserved in the same way.

In very soft animals the spirit will generally penetrate sufficiently fast to preserve the whole.

Animals preserved for their external figure should be suspended nearly in the attitudes in which they are designed to be kept.

Animals which are preserved merely for dissection, may be put into a bottle or cask without suspension, and even more than one or two in the same vessel, paying strict attention to the strength and proportion of the spirit.

If two are put into a cask at once, they should be kept apart for some time, as they make too large a mass when close together for the spirit to penetrate.

More than one or two may be put into the same vessel when they are suspended, because then they are not allowed to press on one another.

According to our proportion of animal and spirit, a vessel may be half filled with them.

Birds are seldom so large but that they may be kept in spirit, so as to preserve external appearances; therefore they should all be suspended with some care. Many may be put into one vessel, but must not be squeezed upon one another; and the mouth of the vessel should be wide enough to let them pass both with and against the direction of the feathers.

If the bird was put into a proper position, the feathers made smooth, and rolled up with a fine linen roller, it might still better preserve their external form.

If a pipe was put into the mouth, and spirit thrown down the wind-pipe, it would pass through almost the whole body by means of the air-cells; and it would therefore be unnecessary to inject any by the anus or abdomen.

Animals of the Lobster or Crab kind may be put into a vessel without suspension, and they should be wrapped up in linen, if preserved in this way, for external form. They should be nearly of the same size, as the larger will break the legs of the smaller if put all together.

Animals of the soft or pulpy kind should be kept apart from others which are hard, more especially if preserved for their external form, and should not be crowded. If possible, they ought to be suspended;

* I call them large animals, because much larger can seldom be brought home whole.

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but many of them are not firm enough to be capable of supporting their own weight upon threads; these should be put into separate bottles.

Shell-fish may be put into the vessels in any manner, as the shell preserves them from pressure; but if they died projecting out of the shell, they should be suspended in the spirit.

If of the spiral kind, a small piece of the shell should be broken off at the tip, to allow the spirit to enter the posterior parts; for the body of the animal fills up the whole mouth of the shell, and the other end becomes putrid before the spirit can get to it.

Snakes should have some spirit injected by the mouth and anus, as I find they are apt to become a little putrid about the belly, and lose the cuticle at that part; then they should be coiled up in close spiral turns round the inside of a small vessel.

Lizards might be suspended by the tails in long bottles.

In some that are very long, the tail may be bent upon the body, or rolled in spiral turns on the inside of the vessel.

The Echinus, with the spines, should be wrapped up in cotton, and either put into a wide-mouthed bottle, or, for greater security, into a round box, with holes in it, so that it can neither touch nor press upon the sides, and the box immersed in spirit.

If the animals are suspended in barrels, cords should be run across the mouth, to which they may be suspended, and then the tops put in, and the spirit added afterwards.

The barrels should in general be tolerably deep.

Of changing the Spirit.—Animals, or parts, that are put into spirit, should have it changed at the expiration of a fortnight; as the first spirit which penetrates the substance of the part to be preserved, will be considerably lowered and discoloured by the fluids of the animal: perhaps it will not be necessary to change the spirit oftener than once; for by the time above mentioned the first spirit will have united sufficiently with the part, and have checked putrefaction, as far as such diluted spirit can, but will not be sufficiently strong to continue the preservation of the part; however, the time will vary according to circumstances. If in a hot climate, the spirit may require changing sooner; if in a cold one, later; if the part be soft or gelatinous, the spirit will also require being changed sooner; and if a hard, or firm part, it may be later.

Another advantage arising from spirit sufficiently strong is its own preservation; for when much diluted and joined with the animal juices, it changes from spirit to vinegar, the effect of which is, that the bones of the animal, or parts, are softened so as to be unfit for a skeleton.

If spirit cannot readily be procured, strong brine will in most cases answer the purpose.

A List of ANIMALS desirable towards completing the series of COMPARATIVE ANATOMY in the museum of the ROYAL COLLEGE of SURGEONS in LONDON.

The names printed in small capitals are of those Animals which are more especially required.

The names marked with an asterisk (*) indicate those animals of which the bones only need be transmitted. Of these it is highly desirable to procure Skeletons both of the male and female, with separate skulls of both sexes, for the teeth, sexual differences, &c., and skulls of the young animal for the deciduous teeth, and the changes of form resulting from growth.

Skeletons and skulls of the different varieties of the human species are objects of particular interest for the Museum. The names of the Tribes, and the localities to which they belonged, should be transmitted with the specimens.

ASIA.--BOMBAY.--*Monkeys of all kinds.--*Deer.--MANELESS LION. Skeleton and skull of male and female.--Birds.--Cambay Flamingo.--FLORICAN BUSTARD.--Reptiles, Fishes, and Marine Invertebrata generally.

CEYLON.--Mammals. ELEPHANT. Skeleton; skulls of a full-grown male and female. Brain and sections of spinal chord of an adult. Impregnated uterus, and natural skeleton of the young Elephant soon after birth. Mammary gland of a suckling female. Sections of the recent skull, containing the organ of hearing in spirit. Jaws of the young animal, in brine, for the pulps of the growing teeth.--SLOW LEMUR, especially impregnated uterus.--SLENDER LEMUR.--Musk-deer, or Small Deer, the stomachs distended, in spirit; skeletons and skulls. Birds.--Skeletons and Sternums, of all the indigenous Birds.--Reptiles. Alligators.--The SNAKE-LIZARD.--A large reptile frequenting the great rivers.--The Python, or Boa; the impregnated oviducts.--Fishes. All freshwater species.--Mollusks. Cuttle-fishes; the Pearl Oyster and the Pearly Nautilus, in spirits. Marine Invertebrata generally. Specimens of the SEA-MANTIS (*Squilla*) in spirit, with its ova and young.

MADRAS AND CALCUTTA.--Mammals. Asiatic Lion. Skulls of both sexes, and skeleton.--ARCTONYX, or Sand Hog.--PANGOLIN, or MANIS; especially impregnated uterus.--ONE-HORNED RHINOCEROS (same parts as are desirable from the Elephant).--PANDA, or CHITWA.--*CHIRU ANTELOPE.--CHICKARA, or 4-horned Antelope.--*The Sloth-Bear.--*Isabella Bear of Nepal. (The impregnated uterus of any species of Bear

is very desirable). Bandicoot Rats.--FLYING SQUIRRELS.--Musk Deer of Thibet. *Squirrels.--Musk-rat, or Musk-shrew. SOUSOUS, or GANGETIC LONG-NOSED PORPESSE, (*Delphinus Gangeticus*). Fossil bones of the *Mastodon*, &c. from the banks of the Irawaddi.--Birds. Adjuvant. Eggs at different stages of incubation, in spirit. Natural skeletons of young.--Cyrus Crane.--Stanley Crane, or Demoiselle.--Jungle-fowl.--BUSTARDS.--Vultures.--Ducks and Teal. Reptiles. Gangetic Crocodile, or GAVIAL. Skeletons of full-sized specimens. Eggs in spirit.--Alligator. Ditto ditto.--Cobra de Capello. Impregnated oviducts in spirit.--Fishes and Mollusks in general; especially the Cuttle-fishes of all kinds. Nautili and *Argonautæ* in spirits.

SUMATRA, JAVA, BORNEO, &c.--ORANG-UTAN. Skulls of this species at different stages of growth, especially the skulls and skeleton of the full-grown or great Orang. Also the viscera of the same; and more particularly the impregnated uterus.--Long-armed Apes, UNKA APE, &c., the same parts.--INDIAN TAPIR, same parts as from the Elephant.--Civets and Genets.--SUMATRAN RHINOCEROS. Skeletons and skull of both sexes; impregnated uterus. Natural skeleton of the young animal.--*BABYROUSSA.--FLYING SQUIRRELS.--PANDA.--BENTURONG.--MYDAUS or Skunk.--TUPAIA.--GYMNURA, or Rat-tailed Weasel.--DE-LUNDUNG (*Prionodon*). *Rimaudayan Tiger.--PANGOLIN, or Manis.--TARSIER.--FLYING MACAUCO (*Galeopithecus*).--FLYING FOX (*Pteropus*).--Opossums.--DUGONG. Especially the skulls of an ascertained male and female; impregnated uterus.--Birds. CASSOWARY. Skeleton of male and female, natural skeleton of young. Eggs, with embryo, in spirit. Newly hatched young, in spirit.--Horn-bills (*Buceros*); especially the HELMET HORNBILL.--Crown Pigeon.--*TWO-SPURRED PEACOCK.--Java Swallow, and specimens of the edible nests, with the eggs.--Reptiles. Alligators, Skeletons of, and eggs.--Pythons, or Boas. Skeletons and impregnated oviducts.--Water-snakes. Fishes, especially freshwater species.--Mollusks Cuttle-fishes. Pearly Nautilus, in spirit. Paper Nautilus, ditto. The *Teredo giganteus* seu *palmulatus*. Mollusca Crab, in spirit. Marine Invertebrata generally.

4.—*Instructions for Making and Registering Meteorological Observations at various Stations in Southern Africa and other Countries in the South Seas, as also at Sea.**

The great importance of possessing an exact and carefully registered account of the variations of the barometer, thermometer, and other meteorological instruments, and of the winds and weather throughout that extensive region of the Southern Hemisphere, which is either included within the boundaries of this colony, or readily accessible from it, has determined the South African Literary and Philosophical Institution to request the assistance of its correspondents, and of all who may have leisure and inclination for observations of the kind, towards the gradual accumulation of a continued and extensive series of meteorological Journals, and towards carrying into effect a concerted plan of contemporaneous observations, on stated days, from which it is conceived that much advantage will be derived. The institution therefore solicits the attention of its correspondents, and of the lovers of knowledge generally, to this object; and earnestly requests their co-operation in making, arranging, and forwarding to its secretary, resident in Cape Town, observations of the nature; and, so far as practicable, according to the plan of those hereafter detailed. Such observations alone can furnish the materials necessary for an accurate and scientific inquiry into the laws of climate, regarded as an object of local interest, and are the only data through which (taken in conjunction with the known laws of physics), the more general relations of meteorology can be successfully investigated.

It can scarcely be necessary to insist on the practical importance of this science to the agriculturist, to the navigator, and indeed in every branch of human affairs; or to dilate on the benefits which must accrue to mankind in general, from any successful attempts to subject to reasonable and well-grounded prediction the irregular and seemingly capricious course of the seasons and the winds; or on the advantages, purely scientific, which must arise from a systematic development of laws exemplified on the great scale in the periodical changes of the atmosphere, depending, as they do, on the agency of all the most influ-

* These instructions are understood to have been drawn up by Sir JOHN HENSCHELT, for the Meteorological Committee of the South African Literary and Philosophical Institution; and have been very generally reprinted in Scientific Journals in all parts of the world; and their excellence merits the distinction.

In a letter with which we have been favoured from Sir JOHN HENSCHELT, that distinguished philosopher writes; "The hourly meteorological observations at the solstices and equinoxes, of which you have no doubt seen accounts, continue to be made here, and at a very great number of other stations in every quarter of the globe—a series from Madras would be most highly appreciated."

It will be observed that this suggestion has been anticipated; and we hope to have a series of these observations from our excellent and indefatigable Astronomer, for as long a period as may be required.—*EDITOR MADRAS JOURNAL.*

ential elements, and embracing in their scope every branch of physical science. It is more to the present purpose to observe that, from what has already been done in this department of human knowledge, there is every reason to hope that no very distant period may put us in possession of the key to many of the most intricate meteorological phenomena, and enable us, though not to predict with certainty the state of the weather at any given time and place, yet at least to form something like a probable conjecture as to what will be the general course of the next ensuing season—perhaps to prepare us beforehand for violent and long-continued gales of wind, great droughts, or extraordinarily wet seasons, &c. in the same manner that our knowledge of the nature and laws of the tides, although confessedly imperfect, and, in a great measure, empirical, yet enables us to announce, beforehand, unusually high or low tides. No doubt such predictions of the weather, although only of a probable nature, would be highly valuable and useful, and would materially influence the practice of men in all operations thereon depending. In illustration of this, we need only refer to the value set by many farmers and others on weather-tables, founded on no sound principles, and ratified at best, if at all, only by a very partial and limited experience; or, to choose a better instance, we may cite the importance which is now attached by every seaman to the indications of the barometer, and the numerous cases with which nautical records abound, of great mischief, or even shipwreck, avoided by timely attention to its warnings.

Meteorology, however, is one of the most complicated of all the physical sciences, and that in which it is necessary to spread our observations over the greatest extent of territory, and the greatest variety of local and geographical position. It is only by accumulating data from the most distant quarters, and by comparing the affections of the atmosphere at the same instant at different points, and at the same point at different moments, that it is possible to arrive at distinct and useful conclusions. Hence arises the necessity of procuring regular series of observations made on a uniform system, and comparable with themselves and with each other, by observers at different stations, and of multiplying the points of observation as much as possible over the interior surface of continents—along sea-coasts—in islands—and in the open ocean.

The geographical position of this colony renders it perhaps the most interesting and important situation on the surface of the globe for observations of this nature: first, whether we regard it either as an advantageous station for observing the commencing action of the great counter-current of the trade-winds, where it first strikes the earth's surface, and, combined with the action of the heated surface of the African Promontory, gives rise to that remarkable alternation of south-east and north-west winds, which forms so distinguishing a feature of our

climate—or consider it, secondly, as the farthest extremity of one of the two great lobes of land which form the terrestrial part of our globe, and as such, constituting at once a barrier to the currents and tides of two great oceans, and a limit to their climates—or, lastly, as a great nautical station, and one not devoid of difficulty and danger, in which every consideration of practical interest combines to stimulate the curiosity of the theorist, and give importance to the results of his inquiries.

As these pages may fall into the hands of many who have been little in the habit of observing systematically, or who may not be in possession of instruments of the nicest construction, attention to the following instructions is recommended as the means of rendering their observations most available for useful purposes, and comparable with each other, and, with those intended to be referred to as standards.

I. General Recommendations and Precautions.

1. The continuity of observations ought to be interrupted as little as possible by changes in the adjustments of instruments—in their places—exposure—mode of fixing—or of reading off and registering them. Whenever any alteration in these or any other particulars takes place, especially such as are likely to affect the zero points, or otherwise to influence the mean results, it should be noticed in the register.

2. So far as possible, registers should be complete—but if by unavoidable circumstances of absence, or from other causes, blanks occur, no attempt to fill them up by general recollection, or by the apparent course of the numbers before and after, should ever be made.

3. The observations should, if possible, all be made by one person—but as this may often be impracticable, the principal observer should take care to instruct one or more of his family how to do it, and should satisfy himself by many trials that they observe alike.

4. The entries in the register should be made at the time of observation, and the numbers entered should be those actually read off on the respective scales of each instrument, on no account applying to them previous to entry any sort of correction, as for instance for zero, for temperature, capillarity, &c. All these and the like corrections, being matter of calculation and reasoning from other observations, are to be reserved till the final discussion of the series, and for separate determination and statement.

5. If copies be taken of the registers, they should be carefully compared with the originals by two persons, one reading aloud from the original and the other attending to the copy, and then exchanging parts, a process always advisable wherever great masses of figures

6. A copy so verified, or the original, (the latter being preferred) should be transmitted regularly (if possible *monthly* from places within the limits of the colony) to the Secretary of the South African Literary and Philosophical Society, at Cape Town, which institution on its part will take care that such documents shall not merely be treasured as a dead letter in its archives, but shall be rendered available towards the improvement of Meteorological knowledge, to the full extent of their actual scientific value.

7. The register of every instrument should be kept in parts of its own scale, as read off, no reduction of Foreign measures or degrees to British being made—but it should of course be stated *what* scale is used in each instrument.

II. Of the Times of Observation and Registry.

Meteorological observations should be made and registered daily, at stated and regular hours. In fixing on these, some sacrifice of system must of necessity be made to the convenience and habits of the observer. The best hours in a scientific point of view would be those of Sun-rise, Noon, Sun-set, and Midnight, and these are the hours for which the registers are kept at the Royal Observatory. But these are not the hours adapted to general habits, and since the midnight observation is likely to be pretty generally neglected elsewhere than in an Astronomical Observatory, the following hours, for a division of the day into three parts, are proposed for what may be deemed the Morning, Afternoon, and Evening observations, viz.

Morning..... 8 A. M.
Afternoon..... 2 P. M.
Evening..... 8 P. M.

If, however, the habits or engagements of any one should not allow him to conform to these hours, rather than not observe he may select his own, specifying only what they are at the head of every page of his register, and adhering steadily to them in practice, only observing to make the extreme observations of each day equidistant from the middle one.

At the same time it will be borne in mind, that in what concerns the great Meteorological questions on which the most interesting features of the subject depend, the night is quite as important as the day, and has hitherto been far too much neglected. To any one, therefore, who may feel disposed to enter more zealously into the subject, and will not consider some personal inconvenience ill undergone for the sake of affording data of a peculiarly valuable description, this Committee would most earnestly recommend the adoption, in preference to all others, of the quaternary division of the 24 hours, as followed at the Royal Observatory above alluded to. And they leave it to the consideration of the Council, whether the keeping and transmission of registers on this principle might not advantageously be distinguished by some honorary re-

ward, as that of a Medal for instance, should the funds of the Institution admit of it.

With a view, however, to the better determining the laws of the diurnal changes taking place in the atmosphere, and to the obtaining a knowledge of the correspondence of its movements and affections over great regions of the earth's surface, or even over the whole globe, the Committee have resolved to recommend, that four days in each year should henceforward be especially set apart by Meteorologists in every part of the world, and devoted to a most scrupulous and accurate registry of the state of the Barometer and Thermometer; the direction and force of the Wind; the quantity, character, and distribution of Clouds; and every other particular of weather, throughout the whole twenty-four hours of those days, and the adjoining six hours of the days preceding and following.* The days they have been induced to fix on and recommend for these observations are, the 21st of March, the 21st June, the 21st September, and the 21st December, being those or immediately adjoining to those of the Equinoxes and Solstices, in which the solar influence is either stationary, or in a state of most rapid variation. *But should any one of those 21st days fall on Sunday, then it will be understood that the observations are to be deferred till the next day, the 22d.* The observation at each station should commence at six o'clock A. M. of the appointed days, and terminate at 6 o'clock P. M. of the days following, according to the usual reckoning of time at the place. During this interval, the Barometer and Thermometer should be read off, and registered hourly, and the precise hour and minute of each reading should be especially noted.

For obvious reasons, however, the commencement of every hour should, if practicable, be chosen, and every such series of observations should be accompanied by a notice of the means used to obtain the time, and, when practicable, by some observation of an astronomical nature, by which the time can be independently ascertained within a minute or two.† As there is scarcely any class of observations by which meteorology can be more extensively and essentially promoted, it is hoped that not only at every station of importance in this colony but over the whole world, and on board ships in every part of the ocean, individuals will be found to co-operate in this inquiry. Every commu-

* This is necessary by reason of the want of coincidence of the day in different parts of the globe, arising from difference of longitude. In order to obtain a complete correspondence of observation for twenty-four successive hours over the whole globe, it must be taken into account that opposite longitudes differ twelve hours in their reckoning of time. By the arrangement in the text the whole of the astronomical day (from noon to noon) is embraced in each series, and no observer is required to watch two nights in succession.

† For example, the first appearances and last disappearances of the Sun's upper and lower border, above and below the sea-horizon, if at sea or on the coast,—or on land the exact length of the shadow of a vertical object of determinate length on an horizontal level, at a precise moment of time, (not too near noon), &c.

nication of such observations addressed by channels as secure and as little expensive as possible to the Secretary of this Institution, will be considered as highly valuable.

III. Of Meteorological Instruments, and first of the Barometer and its attached Thermometer.

The Barometer is the most important of all Meteorological instruments. Its office is to measure the actual pressure of the atmosphere on a given horizontal surface at the time and place of observation. Its fluctuations are observed to have considerable relation to changes in the weather, and especially of the wind. Hence its use as a weather-glass.

A Barometer should be examined, before setting it up, for air-bubbles in the tube, and for the existence of air above the mercury in the upper part of the tube. This is done by gently inclining the instrument either way from the horizontal position a little up and down; when air-bubbles, if large, will be seen to run to and fro, and must be evacuated by inverting the instrument and by gentle blows on it with the hand, driving them up into the cistern. If this cannot be done, the instrument is useless. If air exists to an objectionable amount above the quicksilver, it will not tap sharp against the upper end of the tube when the barometer is quickly inclined from a vertical position, so as to make the mercury rise above its level, nearly to the top, and then gently jerked lengthways and backwards. If the blow is puffy and dead, or is not heard at all, the amount of air must be considerable, and may be expelled by inversion.

In fixing the barometer, choose a good light near a window, but not exposed to sunshine, in a retired apartment, little liable to sudden changes of temperature or to drafts of wind. Adjust the tube to a vertical position by a plumb-line, and fix it so as never to shift from that position. Before reading off, give a few taps on the instrument, enough to make the upper end of the column of quicksilver shake visibly, as the mercury is apt to adhere to the glass and give erroneous readings. In reading, bring the index always opposite to one part. The correct part to choose is the summit of the convexity of the mercury, to which the index should be made a tangent, but if this be difficult to hit, either from the construction of the index or the want of a proper fall of light, the line of junction of the mercury and glass may be taken. In that case, the tapping should never be omitted. Which ever mode of reading is once adopted should be stated, and always adhered to. A piece of white paper placed behind the upper part of the tube will generally enable any one to read off by the convexity of the quicksilver. In placing the index, notice whether it appears to shift a little up and down as the eye is raised or depressed; this is

called Parallax, and is a source of uncertainty to be avoided by placing the eye in reading always on the *exact level* of the top of the mercurial column.

Barometric observations require corrections of three kinds, and to render them available and comparable with others, it is necessary that their amount should be ascertained, and distinctly stated. The first is called the Zero Correction. It includes several subordinate corrections arising from different sources, such as that originating in a faulty placing of the scale of inches, that due to the capillary depression of the Mercury in the glass-tube, and the constant part (which at a fixed station is nearly the whole) of the depression arising from the presence of air or vapour in the upper part of the tube.

To determine the zero correction, the Barometer must be compared with a standard instrument, such as that at the Royal Observatory for instance, or some other which has been compared with it, or with some standard of equal authority. Such comparison ought never to be omitted before forwarding the Barometer to its place of destination, nor should any opportunity be neglected of comparing it, when fixed in its place, with a good portable Barometer. In making such comparisons, all that is necessary is to record the readings of both the instruments, after at least an hour's quiet exposure, side by side, that they may have the same temperature. If compared by two observers, each should read off his own Barometer in his usual manner, and each should take a mean of several readings, then each should verify the other's results. By this means the zero of one standard may be transported over all the world, and that of all others compared with it ascertained.

The amount of the zero correction is often very large, as two or three tenths of an inch, but its influence on the mean results of recorded observations, falls wholly on the determination of the heights of the station of observation above the mean level of the sea, and effects little, if at all, any conclusions of a meteorological nature which may be deduced from them. Hence, if proper care be taken to preserve a Barometer, once set up, immovable, a long and regular series of observation with it has a value independent of any knowledge of this element, and it is fortunate that this is the case, as the zero correction is one extremely difficult to determine exactly *a priori*.

In transporting a *compared* Barometer to its place of destination, great care is necessary. It should always be carried *upright*, or considerably inclined, and *inverted*, and over all rough roads should be carried in the hand, to break the shocks to which it would otherwise be exposed. If strapped horizontally under the roof of a colonial waggon, or tied upright against the wood-work, with its head resting on the floor, there is not a chance of its escaping destruction. Strapped obliquely across the shoulder of a horseman, however, it travels securely and

well, and with common care in this mode of transport, its zero runs no risk of change.

The next correction, and the most important of all, is that due to the temperature of the Mercury in the Barometer tube at the time of observation. To obtain this, every Barometer requires to have attached to, or fixed very near it, a Thermometer, called the attached Thermometer, which must be read and registered at each observation of the Barometer. It is preferable in practice to read off this Thermometer *first*, to avoid the error arising from breathing on, or standing long near it, while reading the Barometer itself. The zero of this Thermometer should be ascertained by comparison with a standard at the temperature of about 60° Fahr.

The third correction applicable to barometric observations arises from change of level of the mercurial surface in the cistern, owing to the transfer of a portion of its contents to or from the tube. In Barometers with small cisterns, and where the lower level cannot be adjusted at each observation, its amount may be large, and its effect being always to make the apparent fluctuation less than the real, *in a fixed proportion*, it ought, if possible, to be ascertained. The data necessary to be known are—first, the internal and external diameters of the tube—secondly, that of the cistern containing the mercury, at the surface, where the tube plunges into it. These particulars, as they must be known to the maker, ought to be inquired of him, and indeed ought to be engraved conspicuously on some part of the instrument.

Although all these corrections are necessary for the strict *reduction* of registered observations, they ought not to be applied to individual observations previous to registry. It is sufficient to know them. Their effect is in all cases easily and safely applicable to mean results, and to the conclusions therefrom deduced, and a world of troublesome and often mistaken calculations may be saved by so applying them.

Of the External Thermometer.—The External Thermometer should have a scale on which whole degrees are read off, and divisions large enough to admit of estimating tenths, or at least quarters of degrees, by the eye. It should be compared with a standard, and the difference stated, at one or more temperatures (the wider asunder the better) within the range of the climate in which it is to be used. In fixing it, choose a perfectly shaded but otherwise free exposure, and one where no reflected sunbeams from water, buildings, rocks, or dry soil, can reach it; and easily accessible for reading. There fix it firmly and upright. In reading it, avoid touching, breathing on, or in any way warming it, by near approach of the person. The quicker the reading is done the better.

Although read off at stated times, notice should be taken of all sudden and remarkable changes of temperature, as indicated by the external thermometer, whenever they occur. In the neighbourhood

of the Cape, and in many other parts of the continent, hot winds frequently set in with great suddenness, often in the night, and singular alternations of hot and cold temperature occur, disturbing the regular laws of the diurnal fluctuation, and connected, doubtless, with many interesting meteorological phenomena peculiar to the climate of South Africa.

Of the Maximum and Minimum, or Self-registering Thermometer.—

This should be placed horizontally in some place out of doors, shaded from direct radiation and rain, and otherwise freely exposed to air, and so fastened as to allow of one end being detached from the fastening and lifted up, so as to let the indexes within the boxes slide down to the ends of the fluid columns, a more convenient mode, when the steel index is free enough to allow it, than the use of a magnet.

Both the thermometers should be read off as early as possible every morning, and the indexes re-adjusted. But as double maxima frequently, and occasionally double minima occur, in consequence of sudden changes of temperature, it is recommended occasionally to inspect both of them, with a view to ascertain whether the motion of either the mercury or spirit has been reversed in an unusual manner, and such double maxima or minima, when remarkable, should be recorded as "super-numerary," with their dates and leading features.*

The Self-registering Thermometer is extremely apt to get out of order, by the indexes becoming entangled in the column of fluid. In travelling they should not for a moment be carried with the mercury bulb downwards; if this should happen, they are sure to arrive in a state unfit for use. To correct them is tedious, and always hazards fracture. With great care, however, it may be done, as follows:—

1st, The Spirit Thermometer. By many jerks, force the index down to the junction of the bulb and tube; then, by cautiously heating and cooling alternately the bulb, the tube, or the air vessel at the top, as the case may require, the disunited parts of the spirit may be distilled from place to place, till the whole is collected in one column in union with the spirit in the bulb.

2d, The Mercurial Thermometer. When the steel index gets immersed in the mercury, it cannot be moved by a magnet, and lets the mercury pass by its side. First cool the bulb (by evaporation of either, if necessary) till the mercury is either fairly drawn down below the index, or a separation takes place in the column, leaving the index with mercury above it. Endeavour then, by tapping, warming the tube, or

* The spirit thermometer is apt to undergo a gradual change of zero by the transfer (by distillation) of part of its spirit to the upper end of the tube. It should, therefore, often be compared with the mercurial one, and the difference of readings applied as a zero. In this only case is the application of a zero before registering permissible, and indeed essential.

by the magnet, to loosen the index ever so little, then apply heat to the bulb, and drive up the index with its superabundant mercury quite into the air-vessel. This requires many trials and much patience. When there, hold the instrument bulb downwards, and suspend the index by a magnet at the top, allowing any globule of mercury to drop into the origin of the tube below; then heat the bulb cautiously over a very small clear flame of an oil lamp, till the mercury rises to the very top of the tube, and fairly unites with the globule there awaiting it. Let the bulb cool, and the mercury will sink in one united column; if not, heat it again. When this is accomplished, the index may be set loose, by withdrawing the magnet, and restored to its proper position in the tube.

A self-registering thermometer may be advantageously left (properly secured) for a whole year, or parts of a year, on elevated summits or rather remarkable points, to ascertain their maxima and minima of temperature during absence. In such cases, take care to defend them from discovery, or accident from wild animals, birds, snakes, &c. In taking it up for reading off, observe not to derange the indexes, and do not leave it without seeing that the indexes are in contact, and the temperature that of the air at the moment.

Of Thermometers buried in the Earth.—Thermometers buried at different depths, for the purpose of examining the monthly changes of temperature of the soil, should have their balls and lower part of the scale well wrapped up in woollen cloth or pounded charcoal, and should be placed in strong earthen vessels, which may be entirely withdrawn from the ground so as to allow of inspecting and reading off the scale, without exposing the balls to any possibility of changing their temperatures while under examination. The vessels should be fitted with covers, to defend the scale from injury in burying and digging up.

A pipe of earthenware (composed of separate pieces), or one of wood, may be sunk ten or fifteen feet below the surface, into dry earth, and a thermometer, defended as above, lowered by a chain. The pipe being then obstructed at every two feet by some stuffing readily hooked up, the thermometer may be easily examined, and a register of its indications kept with very little trouble. In like manner, the temperature of wells may be registered.

Of the Temperature of the Sea.—The surface temperature of the water at sea should be registered, as a matter of course, with the same regularity and at the same hours as the barometer and thermometer. It is more conveniently (and with quite accuracy enough for the purpose) obtained by taking up a bucket-full of the water and stirring round the thermometer in it. Whenever a change to the extent of 2° Fahr. appears to have taken place

since the last observation, a fresh bucketfull should be taken up and the observation repeated. It should also be noticed whether rain has fallen since the last observation. A sudden depression of 3° or 4° indicates the near approach of land. In a voyage from England, lately made by a member of this committee, the temperature of the surface water fell at once 9° Fabr. on approaching within a few miles of the entrance of Table Bay.

The temperature of the sea at considerable depths can hardly be regarded as a subject of ordinary meteorological inquiry and regular registry, though undoubtedly one of much physical interest, for which reason it is not considered necessary to dwell further on it.

Of the Hygrometer, &c.—In the absence of Daniell's Hygrometer, or of ether to cool it, the degree of dryness of the air may be ascertained by observing the temperatures marked by two thermometers suspended freely side by side (but not in contact) in the shade, and completely defended from all radiation to or from the sky, the one having its bulb and stem naked, the other with the bulb and lower part of the stem wrapped in linen or cotton, and thoroughly wetted with pure spring or rain water. The temperatures indicated by both should be noted when the wetted thermometer refuses to sink lower, and the conclusions left for subsequent calculations. The naked thermometer may be the "External Thermometer" itself, in which case a coated thermometer may be kept always suspended near it, completely screened as above mentioned, and wetted some minutes previous to the regular daily readings.

If a hair hygrometer be used, its points of absolute moisture and dryness should be frequently ascertained, as they are apt to change. The former may be found by keeping it some time in a close covered jar lined with wet blotting paper, and having water in it, and noting the point of moisture beyond which it refuses to go. The latter, by keeping it in the same manner in a jar perfectly air-tight, over fresh burnt quicklime, till it refuses to indicate a higher degree of dryness.

The best measure of the momentary evaporating power of the air, seems to be the depression of the wetted thermometer below the dry one. But the actual evaporation from a given surface, is quite another thing, and a question may very reasonably be raised, how far any useful approximation to a knowledge of the total evaporation from an extensive and diversified surface, unequally moistened, and variously exposed to the sun, defended by clouds, or refreshed by dews, can be obtained by any small or local experiments.

The Rain-gauge is an instrument of such extremely easy construction that any person who lives near a tin-man can procure one. In a climate so arid as that of Africa, however, it must be remembered that it will often need examination and cleansing, owing to long intervals of disuse in which insects and dust may lodge. It will often happen, too, that the

slight rain of one day, if left unregistered, will be entirely lost by evaporation in the next—nay, that slight and transient showers may never enter it, being evaporated from it as they fall. The effect of copious dew, too, must be separated from that of rain, so that the mere registry of the contents of the gauge is not of itself a sufficient indication whether rain has fallen in the night or not. However, there are usually good reasons for decision on this point from other indications. Attention to the amount of dew is very necessary, not only because the meteorological questions involved are of a high degree of interest generally, but because in arid climates the dews are of almost as much importance to the maintenance of vegetation as the rain.

In stating the quantity of rain daily received in the gauge, the height of the receiver above the soil should be mentioned, experience having shown that the quantities of rain which actually fall on a given area on the ground, and at a very moderate height above it, often differ materially. In some localities and circumstances, the rain-drops receive accession from the air as they descend, in others they undergo partial evaporation. The former is generally the case in cool moist climates—the latter may be expected in this country.

Of the Wind.—The points most important to remark respecting the wind, are,

1st, Its average intensity and general direction during the several portions of the day devoted to observation and registry.

2dly, The hours of the day or night when it commences to blow from a calm, or subsides into one from a breeze.

3dly, The hours at which any remarkable changes of its direction take place.

4thly, The course which it takes in veering, and the quarter in which it ultimately settles.

5thly, The usual course of periodical winds, or such as remarkably prevail during certain seasons, with the law of their diurnal progress both as to direction and intensity—at what hours and by what degrees they commence, attain their maximum, and subside, and through what points of the compass they run in so doing.

6thly, The existence of Crossing Currents at different heights in the atmosphere, as indicated by the course of the clouds in different strata. In observing these, it is advisable to fix the eye by some immoveable object, as some point of a tree or building, the sun, or the moon, otherwise mistakes are apt to arise.

7thly, The times of setting-in of remarkably hot or cold winds,—the quarters from which they come, and their courses, as connected with the progressive changes in their temperature.

8thly, The connexion of rainy, cloudy, or fair weather, with the quarter from which the wind blows or has blown, for some time previous.

9thly, The usual character of the winds as to moisture or dryness, not as deduced from mere opinion or vague estimation, but from actual observation of the hygrometric state of the atmosphere during their prevalence.

Among these particulars it will be seen that some are of a nature susceptible of daily observation and registry, while others call for an exercise of the combining and inductive faculty on the observer's part, and cannot be made out otherwise than by continued attention and habitual notice of phenomena with a view to the investigation of their laws. The general impression left upon the mind as to any of the points of this kind above enumerated, by the occurrences of the past month, will therefore be more properly stated, in the way of summary remarks at the end of the Monthly Registers, than as entries under particular days.

Of the State of the Sky.—In describing the state of the sky as to clouds, &c. the observer will bear in mind that it is only in that region of the sky which is vertically above him that the true forms and outlines of the clouds are exhibited, and the area they cover, as well as the intervals between them distinctly seen. As they approach the horizon in any direction, their extent is foreshortened by perspective, their apparent magnitude diminished by distance, and their intervals covered in and hidden by their mutual interposition. In estimating therefore the quantity of clouds in the sky, regard must be had to this, and our judgment should rather be formed on a view of the region extending from the zenith every way half way down to the horizon, than from the aspect of the heavens below that limit. It would be better to notice both, and state, separately, the proportions in which each are covered, and the quarter of the horizon towards which the chief masses in the lower region lie.

The general aspect of Clouds, as classed under the heads Cumulus, Cirrus, Stratus, &c. should be noticed, and especially the height of this inferior surface, or the level of the vapour plane, should be estimated. In a mountainous region this is easy, so long as the vapour plane is below or not far above the summits of the hills, and in such regions the formation and dissipation of cloud in the neighbourhood of the mountain summits, under the influence of certain winds, form a subject of study of a highly curious and interesting nature.

The formation of Clouds at night, during calm weather, under the influence of a gradually descending temperature, is another point worthy of attention. It frequently happens, that, without any perceptible wind, the sky will suddenly become hazy in some one point, and the haze condensing and spreading, in all directions, without a wind, the whole heaven will become overcast in a remarkably short time. The same thing will sometimes occur nearly at the same hour for many nights in succession. Such phenomena should be noted whenever they occur.

Two or even three strata of clouds are very common in this district of South Africa. The lowest frequently resting immediately on the land and sea. The height and thickness of these strata, their connexion with cross or opposite currents of wind in the regions where they subsist, and the laws of their formation in gradual intermixture, deserve to be studied with care, and with reference to the hygrometric state of the air at the time and place, and for several hours before and after.

Of Thunder and Lightning, and of the Electrical state of the Air.—Connected with this part of the subject is the observation of shooting Stars and luminous Meteors. Remarkable ones should be noticed, and the moment of their appearance, their direction, duration, length of path, and *course among the Stars*, ascertained and noted, with the phenomena of their increase and decay of light, apparent size, separation into parts, trains left behind, &c. The general direction (if any) which they observe on particular nights, is a point also to be attended to. Such are the frequency and brilliancy of these splendid phenomena in the clear sky of this colony, that there can be no doubt of their affording an available method of ascertaining the differences of longitude of the most distant stations, if duly observed by persons furnished with means of ascertaining the time.

Thunder-storms of course will be noticed when they occur under the general head of the weather, but it is of consequence also to notice distant lightning, not accompanied with thunder audible at the place of observation (by reason of its great distance),* especially if it takes place many days in succession, and to note the quarter of the horizon where it appears, and the extent it embraces. In an actual thunder-storm, especial notice should be taken of the quantity of rain that falls, and of the fits or intermittances of its fall, as corresponding, or not, to great bursts of lightning, as also of the direction of the wind and the apparent progress of the storm with or against it.

Observations of the Electrical state of the Air in serene weather are unfortunately too much neglected. The apparatus they require is simple, and by no means costly, and may be constructed indeed by any one for himself with ease.

If the Committee in this their first Report do not dilate on this and other of the less usually practised observations of Meteorology, it is because they wish for the present chiefly to call attention to the accumulation of regular and daily observations of a more definite and numerical character. With this view they have drawn up, and by the liberal aid of Government, have procured to be printed skeleton forms, for immediate distribution among such Correspondents of the Institution, and others, as may be willing to undertake their filling up. These comprise, it is true, only the registers of the Barometer and its

* Thunder can scarcely ever be heard more than 20 or 30 miles from the flash which produces it. Lightning, on the other hand, may be seen (or at least its reflexion on the clouds, forming what is called *sheet lightning*) at the distance of 150 or 200 miles.

attached Thermometer, with that of the external Thermometer, and a column of Remarks for Wind and Weather, as being the most essential and indispensable elements of Meteorology; but it is in the power of any one who pleases to supply additional information, and to those who have leisure, instruments, and inclination for the task, the Committee would particularly recommend the regular observation of the Wet Thermometer, those of the Self-registering Thermometer and Weekly or Monthly Observations of Thermometers buried at different and progressive depths beneath the surface of the soil.

The printed forms provide for the arithmetical convenience of casting up the *means* for each month. In doing so, it is requested that care will be taken to verify the results by repetition, and (that usual sources of error may not escape notice) they recommend in every instance, before adding up the columns, to look down each to see that no obvious error of entry (as of an inch in the barometer, a very common error, or what is more difficult of detection, an error in the first decimal place) shall remain to vitiate the mean result. It is perhaps unnecessary to do more than mention the precaution of *counting* the days in each column on which observations occur, so as to admit of no mistake in the *divisor*, and to use throughout the decimal arithmetic in calculating the mean results. Care and exactness in these points will in most cases add greatly to the value of the communications, as it will be quite impracticable for the Committee, should observations flow in in masses, unreduced or erroneously reduced, to undertake the overwhelming task of recomputing them.

Although not, strictly speaking, a branch of meteorology, yet as the collection of observations of the Tides has been made a part of the duties of your Committee, they propose the following stations as points where it would be especially desirable to obtain regular observations of the time and height of high and low water, according to the rules and on the plan proposed by Mr. Whewell, in his late researches on this subject, and they earnestly invite communications on this head from any residents at those ports who may have leisure and take interest enough in the important questions connected with the subject.

Cape Town,	Ascension,
Simon's Bay,	Mauritius,
Port Elizabeth,	Tristan d'Acunha,
Knysna,	Madagascar,
Saldanha Bay,	Mozambique.

In Cape Town and Simon's Bay, they have the pleasure to report, that a series of observations under the superintendence of Captain Bance and Mr. Leven have already been undertaken at the instance of the Astronomer-Royal, and are now in active progress.

