THE

TRANSACTIONS

OF

THE LINNEAN SOCIETY

OF

LONDON.

VOLUME XX.

PART THE FIRST.

LONDON:

PRINTED BY RICHARD AND JOHN E. TAYLOR, RED LION COURT, FLEET STREET

SOLD AT THE SOCIETY'S HOUSE, SOHO-SQUARE;

AND BY LONGMAN, BROWN, GREEN, AND LONGMANS, PATERNOSTER-ROW;

AND WILLIAM WOOD, TAVISTOCK-STREET, COVENT-GARDEN.

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1851.
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TRANSACTIONS

OF

THE LINNEAN SOCIETY.

I. *On the Development of the Ovulum in* Avicennia. *By the late* William Griffith, *Esq., F.L.S. &c. &c. Communicated by* R. H. Solly, *Esq., F.R.S., L.S. &c. &c.*

Read November 19th, 1844.

In connexion with the development of the seed and embryo in *Santalum* and *Osyris*, the following account of the development of the same parts in *Avicennia* may not be altogether misplaced; for the placentation is almost precisely the same; the same posterior elongation of the embryo-sac takes place; and in all the embryo is, at least when matured, external to the nucleus or body of the ovulum.

The ovula of *Avicennia* appear to me to be nucleary: they closely resemble in appearance the same bodies in *Santalum*, *Osyris*, *Schœpfia*, *Olax*, *Congea*, &c. (Tab. I. figs. 1, 2.)

The first change observed takes place in the central tissue of the ovulum, which appears to become of a denser nature than the rest, the density gradually extending to near the apex of the ovulum, in which, at a period antecedent to fecundation, the embryo-sac will be found. This embryo-sac appeared in most instances to be a membranous sac with an enlarged apex or head, contained within the apex of the nucleus, and a subcylindrical body, extending backwards a short way to the termination of the dense central tissue, into which at this period a vascular fascicle is seen to be extended (Tab. I. figs. 3, 4.).

The first change, subsequent to the application of the pollen-tubes to the apex of the sac, appeared to consist of the usual preparatory steps in the formation of cellular tissue (Tab. I. fig. 5.).

The next change observed was one affecting the figure of the sac itself, which now exhibited, as it were, a short prolongation posteriorly in the direction of the axis of the ovulum, and consequently in exact relation with the dense central tissue; or, in other words, instead of being straight, it now appeared curved at its anterior extremity. The subcylindrical body of the sac was also observed to have become prolonged posteriorly within the inner side of the ovulum (Tab. I. figs. 6, 7.).

That half of the dilated head of the embryo-sac next the short central prolongation was at this period observed to be filled with rudimentary cellular tissue or young albumen. As this albuminous tissue increases, it first occupies the whole of the original head of the sac, which then appears to become enlarged, and then to pass out of the apex of the ovulum (Tab. I. figs. 8, 9.), to which direction its subsequent enlargement is almost entirely confined. At the same time the posterior prolongation of the body of the sac continues. The albuminous tissue having attained some size, will be found to present towards its centre, and corresponding with the axis of the ovulum and that of the application of the pollen-tubes, the rudiments of the future embryo (Tab. I. fig. 9.).

At a subsequent period the albuminous mass, being considerably increased in size, presented on its anterior surface a curved furrow or groove, which was found to correspond with the points of the cotyledons of the young embryo, now considerably increased in size (Tab. I. figs. 11, 12.). At this period the part of the sac within the ovulum has undergone little change, except the posterior (lateral) prolongation, which has by this time passed back into the placenta, within which it is divided in a digitate irregular manner (Tab. I. fig. 10.).

The next stage presented the points of the cotyledons quite naked (*i. e.* external to any part of the seed), they having protruded through the groove above mentioned. As the embryo increases in size the cotyledons become more and more exposed: the part of the albumen below the line of exsertion of the cotyledons does not undergo much change; but that part above the same line, or rather between the inner cotyledon and body of the ovulum, becomes enlarged and flattened almost into a membrane; and even when the cotyledons are as long as the placenta, this part of the albuminous tissue equals them in length (TAB. I. fig. 13.).

The mature embryo, with the exception of its radicle, which is always imbedded in the albuminous tissue, may be said to be naked. The upper part of the albumen at this period is much dilated, and almost membranous; the edges are very irregular (TAB. I. figs. 13 & 14.).

The conduplication of the cotyledons takes place at an early period; their inequality at a much earlier, even before the protrusion of their points.

The central prolongation of the sac was not observed later than the period represented by fig. 12. TAB. I., but it is probable from appearances that it is at length filled with albuminous tissue.

The exact distance to which the vascular fascicle at length reaches was not observed: probably it extends, when complete, to the apex of the short central prolongation of the sac.

The above observations were made very shortly before my departure from Malacca: they are deficient in several respects; but of the mode by which the embryo becomes external to the seed to so great a degree I can speak with the requisite confidence.

I now proceed to offer my remarks on the circumstances detailed above.

The elongation of the posterior end of the embryo-sac, occurring as it does in a plant so different in general organization from those in which it has hitherto been observed, appears to me remarkable. It is curious that this prolongation has only been observed in association with a particular form of the free central placenta, and thus the exact observation of the corresponding developments in *Olax* and *Congea* becomes more desirable than ever.

The shape of the embryo-sac in that stage, represented by fig. 7. TAB. I., is also worthy of notice: so far as I know, it is the only instance of an embryo-sac prolonged posteriorly, it may be said, from two points of its surface, or which may not be considered to be in itself a rectilinear body. The general analogy of the relations of the embryo-sac with the nucleus would lead me to suppose that the embryo-sac of *Avicennia* consisted originally of that part in the axis of the ovulum, viz. the head or dilated end, and what I have called the short central prolongation. But what has been recorded of *Santalaceæ* (and the whole of my observations on *Avicennia*) is opposed to this; for in all the instances observed, the posterior prolongation is a prolongation of the posterior end of the sac itself, which obviously would not be the case if the ordinary relations of embryo-sacs to their nuclei existed in *Avicennia*.

Another non-analogous instance may be observed in the gradual protrusion outwards of the young albumen, which is assumable as being at one period entirely interior to the nucleus or ovulum. In all the really analogous instances in which the albumen is exterior to the ovulum, it is *always* exterior, that part of the embryo-sac in which it is developed being protruded long before any albuminous tissue has been developed, which indeed is almost always subsequent to fecundation properly speaking, viz. the completion of certain relations between the anterior end of the pollen-tube and the embryo-sac.

A third non-analogous instance seems to me presented by the exsertion or protrusion of the cotyledons. Protrusion of the radicular end of the embryo is not, perhaps, uncommon; but in these cases it may be difficult to ascertain to what extent the protrusion may be due to germination.

In *Cryptocoryne ciliata* (*Ambrosinia ciliata*, Roxb.) however the protrusion takes place long before the cotyledon has acquired its full growth, up to which period moreover it retains its firm fleshy substance. In a Malacca subgeneric form of *Cryptocoryne*, in which the margins of the spatha cohere into a tube to a great extent, although the plumula is still of considerable size, no protrusion whatever takes place. By the peculiar way in which this is performed the embryo becomes almost entirely naked, without however changing the direction it would have had, had it been developed, as it so generally is, within the body of the seed. It is curious that the obliquity in the direction of the young embryo, which is still more extraordinary, takes place at a very early period, for it forms an obtuse angle with the line of the axis of the ovulum and application of the pollen-tubes before there is any indication of cotyledons. For this I do not see any appreciable reason, mechanical or otherwise, though it would perhaps be amiss to overlook the comparative density of the axis of the ovulum in endeavouring to account for the protrusion of the albumen, and perhaps for the production of the lateral posterior prolongation.

The extension of the vascular fascicle so far into what has been considered the ovulum, leads me to doubt the real extent of this organ. I cannot recall to mind any instance in which the vascular supply of the ovulum is prolonged into the substance of the nucleus. A similar doubt is suggested by the extent of the head of the embryo-sac inside the ovulum; for this sac in general, during the development of the albumen and embryo, is made gradually to encroach upon the nucleus, by which this originally solid cellular body becomes generally reduced to a mere cellular membranous covering, or possibly to be entirely obliterated. But whatever may be the real extent of the ovulum, the nucleary form of which is only physiologically distinguishable from the placenta, the co-existence of a vascular fascicle with the posterior prolongation in *Avicennia* seems to me to be against the opinion of these curious extensions being of a chalazal nature.

I was not able to ascertain clearly the absolute relations with the embryo-sac established by the pollen-tube after it had reached the sac, still less the absolute relations which the end of the pollen-tube bore to the nascent embryo. All the indications however furnished by my sketches are in favour of the penetration of the pollen-tube into the sac, as far as the spot in which the embryo makes its first appearance.

Attention to a peculiarity between the direction of the unimpregnated ovulum and that of the seed in *Avicennia* was first pointed out by Mr. Brown in his 'Prodromus*,' in which it is ascribed to the fecundated ovulum becoming erect. This would manifestly make the radicle superior; but if the ovulum were of the same nature as in *Myoporinæ,* to which Mr. Brown's remarks seem to refer, it would as obviously make the radicle inferior. In a subsequent account given by Mr. Brown through Dr. Wallich†, the erection of the seed is attributed to an elongation upwards of the body of the seed, the (true) apex maintaining its original (inferior) situation.

The most important difference between this last account and that which I have attempted to give, is, that I find *the embryo only* to be erect; one part of the ovulum (the nucleus), from which it is assumable the seed-coat might

* *Op. cit.*, ed. Nees, p. 374. † Pl. Asiat. Rar. iii. pp. 44, 45.

have been, partly at least, derived, suffering no change in direction whatever, and the other, from which the albuminous covering might have equally resulted, only a partial one. The embryo also, in its earlier stages of development, undergoes a degree of change of direction, but only sufficient to enable it to pass up outside the ovulum, in the same direction it would have maintained had it been ordinarily developed.

EXPLANATION OF THE PLATE.

TAB. I.

Avicennia resinifera, Forst. fide Jack, and *Av. intermedia*, Griff. MSS.*

Fig. 1. Placenta and ovula, at an early period before expansion of flower, and before the corolla exceeds the calyx in length (species not noted).

Fig. 2. Longitudinal section of one of the ovula of the same; the subsequent dense central tissue appears to be commenced.

Fig. 3. Longitudinal section of an ovulum, more advanced; the apex of the embryo-sac is close to the apex of the ovulum, and its body cylindrical, reaching to the central dense tissue (*A. resinifera*).

Fig. 4. Embryo-sac of the same, separated.

Fig. 5. Embryo-sac of an ovulum at the period after the application of the pollen-tubes to its apex:—magnified about 500 times (*A. resinifera*).

Fig. 6. Longitudinal section of an ovulum of the same after blackening of the apex of the style, the fall of the corolla, and evident enlargement of the ovarium; part of a pollen-tube is seen attached. The embryo-sac is enlarged, and extends further posteriorly; otherwise there is little change in the ovulum.

Fig. 7. Longitudinal section of an ovulum, a little more advanced. The embryo-sac is more prolonged posteriorly, and also presents a short prolongation corresponding with the axis of the ovulum. It is still interior to the ovulum; the dilated apex has commenced to be cellular.

Fig. 8. Placenta and ovula (*A. intermedia*) at a more advanced stage: three of the ovula have aborted; the fertilized one is seen laterally, and a protuberance (*a*) is visible from its apex.

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* *A. intermedia* is founded on a Malacca plant altogether intermediate between what appears to be *A. tomentosa* and *A. resinifera*.

Fig. 9. Longitudinal section of an ovulum of this period: the young albuminous mass (the protuberance of fig. 8.) is now seen to be partly exterior to the ovulum. A pollen-tube is still in attachment. The disc represents the rudimentary embryo.

Fig. 10. Part of the ovulum, the whole of the posterior lateral elongation, now digitate at the end, which is confined in the placenta, and once-branched also within the ovulum, the central or axile prolongation, the now almost entirely exserted albumen, and the embryo. This figure does not represent a section of the albuminous mass, but of the body of the ovulum alone, one side of which was sliced off to expose the albumen.

Fig. 11. Placenta (entire) of an ovarium some time after fecundation. *a.* Apex of the placenta. *b, b.* Barren ovula. *c.* Fecundated ovulum. *d.* Exserted albuminous mass, showing the furrow or chink? by which the points of the cotyledons will pass out (*A. intermedia*).

Fig. 12. Fecundated ovulum; longitudinal section through the body of the nucleus, but not through the albuminous mass: the tips of the cotyledons reach the furrow or chink.

Fig. 13. An entire placenta of *A. resinifera* at a more advanced period: the letters have the same references; *e.* shows the lower edge of the former furrow, now an opening; *d.* the large inner lip or edge with irregular margins overlapping the cotyledons.

Fig. 14. Young seed and embryo about the same period of development: the embryo is removed from the seed, which is viewed obliquely. *a.* Body of the ovulum or nucleus. *b.* Fleshy part of the exserted albuminous mass. *c.* Lower or outer edge of the fissure by which the cotyledons have protruded. *d.* Inner or upper, now membranous, cellular edge of the same.

W. Griffith delin.

E. S. Weddell sc.

II. *Some Observations upon the Structure of two new Species of* Hectocotyle, *parasitic upon* Tremoctopus violaceus, *D. Ch., and* Argonauta Argo, *Linn.*; *with an Exposition of the Hypothesis that these* Hectocotylæ *are the Males of the* Cephalopoda *upon which they are found. By* A. Kölliker, *Professor of Physiology and Comparative Anatomy in the University of Zurich. Communicated by* Robert Brown, *Esq., V.P.L.S. &c. &c.*

Read April 15th and May 6th, 1845.

WHILST visiting Messina and Naples during the summer of 1842, I found two worms resembling the *Hectocotyle Octopodis*, described by Cuvier as found upon the *Octopus granulosus*, Lam.; the one upon the *Tremoctopus violaceus*, Delle Chiaje (*Octopus velifer*, Fér.), the other upon the *Argonauta Argo*, L. At first sight I took them for epizootic worms, to which, from their white colour and numerous suckers, they bore a great resemblance; but when I examined them more accurately, I met with so many peculiarities, a few of which I will here mention, namely the existence of a heart, arteries and veins, branchiæ, and coloured contractile pigment-cells, that at length I was compelled to abandon that idea. Proceeding with my examinations, I soon found that the animals were all males; and remembering that that sex of the *Argonauta* and *Tremoctopus* was not as yet known, I supposed that I had discovered the males of those *Cephalopoda*. I must confess that at first I did not place much reliance upon this conjecture, for the great dissimilarity between the supposed sexes surprised me so much that I scarcely dared to believe it to be well-founded. However, as I proceeded further with my researches, I found more and more to strengthen my supposition, so that finally I was led to regard it as very probable. But before proceeding to submit the arguments on which I formed my opinion, I propose to give a slight sketch of my anatomical researches with respect to the above-mentioned animals.

Description of the Hectocotyle *of* Tremoctopus violaceus.

1. *External Form.*

This animal very much resembles the *Hectocotyle Octopodis*, which Cuvier has described in the 'Annales des Sciences Naturelles' for the year 1829*, the anterior part of the body being long, worm-like, and provided with two rows of suckers on its ventral surface, the posterior short and of an oval shape; but independently of its being much smaller, it differs also at first sight from *H. Octopodis* in the back being fringed with a great number of little branchial appendages, and the posterior extremity having a long process.

The *anterior part* of the body varies in length from $1\frac{1}{3}$–$1\frac{2}{3}$ of an inch, is thickest in the middle, and diminishes towards both extremities. Without the branchiæ and suckers it would be nearly cylindrical, but in the natural state the cephalic portion is almost quadrangular, while that immediately behind is flat, and has sharp margins. Its colour is almost entirely pure white; it exhibits however at the branchiæ some azure tints, and here and there some yellowish hues; there are also some remarkable spots on the back, of which I shall speak presently. The *upper surface* of this anterior part bears in its cephalic portion the branchial appendages and the spots just mentioned; the upper surface of the posterior portion, on the contrary, is perfectly smooth; the spots are arranged in two slightly-irregular rows between the branchiæ along the middle of the back; they are circular, about $\frac{1}{20}$th of a line in diameter, of a brown or violet colour, and about 50 in number. The branchial appendages are placed on a low, mantle-like margin, which takes its origin from the side of the animal between the suckers and the coloured spots; the appendages have a conical form, are 1 line long and $\frac{1}{6}$th of a line broad: during life those next to the middle of the back stand vertically erect, the others successively assume a more inclined direction, and the outermost lie nearly transversely. The appendages are disposed in irregular longitudinal lines; their number is considerable, amounting to about 250 on each side.

The *ventral surface* of the anterior part is quite smooth in the middle, and slightly convex from side to side; on each of its margins are situated 40 or 41

* 1re Série, t. xviii. p. 147.

suckers, which are disposed alternately, and bear the strongest resemblance to those of the *Tremoctopus* itself.

The *posterior part* of the body is a large oval sac, of 5 lines in length, to which the penis is appended. The sac is quite as large as the largest part of the body, and incloses a great many convolutions of a small canal and one large duct. The penis is situated on the abdominal surface, and takes its origin from the foremost part of the oval sac: it is conical and partly free, partly confined in a delicate membranous sheath, which is attached to the ventral aspect between the last six suckers; its form and length vary according as it is contracted or extended; in the first case it is 4 lines long, $\frac{1}{2}$ a line thick, and curved; in the latter, 7 lines long, $\frac{1}{4}$ of a line thick, and nearly straight.

2. *Structure.*

a. Skin.

The skin of the animal consists of two layers; the exterior is the epidermis, formed by delicate, polygonal cells, of a diameter of 0·018–0·036‴, which contain round nuclei; the interior, the corium composed of cellular tissue, the outer fibres of which are disposed longitudinally, and the inner transversely. The coloured spots, already mentioned, form a very remarkable object in the description of the skin; each of them is a cell, containing a nucleus and a great many coloured granules, and exhibits during life the same curious phænomenon which R. Wagner has discovered in the pigment-cells of *Cephalopoda*, viz. a regularly alternate expansion and contraction. As in the example just quoted, the colour of the cells varies according as the granules are assembled together in a mass or scattered about in the expanded cell. With regard to the power which effects these contractions, it is not yet proved whether it lies in the contractile membrane of the cells, as Wagner supposes, or in the contractile cellular tissue which surrounds them, an opinion which I have lately advocated.

I have yet to mention some peculiar minute pores which are found on the anterior part of the ventral surface. They are arranged in rows of four or five on each side between the mesial line and the suckers, thus forming a continuous series. Each opening is elliptical in figure, the longest diameter being 0·024–0·012 P. L., and conducts to a canal of the same size, which penetrates through the muscular envelope of the body into the abdominal cavity. These organs are probably an apparatus for conveying water into the abdominal cavity, resembling that of the *Radiata* and *Mollusca.*

b. Muscular System.

This system is highly developed; the suckers and the penis are both furnished with muscles, and there is also a peculiar muscular envelope of the body. The latter has a very curious organization: it consists of three layers, the external of which is 0·048 P. L., and the innermost 0·024 P. L. in thickness; both are formed by circular fibres, the former being continuous with the corium, and the latter containing a tubular cavity, through which the intestine passes. The middle layer is formed of longitudinal fibres, which are arranged in such a manner as to form numerous septa or partitions, radiating from the centre to the circumference, *i. e.* from the central to the external layer, thus presenting very much the appearance of a carriage-wheel. There are, moreover, other very short transverse fibres uniting these septa. Consequently the entire envelope of the body consists of four distinct species of fibres, very singularly disposed.

The muscles of the acetabula are the following. Each one is attached to the muscular envelope by two large retractors; and it has besides a small layer of circular fibres surrounding it externally, and a thick stratum of longitudinal ones internally.

The penis has a slight layer of transverse as well as longitudinal fibres.

The muscles seen with the microscope are, like those of the human intestine, composed of large flat fibres with nuclei, and neither showing transverse lines, nor being united in bundles.

c. Intestine.

As far as I could trace the intestine by dissection and with the microscope, it appeared to be very simple. The mouth is placed at the anterior extremity just above the foremost sucker, and is small and elliptic, without any lips or teeth. The intestine itself is a cylindrical tube, which nearly fills the cavity of the body, and runs straight through its whole anterior worm-like part till it reaches the oval sac. Whether it finishes here or not I cannot tell, because, notwithstanding repeated examinations, I was not able to find an anal orifice.

It may, however, be conjectured that the intestine, if it does not end in a cæcum, passes into the part which I have called penis, and ends at its extremity. With regard to minute structure, the intestine is composed of an exterior muscular layer and a thick epithelium.

d. Vascular System.

Though I have not been able to investigate the whole vascular system clearly, yet I have seen enough to convince me that it is more complex than could be expected from the simple external form of the animal.

The heart is situated in the middle of the back between the branchiæ, on the outside of the above-mentioned muscular envelope of the body, being covered only by the skin. It has an oval shape, being about $\frac{4}{10}$ths of a line in length and $\frac{1}{10}$th of a line in breadth, and seems to consist of an auricle and a ventricle. As I only discovered the heart after my return from Italy, in dissecting the individuals brought with me in spirit, I can say nothing about its contractions; nor am I able even to explain its connexion with the vessels. The only fact which I distinctly saw is, that two large vessels take their origin from the heart, the one from the part which I judge to be the auricle, the other from the ventricle.

With regard to the vessels of the branchiæ and the body my inquiries have been more successful. On each side of the back of the animal there are in the cephalic portion, just beneath the branchial appendages, two large vessels close together: the one situated most externally, which has a diameter of $0{\cdot}096'''$, may be called the branchial artery; the other, of $0{\cdot}048'''$ diameter, the branchial vein.

The branchial arteries give to each branchial appendage a single branch, which, after having formed some ramifications, is connected by capillary anastomosis with the branchial veins. The branchial arteries take their origin from two venæ cavæ, which come from the posterior part of the body, and are formed by the junction of all the smaller veins of the body, among the most conspicuous of which are those of the generative organs and the skin.

The branchial veins are formed by a great number of small veins, which take their origin from the above-mentioned system of capillaries included in the branchial appendages. I could not trace these vessels to the heart; neither was I able to discover vessels, which, from a connexion with the aorta, would appear to be the arteries of the body.

With regard to minute structure, the capillaries are formed by one single, delicate membrane provided with nuclei; the larger vessels have in addition to this membrane a layer of muscular fibres more or less thick.

e. Nervous System and Organs of Sensation.

The only fact which I can furnish with regard to the nervous system is, that there exists a small nerve running alongside the intestine, which is provided, as far as I have observed, with one ganglion containing nucleated cells. This nerve is included in a sheath of cellular tissue, and gives off branches to the intestine.

I was equally unfortunate in my endeavours to discover the organs of sensation, being, after the most careful observation, unable to find organs either of sight or hearing or tentacles.

f. Organs of Generation.

All the specimens which I saw were males. The testicle is formed by an extremely long, small and tortuous tube, which fills nearly the whole of the sac above mentioned, and can easily be perceived in the living animal through the pellucid membrane of the sac. The vas deferens is provided with a strong muscular layer, and has its posterior part included in the oval sac; whilst the anterior part, which is narrower, runs through the middle of the penis, and opens at its extremity by a small orifice. The semen, when taken from the living animal, presents the appearance of a silk thread. It consists of innumerable spermatozoa, which have the same size and form as those in *Octopus vulgaris*, and which originate from small cells filling the end of the testicle.

Description of the Hectocotyle *of* Argonauta Argo.

Delle Chiaje in his memoirs has given a very unsatisfactory figure and description of this animal, which he has named *Trichocephalus acetabularis*. Many years later Costa found specimens of the same animal, and described it also imperfectly, though better than Delle Chiaje, in the 16th volume of the new series of the 'Annales des Sciences Naturelles,' page 185, under the title of *Prétendu parasite de l'Argonaute.* According to his opinion the animal is only a part of the *Argonaut*, perhaps a spermatophore, of a singular shape. According to my own opinion, which will be explained hereafter, the body discovered by Delle Chiaje and Costa is indeed a distinct animal, and, as I hope to be able to prove, most probably the male of the *Argonaut*. As this animal is very like the *Hectocotyle* of the *Tremoctopus* in its exterior shape and structure, I propose to give only a brief account of those points in which they chiefly differ.

The *Hectocotyle* of the *Argonaut* is worm-like, 7 lines long and ½ a line in breadth, thicker in its posterior than in its anterior part, and provided at the latter with a filiform appendage 6 lines in length. The ventral surface of the body is furnished with two rows of suckers alternately disposéd, forty-five on each side; the dorsal surface is smooth, without branchiæ, but provided in its posterior part with a great many round or elliptic spots of a red or violet colour. The appendage is thickest at its origin, and gradually decreases till it becomes very small. In two of the three animals which I obtained, the end of this appendage was quite free; in the third one I found it fixed to the posterior part of the body, that is to say, the end of the process pierced through an opening in the back, just at the part where the coloured spots commenced, and was connected with the male organs in a manner which I shall hereafter describe. Attached to the superior surface of the appendage, close to its junction with the head of the animal, are two delicate triangular membranes, one on either side; they are connected to the appendage by one side, the other being free.

The structure of the animal is very similar to that of the *Hectocotyle* of the *Tremoctopus*. The skin, the contractile coloured spots or pigment-cells, the muscular envelope of the body, the structure of the suckers, are nearly alike in both, size alone excepted. I found however only one large vessel on each side, and instead of branchiæ a great multitude of capillary vessels in the filiform appendage and in the skin of the dorsal surface. I could not detect a heart, nor was I able to find either nerves or organs of sensation. The intestine, which commences with a small orifice just beneath the basis of the appendage, could be traced through the whole body, but no anal opening was to be found.

On the contrary, the male organs were readily traced, and appeared highly developed. The testicle presented the same structure as that of the *Hectocotyle* of *Tremoctopus*, and was inclosed in a large elliptic sac in the dorsal surface, just where the pigment-cells were placed: it gave origin to a small vas deferens, which could not be traced to any great length in two of my specimens. In the before-mentioned animal, however, in which the end of the appendage pierced through an opening in the back, the vas deferens was connected with the appendage, and ran closely attached to its superior surface until it reached the basis; hence it took its course backwards, and entered there a peculiar long tube situated under the sac containing the testicle. This tube, which is composed of two membranes, the internal being thick and muscular, the external thinner and of a mother-of-pearl lustre, may be regarded as the penis. In its interior the vas deferens makes a great many convolutions till it reaches the hindermost part of the body, where it opens together with the penis by a small orifice. The semen and the spermatozoa resemble those of the *Hectocotyle* of the *Tremoctopus*.

Having thus shortly stated the result of my observations on these two species of *Hectocotyle*, I proceed to the most important part of this essay, that is to say, to a statement of the reasons which induce me to regard these *Hectocotylæ* as the males of the Cephalopods on which they live.

But first I must prove that the *Hectocotylæ* described are really animals, inasmuch as Costa considers one of them as a detached portion of the *Argonauta*, or as a part of the seminal apparatus. According to my observations, there can be no doubt of the object in question being a distinct animal, as I had it for hours living in my room, and observed its energetic and evidently voluntary motions. Neither can the *Hectocotyle* be a part of the seminal apparatus, for it is not to be supposed that in that case it would be provided with vessels, nerves, muscles, pigment-cells, &c.; nor a detached portion of the Cephalopod on which it is found, no injury being observable on the latter, and the *Hectocotyle* always living perfectly free on its surface.

As it is therefore placed beyond all doubt that the two *Hectocotylæ* are animals, the question is reduced to whether they stand in a nearer relation to their Cephalopods,—whether, in fact, they are the males of these Cephalopods, or whether they are to be regarded as animals quite different, and belonging perhaps to the class of *Epizoa*. According to my conviction the first is the correct view, which I hope best to prove by showing how I myself arrived at this conclusion.

After I had concluded the anatomical examination of the two *Hectocotylæ*, I for the first time entertained doubts of their relation to Epizootic worms, as for example *Tristoma* and *Myzostoma*, which they so perfectly resemble in their outward appearance, when I considered that not one of these worms, although not unfrequently provided with a highly developed vascular system, possesses two kinds of vessels, that is to say, arteries and veins, a heart and branchiæ. Yet this alone, as may easily be believed, would not have been sufficient to induce an opposite conclusion, if other facts had not attracted my attention and compelled me to examine more carefully. In the first place, I was compelled to recognize the remarkable similarity of the *Hectocotylæ* furnished with numerous suckers and violet pigment-spots with the arms of the Cephalopods on which they live; a similarity which extends so far that the suckers of *Hect. Argonautæ*, with reference to the form and arrangement of the muscles, perfectly resemble those of the Argonaut, while those of the *Hect. Tremoctopodis* accurately represent those of the *Tremoctopus*; and the colour of the pigment-spots in each of the two animals belonging to each other perfectly coincided. Continuing to meditate on the subject, I called to mind several other points of agreement. First, the spermatozoa of *Hectocotyle*, which (like those of *Sepia*, *Octopus*, &c.) are furnished with a moderately long cylindrical body and a long filiform appendage; and secondly, the contractile pigment-cells, which occur in *Hectocotyle* exactly as in the Cephalopods, which is the more important, inasmuch as these remarkable cells have hitherto been found in no other animals. Lastly, I discovered the interesting fact, that the fibres which form the muscular mass of the arms of the Cephalopods are arranged in exactly the same complicated manner in three layers as those which form the muscular envelope of the body of the *Hectocotylæ*.

All these facts at length led to the conviction that there existed a remarkable agreement between the *Hectocotylæ* and their Cephalopods; and the more I considered the subject, the more I felt compelled to believe in a certain relation between them. It was then that the view first occurred to me that the *Hectocotylæ* might be the males of the Cephalopods on which they live, when I called to mind that the twelve specimens of *Hect. Tremoctopodis violacei* and the three of *Hect. Argonautæ* which I had obtained at Messina were all males, and that although a very large number of Argonauts had been examined with reference to their sexual organs, no one had yet been fortunate enough to discover male organs in them. I can prove that of 280 Argonauts, of which Poli examined 30, Delle Chiaje 50, Van Beneden 3, Owen 100, Broderip 60, and myself 50, there was *not a single male*. On this assumption it was easy to explain why no one had hitherto been able to detect the male of *Argonauta*, although it must be admitted that males are very abundant; for as Owen, Madame Power, myself and many others have observed, nearly all the female Argonauts carry about with them impregnated bags of eggs, containing embryos more or less developed. On the other hand, I could not attach too much importance to this view, as it appeared too hazardous to believe that the small vermiform *Hectocotylæ* with their (as far as could be ascertained) imperfect organization, could be the males of some of the larger *Cephalopoda*, which stand so high as regards their structure. I was compelled indeed to admit that something similar takes place with regard to some animals of the class *Crustacea*; in which, as Nordmann has shown, in the genera *Achtheres, Lernæopoda, Tracheliastes*, &c., the males are not only many times (frequently a thousand times) smaller than the female, but also live only upon the females attached in the neighbourhood of their sexual openings, and moreover (which is of the greatest importance) are quite different in their external form and in their structure. Nevertheless, in spite of this important analogy, I did not yet venture to attach full credit to my conjecture, more especially because other genera of Cephalopods, as for example *Sepia, Sepiola, Octopus, Eledone*, &c. possess males of the common form; and because I was not in a condition (as Nordmann had done with reference to the above-named parasitical *Crustacea*) to refer the deviating form of the *Hectocotylæ* to any even embryonary form of *Cephalopoda*.

So far had I arrived by my own investigations; that is to say, I had good grounds for the *conjecture* that the two *Hectocotylæ* were the males of certain Cephalopods, but I was not in a condition to place it beyond doubt, when fortunately my attention was directed to a letter from Madame Power, which Professor Maravigna of Catania had communicated in the year 1835 to the Società Gioenia of that place, in which are contained facts which appear to solve all doubts, and to show on the fullest evidence that the view which I had arrived at through the observations above given is the true one. As I know Madame Power's letter only by a notice given of it by M. de Blainville in the 'Annales des Sciences Naturelles,' 2nde série, vol. vii. p. 173, I can only quote what is there given. De Blainville says:

" Madame Power, ayant en sa possession un grand nombre de ces animaux [Poulpes de l'Argonaute] remplis d'œufs, elle s'est assurée que jamais le Mollusque, à aucune période de son existence dans l'œuf, n'est pourvu de coquille, et qu'il naît ou vient à la lumière entièrement nu; mais qu'il se fabrique une coquille après sa sortie."—" Madame Power, conduite à répéter ses observations, arriva aux mêmes résultats que la première fois, et elle ajouta à son premier Mémoire non seulement un Supplément dans lequel elle consigna les faits qu'elle avait nouvellement observés, mais elle envoya en même temps à la Société Gioénienne ainsi qu'à son secrétaire, les œufs du poulpe de l'Argonaute et les petits poulpes récemment sortis de l'œuf, avec des individus qui avaient déjà plusieurs jours de naissance, et d'autres pourvus de coquilles de différens âges, tous élevés par elle et qu'elle avait vu croître et se développer sous ses yeux. M. Maravigna affirme avoir spécialement observé parmi les petits poulpes qui lui ont été envoyés, l'un d'eux sortant de l'œuf auquel il étoit encore attaché, et qui était entièrement depourvu de coquille. Ainsi ajoute-t-il, les faits observés par Madame Power conduisent à conclure que non-seulement le poulpe de l'Argonaute est le véritable constructeur de sa coquille, et qu'il ne la construit pas dans l'œuf, mais après sa naissance; mais encore que le petit poulpe, au sortir de l'œuf, ne ressemble pas entièrement à ce qu'il sera par la suite; c'est alors une sorte de petit ver (*vermicello*) pourvu de deux rangées de ventouses dans la longueur, avec un appendice filiforme à une extrémité et un petit renflement vers l'autre, où il paraît que sont les organes de la digestion; en sorte que, suivant M. Maravigna, on pourrait supposer que ce ne serait d'abord qu'un appendice brachial extrêmement petit, duquel se développeraient ensuite autant de parties qu'il est nécessaire pour le constituer tel qu'il doit devenir par la suite."

So far De Blainville. According to my views it follows from these observations of Madame Power, which Maravigna, as he told me himself, has repeated, (presupposing that they are entitled to full confidence,) that undoubtedly a vermiform animal quite similar to the *Hect. Argonautæ*, which possesses two rows of suckers, is thicker at one end, and furnished at the other with a filiform appendage, is contained in the eggs of the Argonaut. It would thus be proved that the *Hectocotyle* which has male organs only, is the male of the Argonaut. But however much I may wish to give full credit to the observations of Madame Power and Maravigna, I will not conceal some objections which occur to me on the subject. Madame Power and Maravigna state that they have seen the young vermiform Argonaut escape from the egg. It is easy to perceive that everything depends on the interpretation to be put on this expression. If it is not to be taken literally; if they merely mean to say that in the egg-bag of an Argonaut they have found little worms which resemble the arm of an Argonaut, nothing whatever is proved by it. But if we are to take the observation exactly as it is related and not otherwise, it is of the greatest importance. In this latter case the only remaining question would be, whether Madame Power and Maravigna in fact found an entire egg-bag attached to the shell of *Argonauta* full of *Hectocotyle*-like embryos, or whether they saw among eggs with the common embryos a few with vermiform animals. In the latter case the eggs might have been the eggs of *Hectocotyle*; in the former no doubt could remain that the *Hectocotylæ* are the males of the Argonaut. It is obvious that having made no observations of my own on this point, I can give no decided opinion. All that I can say is, that if Madame Power and Maravigna have actually seen an entire egg-bag of *Argonauta* full of *Hectocotyle*-like embryos, I for my part have not the smallest doubt that the *Hectocotyle Argonautæ* is the male Argonaut. At all events, as the fact would be in a high degree contrary to all analogy, and must actually be regarded as wonderful because single of its kind, new observations are necessary before it can be regarded as established.

I believe that I have now said all that can be adduced in favour of the conjecture that the *Hect. Argonautæ* is the male Argonaut. As regards the *Hectocotyle* of the *Tremoctopus*, I cannot adduce the same facts in its favour, as I have not seen it escape from the eggs of the *Tremoctopus*. Still I have not the smallest doubt, that if it were established that the *Hect. Argonautæ* is the male of the Argonaut, a similar relation would be admitted for the *Hectocotyle* of the *Tremoctopus.* The same may be said with still greater certainty of Cuvier's *Hectocotyle Octopodis,* (which has not since been observed by any one,) more especially because this animal, size excepted, almost entirely agrees with the *Hectocotyle Argonautæ.*

In conclusion, I sum up in a few words all that may be said upon this subject.

1. The *Hectocotylæ* have arteries and veins, a heart and branchiæ, and are therefore very probably not Epizootic worms.

2. *Hect. Argonautæ* and *Hect. Tremoctopodis* bear a close resemblance to *Cephalopoda* in general, and in particular to the genera on which they live, for they have

   a. The same spermatozoa.

   b. Contractile pigment-cells.

   c. Similarly formed and similarly organized suckers.

   d. The same remarkable arrangement of the muscular fibres; the *Hectocotylæ* in the muscular envelope of the body, the Cephalopods in the arms.

3. Among 280 Argonauts examined not a single male was found.

4. Nevertheless, the males must be very abundant, inasmuch as nearly all the Argonauts possess impregnated ova.

5. The *Hectocotylæ* live in the neighbourhood of the female sexual organs of their Cephalopods, and are all males.

6. The eggs of the Argonaut contain, according to Madame Power and Maravigna, embryos perfectly resembling the *Hect. Argonautæ.*

If this last position is correct, the *Hectocotyle Argonautæ* is undoubtedly the male of the Argonaut.

III. *Descriptions of some unpublished Species of Plants from North-Western India.* *By* M. Pakenham Edgeworth, *Esq., F.L.S., Bengal Civil Service.*

Read June 3, 1845.

DURING a residence of several years in the north-west provinces of Bengal, I gradually collected an herbarium amounting to about 2000 species, partly from the plains and partly from Himala; all the specimens, with a very few exceptions, were collected with my own hands. On my return to England, I gave it, with the exception of a few families mentioned below, to Mr. Bentham, who has kindly undertaken to name and include such as may be new of the *Scrophularineæ* and *Labiatæ* in his monographs of those families in the forthcoming volumes of DeCandolle's 'Prodromus,' and likewise the *Leguminosæ* in his examination and revision of that extensive family. The *Acanthaceæ* have been sent to Professor Nees von Esenbeck; and the remainder of the *Corollifloræ*, from *Bignoniaceæ* onwards (according to the arrangement in DeCandolle's 'Prodromus'), were sent to M. DeCandolle himself; the *Gramineæ* to Messrs. Ruprecht and K. von Meyer at St. Petersburgh; and the few *Carices* I had to Dr. Boott. The remainder has been compared by Mr. Bentham with his herbarium, and such species as appeared new have been carefully examined by me again from the dried specimens. Of most I had descriptions, more or less detailed, made from the fresh plant, and they have been since compared, as far as practicable, with Dr. Royle's and Dr. Wallich's herbaria. Some of those now published are remarkable as offering new forms, as for example, a *Clematis* with bearded filaments and introrse anthers; an *Inula* with white flowers and the habit of an *Aster*; and a Commelyneous plant with a twining stem: others, as being Indian species in genera hitherto considered exclusively American, as *Adenocaulon* and *Oxybaphus*.

In a few instances I have described plants previously named, but without descriptions, by Dr. Wallich in his 'Catalogue,' or by Dr. Royle in his 'Illustrations.'

I have very unwillingly been obliged to add some more genera to the already unwieldy *Umbelliferæ*; but it was impossible to include these species under existing genera, as now defined. It is remarkable that already in this family, out of 65 Indian species described in DeCandolle's 'Prodromus,' and 15 more by Dr. Lindley in Royle's 'Illustrations,' no less than 8 new genera have been formed out of solely Himalayan species; and I have no doubt that very many new species and genera are still to be found in these mountains.

Ord. Ranunculaceæ.

1. Clematis (*Flammula*) amplexicaulis; floribus paniculatis, sepalis obtusis revolutis, foliis ternatisectis, petiolis longis amplexicaulibus, foliolis ovatis acuminatis.

Hab. Himala, in sylvis ad alt. ped. 7000–9000. Dhanaulti. Floret Aug. et Sept.

Scandens, glaberrima. Folia ternatisecta; petiolo longo (4–6 pollicari) basi dilatato amplexicauli; foliolis distantibus longè petiolulatis, glabris, ovatis, obliquè cordatis, acuminatis, integris, vel variè lobatis, crenato-serratis, serraturis mucronatis, 5–6 pollic. longis, $2\frac{1}{2}$–3 latis. Paniculæ foliaceæ dichotomæ, cum pedunculo intra ramos solitario subtrichotomæ. Pedunculi longi; bracteis amplexicaulibus acuminatis gradatim minoribus variè lobatis, supremis sessilibus lanceolatis 3-dentatis. Flores nutantes; sepalis erectis apice revolutis oblongis obtusis subemarginatis, utrinque velutinis, 10–12 lineas longis. Stamina villosa. Achenia hirsuta, caudâ basi longè, suprà gradatim minùs barbato-plumosâ, apice nudo.

Affinis videtur *C. connatæ*, Wall. at satis differt formâ foliorum florumque.

2. Clematis (*Flammula*) gracilis; floribus ternis longè pedunculatis, sepalis erectis apice revolutis extùs velutinis intùs glabris, foliis ternatisectis membranaceis.

Hab. Himala, in sylvis. Shioli, alt. ped. 7000–8000.

Scandens, glabriuscula. Folia ternatisecta subglabra membranacea; foliolis petiolulatis subcordato-ovatis acutis, dentatis, serraturis mucronatis, 3–4 poll. long. 2 poll. latis. Pedunculi longi graciles 3-flori; bracteis lineari-lanceolatis acutis. Flores nutantes; sepalis erectis apice revolutis obtusis extùs velutinis. Stamina basi glabra, suprà pilosa. Achenia tomentosa, caudâ basi plumosâ, apice nudo.

A *C. Mauritianâ* differt sepalis erectis nec patentibus, et foliis tenuioribus.

3. CLEMATIS (*Flammula*) VELUTINA; floribus paniculatis nutantibus, sepalis erectis apice revolutis, foliis pinnatisectis nervosis; foliolis glabris cordato-ovatis.

Hab. Himala, in sepibus, alt. ped. 6000–9000. Simla, Nagkunda.

Scandens, glabriuscula. Folia pinnatisecta puberula; foliolis longè petiolulatis, cordato-ovatis acutis, irregulariter lobatis integerrimisve, grossè crenato-serratis, serraturis mucronatis, 3–4 poll. long. $1\frac{1}{2}$–2 lat. Paniculæ multifloræ, pedunculis ternis longiusculis, bracteis lanceolatis plùs minùs lobatis dentatisve. Flores nutantes, sepalis obliquis acutis utrinque velutinis erectis apice revolutis pollicaribus. Stamina villosa. Achenia tomentosa, caudâ plumoso-barbatâ.

4. CLEMATIS (*Flammula*) PARVIFOLIA; pedunculis solitariis 1-floris, foliis bipinnatisectis; foliolis integris sublobatis puberulis glaucis, petiolis dilatatis.

Hab. Himala, ad alt. ped. 10,000–11,000.

Subscandens, subglabra. Caulis (junior) minutissimè puberula purpurascens teres nec sulcata. Folia glaucescentia bi-pinnatisecta; pinnis 4–5 jugis brevibus pauci-foliolatis; foliolis subtùs adpressè puberulis suprà glabris, ovatis, integris v. subdentatis, terminali acuminato, 6–8 lineas longis, 2–3 lin. latis; petiolo basi dilatato subamplexicauli. Pedunculus axillaris solitarius 1-florus 2-bracteolatus, bracteis 3-partitis v. 3-lobatis. Flos ignotus. Achenia villosa, in caudam longissimam usque ad apicem barbato-plumosam producta.

Proxima videtur *C. sulcatæ*, Wall. no. 4667, satis distincta foliorum pinnis brevibus nec longè petiolatis, petiolis dilatatis.

CLEMATIS, *Sectio nova* BEBÆANTHERA (βέβαιος fixus, ab antherâ affixâ nec liberâ). *Antheræ introrsæ barbatæ. Petala* 0. *Involucrum* 0. *Achenia in caudam barbato-plumosam producta. Cotyledones approximatæ.*

5. CLEMATIS BARBELLATA; monoica, pedunculis unifloris axillaribus, foliis ternatisectis; foliolis ovatis acuminatis, antheris introrsis barbatis.

Hab. Himala, in sylvis, ad alt. ped. 8000–9000. Chúr. Junio.

Scandens, glabra. Caulis teres purpurascens. Folia ternatisecta; foliola breviter petiolulata, obliquè ovata, plùs minùs acuminata, lobata, vel inciso-dentata, argutève serrata, serraturis mucronatis, 2–$2\frac{1}{2}$ poll. longa, 1–$1\frac{1}{2}$ lata. Pedunculi axillares numerosi uniflori 2-bracteolati foliis breviores. Sepala subpatentia utrinque velutina purpurea ovata acuminata, apiculo reflexo, 10–12 lin. longa. Fl. ♂: Stamina sepalis duplò breviora;

filamentis dilatatis hirsutis; antheris introrsis, connectivo dilatato fixis, dorso densè hirsuto-barbatis. Fl. ♀: Achenia glabra, caudâ longâ ($1\frac{1}{2}$ pollicari) subæqualiter barbato-pilosâ. Semen pendulum. Cotyledones approximati.

Hæc species sectioni novæ pertinere videtur; unà cum *C. montaná* a *Cheiropside* differt involucri carens; et dum habitu ad *Atragenem* inque situ etiam cotyledonum accedit, ab istâ differt egentiâ petalorum. At maximè a toto genere nec non tribû differt in formâ staminum et structurâ antherarum, quæ introrsæ sunt ut in *Pæonieis* nec liberæ et extrorsæ ut in aliis omnibus Ranunculaceis; quapropter malim genus novum potiùs quam sectionem instituere, nisi vetet habitus omninò *Clematidis*.

6. THALICTRUM MACROSTIGMA; foliis biternatis; foliolis rotundatis 3-lobis: segmentis mucronulatis, floribus axillaribus solitariis, sepalis scariosis, filamentis longissimis paucis, stylis brevibus, stigmatibus magnis, acheniis stipitatis.

Hab. Himala, ad alt. ped. 7000–9000. Jhillam, in Garhwál Orientali Superiore. Floret Oct.

Herba 1–2 pedalis. Folia subsessilia 2-ternata; foliolis petiolulatis 3-lobis, segmentis integris lobulatisve mucronulatis, basi obtusis subcordatisve. Pedunculi solitarii axillares uniflori, folii longitudine; sepala 4 scariosa, ovata, acuta, trinervia. Stamina 8–12, filamentis longissimis capillaribus; antheris apice mucronatis. Ovaria 9–15 dolabriformia, interiora longiùs, exteriora breviùs stipitata, stylo brevissimo, stigmate dilatato hastato valdè papilloso, marginibus demùm revolutis subfusiformi. Fructus?

7. THALICTRUM SECUNDUM; ramis foliisque biternatis secundis sessilibus; foliolis 3-lobis basi cuneatis, floribus solitariis, stigmatibus dilatatis, acheniis stipitatis.

Hab. Himala, in rupibus, alt. ped. 11,000–13,000. Chúr, Badhrinath. Sept. Oct.

Herba 4–12 uncialis, foliis ramulisque secundis. Folia sessilia biternata; foliolis petiolulatis, basi cuneatis, 3-lobis, segmentis integris 3-crenatisve, nervosis. Pedunculi axillares, foliis duplò longiores, solitarii, 1-flori. Sepala ——? Stamina ——? Styli breves, stigmatibus hastatis dilatatis papillosis, marginibus demùm revolutis. Achenia stipitata, dolabriformia, nervosa.

8. THALICTRUM ELEGANS (*Wall. Cat.* 4728); foliis tripinnatisectis, foliolis cuneatis 3-lobis 3-dentatisve, acheniis longe stipitatis bialatis.

Hab. Himala, in rupibus, alt. ped. 10,000–12,000, in cacumine Montis Chúr.

Herba pedalis parcè ramosa. Folia 1–2 pollicaria 3-pinnatisecta; foliolis minutis 3-lobis, 3-dentatisve, lateralibus obtusis, terminali plùs minùsve acuto. Pedunculi axillares uniflori. Flores desunt. Achenia longè stipitata, gibbosa, nervosa, membranaceo-alata, alâ superiore duplò majore; stylo persistente, stigmate mediocriter dilatato, marginibus inflexis subfusiformi. Semen ellipticum glabrum.

Species* distinctissima, acheniis membranaceo-alatis.

9. THALICTRUM PEDUNCULATUM; foliis 3–4-ternatisectis; segmentis petiolatis rotundatis 3-lobis: lobis 3-lobulatis, sepalis 4–5 petaloideis, acheniis 10–11 apice uncinatis.

Hab. Himala, ad alt. ped. 7000–8000 in nemoribus. Simla. Floret Aprili.

Herba bipedalis. Folia 3–4-ternatisecta; vaginâ petioli membranaceâ integrâ; foliolis graciliter petiolatis rotundatis trilobis, basi cuneatis, obtusis, cordatisve, lobis 2–3-lobulatis. Pedunculi 2–3 ex axillâ folii superioris depauperati orti. Sepala petaloidea, 4–5, alba, rotundato-ovata, obtusa. Stamina sepalis breviora, filamentis subdilatatis; antheris muticis. Ovaria gibba striata, 10–12; stylo longo uncinato stigmate brevi subcapitato, nec dilatato. Achenia elliptica compressa breviter stipitata utrinque attenuata, nervis prominentibus simplicibus furcatis vel anastomosantibus striata, stylo longè incurvo uncinata.

Proxima videtur *T. orientali* (Ann. Sciences Nat. xvi. p. 349), at differt carpellis longioribus pluribusque, nec tantùm 3–4, foliolisque magis lobatis.

T. radiato etiam accedit stylis uncinatis foliisque triternatis.

10. ANEMONE (*Homalocarpus*) SCAPOSA; foliis longè petiolatis cordato-palmatis quinquefidis; lobis 3–5 lobatis: lobulis integris 2–3-crenatisve villosis, involucralibus tribus v. quatuor trifidis; lobis oblongis integris dentatisve, pedicellis 5–6 unifloris involucro multò brevioribus, sepalis 5 ovatis extùs puberulis albis, acheniis pilosis, scapo foliis longiore.

Hab. Himala, in pascuis elatis, alt. ped. 10,000–12,000. Chúr. Floret Junio.

Differt ab *A. polyanthi* (eadem ac *A. longiscapa*, Wall.) acheniis pilosis nec glabris, et ab *A. Baikalensi* foliis 5-fidis nec 3-partitis; valdè affinis *A. villosæ*, Royle†.

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* The description of this plant by Mr. Don in Dr. Royle's 'Illustrations' is so inaccurate, that I believed this to be a distinct species, till I saw the specimens in Dr. Royle's herbarium and in that of the Linnean Society. I cannot but imagine that Mr. Don must have accidentally transferred the description of some other specimen to this name and reference.

† Dr. Lindley has described a species much resembling this plant in the 'Botanical Register,' 1844, t. 65, under the name of *A. obtusiloba*, Don, as identical with *A. Govaniana*, Wall. Cat. 4688. But it is totally different from the authentic specimens of that plant in Mr. Bentham's herbarium, and from the description in Don's 'Prodromus,' p. 194; that species having but one flower in the involucre,

11. Ranunculus (*Hecatonia*) nephelogenes; acaulis, foliis radicalibus petiolatis glabris lanceolatis cuneatisve integris vel tri-inciso-crenatis, scapo solitario 1–2-foliato 1-floro, petalis subrotundis, acheniis rugosulis rectè acuminatis.

Hab. Himala, in elatis, alt. 17,000–18,000 pedes. Floret Sept. Oct.

Acaulis, uncialis, nec stolonifera. Folia radicalia, petiolata, lanceolata, integerrima v. cuneata 3-inciso-crenata. Scapus solitarius terminalis 1-florus 1–2-foliatus, foliis integris trifidisve, apice pubescens. Sepala basi pilosa, apice glabra, reflexa. Petala subrotunda, lætè aurea, sepalis longiora. Stamina 10–15. Ovaria 0. Achenia rugosula ovata acuminata, stylo recto nec adunco.

Proxime accedit *R. salsugineo, nubigeno, cymbalariæque*, sed ab omnibus differt egentiâ stolonum, formâ petalorum foliorumque et calyce reflexo nec adpresso.

12. Ranunculus (*Hecatonia*) riparius; hirsutus, foliis radicalibus ternatisectis; foliolis petiolatis basi cuneatis 3-partitis: segmentis dentatis acutis, receptaculo elongato piloso, acheniis compressis lævibus stylo incurvo brevissimè apiculatis.

Hab. In ripis arenosis fluminum Indiæ Septentrionalis. Lodihana, Bhogpur in Gange.

Radix fibrosa. Caules numerosi hirsuti ramosi. Folia radicalia petiolata ternatisecta; foliolis petiolatis basi cuneatis 3-partitis, segmentis dentatis acutis pilis paucis adpressis subhirsutis: caulina similia sed gradatim difformia: floralia lanceolata. Flores solitarii axillares, pedunculo folio breviore. Sepala extùs hirtella reflexa. Petala sepalis breviora. Achenia numerosa, in receptaculo elongato piloso spiraliter disposita, compressa, marginata, stylo incurvo (sæpè caduco) brevissimè apiculata. Herba annua pedalis.

R. fibrosæ, Wall. Cat., eidem ac *R. nepalensi*, DeC. no. 113, maximè accedit; differt pluribus notis.

13. Ranunculus brevirostris; adpressè pilosus, foliis radicalibus longè petiolatis rotundatis palmatim tripartitis; segmentis obtusis 2–3-fidis dentatis, sepalis adpressis, acheniis glabris gibbis marginatis, stylo brevissimo incurvo caduco.

Hab. In uliginosis Himala, alt. ped. 10,000–11,000. Floret Oct. Badhrinath, 1838.

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and therefore not belonging to the section *Homalocarpus*. Dr. Lindley's plant is almost identical with *A. villosa*, Royle, Ill. Bot. Him., differing only in the degree of villosity. My plant differs from both, in having the leaves more and more deeply divided and very much shorter pedicels.

Perennis, 2–3 pedalis, multicaulis. Caules fistulosi adpressè pilosi, ramosi. Folia radicalia longè (petiolo 1–2-pedali) petiolata, rotundata, basi cordata, 3-partita; segmentis 2–3-fidis, inciso-dentatis, obtusis: caulina gradatim minora, segmentis acutioribus: floralia lanceolata. Flores majusculi. Pedunculi dichotomi adpressè pilosi. Sepala hirsuta ovata adpressa, petalis rotundatis duplò breviora, margine membranaceo revoluto. Receptaculum breve glabrum. Achenia glaberrima, apicem versus subrugosa, gibba, marginata, stylo brevissimo incurvo superata, vel sæpiùs stylo caduco obtusa.

Affinis *R. recurvato*; differt calyce non recurvato stylisque brevibus caducis.

Ord. Berberideæ.

14. Berberis (*Sect.* 1.) brachybotrys; spinis 3-partitis, foliis obovatis spinoso-serratis, paniculis foliis brevioribus, baccis subcylindricis rubris.

Hab. Himala, ad alt. ped. 9000–12,000. Chúr, Liti, Badhrinath, &c. Floret Junio. Fructus Sept. Oct.

Frutex humilis 2–3 pedalis, ramis virgatis. Spinæ 3-partitæ, foliis duplo breviores. Folia fasciculata sessilia cuneato-obovata spinoso-serrata vel rariùs subintegra. Paniculæ racemiformes, erectæ, confertifloræ, foliis breviores, ramulis bracteatis trifloris; bracteæ lanceolatæ acuminatæ, florales pedicello longiores. Sepala et petala rotundata. Bacca subcylindrica, stylo brevissimo superata, rubra.

Affinis *B. Kunawarensi*, Royle; differt paniculis brevioribus.

Ord. Nymphæaceæ.

15. Nymphæa (*Cyanæa*) punctata; foliis subpeltatis suborbiculatis sinuato-dentatis glabris subtùs punctatis basi bilobis; lobis approximatis, stigmate 20-radiato.

Hab. In stagnis Prov. Sirhind, Sádhaura. Julio, Septembri.

Folia natantia vix peltata, suborbiculata, obtusè sinuato-dentata, glabra, subtùs immerso-punctata, purpurascentia, basi biloba lobis approximatis. Scapus ad apicem hispidulus. Calyx glabriusculus. Petala oblongo-lanceolata acuta, cærulescentia, 3–5 pollicaria. Stamina basi dilatata, apice in appendicem oblongam foliaceam supra antheras producto. Stigmata circiter 20.

Differt ab omnibus hujus sectionis foliis punctatis.

16. Nymphæa (*Lotus*) sagittata; foliis subpeltatis integris ovato-sagittatis subtùs pubescentibus impunctatis, antheris exterioribus breviter appendiculatis.

Hab. In stagnis Prov. Sirhind, Ambala. Floret Junio, Octobri.

Folia subpeltata, integra, ovata, sagittata, lobis divaricatis, suprà glabra subtùs pubescentia nec punctata. Scapus ad apicem pubescens. Petala oblongo-lanceolata obtusa 1–$1\frac{1}{2}$ pollicaria.

Affinis hinc *N. stellatæ* illinc *N. eduli.*

Ord. Fumariaceæ.

17. Corydalis (*Capnites*) pauciflora; caule exsquamato, foliis triternatis; foliolis obovatis integris obtusis mucronulatis, racemo paucifloro, calcare elongato obtuso.

Hab. Himala, in sylvis humidis, alt. ped. 7000–8000. Simla. April.

Herba glaberrima, vix erecta, 5–6 uncialis. Radix ——? Caulis simplex, exsquamatus, bifoliatus cum racemo uno, sive racemis duobus cum foliis tribus; folia inferiora opposita 3-ternata, superiora alterna biternata, segmentis primariis longè petiolatis, foliolis obovatis basi cuneatis apice obtusis mucronulatis, integerrimis; lætè virentia. Racemi terminales 3–4-flori: bracteæ ovatæ integræ denticulatæve acutæ pedicello multo breviores. Pedicellus fructifer elongatus. Sepala minima laciniata non caduca. Petala conniventia purpurascentia. Calcar 6–7 lineas longum, pedicello longius; synematis calcar ad finem ferè istius productum. Siliqua ovata, in stylum persistentem attenuata.

Valde affinis *C. longifloræ*; differt calcaribus brevioribus obtusis, et caule exsquamato.

18. Corydalis flabellata; erecta, caule ramoso exsquamato, foliis pinnatisectis; foliolis flabelliformibus glaucis, racemis confertifloris, calcare brevi, siliquâ oblongâ, stylo longo persistente.

Hab. In glareosis Himala, alt. ped. 9000–10,000. Malári, in Garhwál Superiore.

Herba 1–2 pedalis, glabra. Caulis erectus ramosus. Folia crassa alterna pinnatisecta; foliolis flabellatis, emarginatis plùs minùs sinuatis. Racemi axillares terminalesque, ramis superioribus exfoliatis paniculam formantibus. Flores conferti. Pedicelli breves, bracteâ subulatâ sublongiores. Sepala (non valdè caduca) semisagittata, scariosa, sinuato-dentata. Petala lutea, exteriora apice patentia dorso cristata, cristâ integrâ, mucronata; interiora oblonga basi attenuata, apice rotundata emarginata, latere superiore breviter alata. Calcar breve, pedicello vix longius; synematis calcar breve incurvum. Siliqua ovata, nec inflata, in stylum persistentem attenuata, polysperma; semina nigra, lævia, caruncula parvo sinum tantùm tegente.

Affinis *C. crassifoliæ*, Jacquemont, et cum illo nullæ sectioni Candollianæ referenda.

19. Corydalis debilis; foliis 2–3-pinnatisectis; segmentis cuneatis trilobatis

rotundato-obtusis mucronulatis, petiolo vaginante, racemis longis, bracteis 3-dentatis pedicello duplò longioribus, calcare longo obtuso, siliquis obovato-oblongis, stylo persistente.

Hab. In Himala, alt. ped. 9000–10,000, in valle Vishnuganga fluminis infra Badhrinath.

Glabra; caulis debilis ramosus. Folia alterna 2–3-pinnatisecta glauca, petiolis alâ membranaceâ vaginantibus, segmentis cuneatis trilobis rotundato-obtusis mucronulatis. Racemi axillares terminalesque, multiflori. Bracteæ foliaceæ, cuneatæ, tridentatæ, supremæ lanceolatæ acutæ pedicello duplò longiores. Sepala minima scariosa caduca lacinioso-dentata. Petala lutea; exteriora dorso cristata; lateralia unguiculata. Calcar petalis longius; synematis calcar isto dimidio brevius. Stigma 4-lobatum. Stylus filiformis persistens. Siliqua obovato-oblonga, apice truncata, basi attenuata.

Affinis *C. vaginanti, filiformi,* &c.

Ord. Cruciferæ. Trib. Arabideæ.

20. Arabis (*Alomatium,* § 1. DeC.) Himalaica*; pilis bifidis simplicibusve hispida, foliis pauci-dentatis integrisve radicalibus petiolatis caulinis sessilibus amplexicaulibusve obovatis, pedicellis calyce hispido brevioribus.

Hab. In glareosis Himala, alt. ped. 10,000–11,000. Mana. Sept. Oct.

Annua, erecta, 6–10 pollicaris, pilis simplicibus furcatisque hispida, ramulosa. Folia inferiora in petiolum attenuata, superiora sessilia vel amplexicaulia, obovata, denticulata vel integra, hirsuta. Rami, racemum foliaceum formantes, post anthesin elongantur. Pedicelli breves. Sepala erecta hirsuta marginata basi æqualia. Petala parva, limbo dilatato integerrimo lilacina; glandula hypogyna utrinque placentaria 1, valvaria 1 (?). Stamina edentula. Stylus brevis; stigma capitatum. Siliqua teretiuscula compressa 1-nervis, pilis furcatis hispida; semina alternatim biserialia, ovata, rugosula, glabra, immarginata; funiculo brevi filiformi; septo enervi.

21. Arabis (*Alomatium,* § 1. DeC.) amplexicaulis; infrà pilis simplicibus hirsuta suprà glabra, foliis latè ovatis dentatis integrisve, sepalis basi æqualibus glabris, petalis emarginatis, siliquâ longissimâ glabrâ stylo apiculatâ, seminibus alâ parvâ marginatis rugoso-striatis.

Hab. In sylvis humidis, alt. ped. 8000–9000. Chúr; Shioli in Garhwál, &c. Floret Junio.

Annua, erecta; caule tereti vix ramoso, infrà pilis simplicibus hirsuto suprà glabro. Folia

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* Himala*icus* potiùs quam Himalensis aut Himalayanus, ut Pyrena*icus*, Carpath*icus*, Alta*icus*.

radicalia lanceolata obtusa in petiolum attenuata dentata hirsuta. Folia caulina sessilia amplexicaulia, inferiora latè ovata, grossè dentata, superiora lanceolata integra, plùs minùs hirsuta, pilis simplicibus vel præsertim in nervis furcatis, 1–3 poll. longa, ½–1½ lata. Racemi elongati, axillares pauciflori, terminales multiflori. Pedicelli calyce longiores, fructiferi elongati. Sepala basi æqualia, obtusa, erecta, glabra. Petala, limbo dilatato emarginato, alba. Stamina, filamentis dilatatis edentulis; antheris oblongis basi cordatis virescentibus; glandula utrinque placentaria 1 magna, valvariæ 2 parvæ; stylus brevis, stigmate subcapitato emarginato. Siliqua longissima (2–3 pollicaris) glabra, stylo elongato apiculata; valvis subenervibus; placentis prominulis; septo hyalino enervi; funiculis longiusculis filiformibus. Semina alternatim uniserialia, alâ parvâ marginata, rugoso-striolata.

22. ARABIS (*Alomatium*, § 3. DeC.) SAXICOLA; pube stellatâ hispidula, ramis efoliaceis, foliis lineari-oblongis integris, pedicellis calyce hirsuto multò longioribus, siliquâ lineari compressâ.

Hab. In glareosis saxosisque in valle fluminis Dhawli, Garhwál Superioris, alt. ped. 9000–11,000.

Frutex ramosa, pube stellatâ adpressè hispidula. Folia lineari-oblonga, basi attenuata integra. Pedicelli calyce multò longiores. Sepala duo basi subgibbosa hirta. Petala basi attenuata, oblonga, rosea. Glandula placentaria utrinque 1, valvaria 1 (?). Stamina edentula; antheris ovatis basi cordatis. Stylus brevis; stigmate emarginato. Siliqua linearis, compressa, polysperma, valvis 1-nervibus; septo hyalino enervi; placentis internis; funiculis filiformibus. Semina alternatim 1-serialia, ovata, minutissimè rugosula, immarginata.

23. ARABIS ARVENSIS; ramosa, hispida, foliis petiolatis lanceolatis v. ovatis dentatis, racemis axillaribus, floribus subsessilibus, siliquis subteretibus hispidis stylo conico acuto persistente apiculatis.

Hab. In arvis Pentapotamiæ prope Lahor. Mart.

Herba annua, erecta, ½–2 pedalis, ramosa, pilis bifidis stellatisque hispida. Rami subteretes. Folia alterna, omnia petiolata, lanceolata vel ovata, distanter dentata, hispida. Racemi terminales, inflorescentiâ elongati. Flores subsessiles (infimi 1–2 sessiles). Sepala erecta, basi æqualia, oblonga, membranaceo-marginata, hirsuta. Petala unguiculata, exserta, limbo dilatato obovato roseo. Stamina edentula. Antheræ longæ sagittatæ. Glandulæ nullæ? Stigma conicum, acutum. Siliqua longa, subteres, pube stellatâ subhispida.

Affinis *A. Cebennensi.*

24. Arabis (*Lomaspora; Catalobus*, Meyen) pterosperma; erecta, foliis pilis 2–3 furcatis hispidulis sessilibus denticulatis, pedicellis calyce glabro duplò longioribus, siliquâ gracili patente polyspermâ, seminibus alatis rugosis.

Hab. In Himala, alt. ped. 9000–10,000. Badhrináth.

Erecta, ramis filiformibus pube bi- trifurcatâ hispidulis. Folia caulina sessilia, obovata vel oblonga, denticulata vel integra. Racemi terminales, post anthesin elongati. Pedicelli calyce longiores. Sepala basi æqualia, ovata, obtusa, marginata, glabra. Petala oblonga, basi attenuata. Stamina edentula. Glandulæ utrinque valvariæ 2, placentariæ 0. Stylus brevis. Stigma capitatum. Siliqua longissima, polysperma, compressa, glabra, suberecta, vix patens; valvis dorso 1-nervibus, septo enervi hyalino. Semina alternatim 1-seriata, alata; testâ præsertim in alâ rugosâ; funiculo filiformi longo.

Affinis *A. Canadensi.*

Trib. Sisymbrieæ.

25. Sisymbrium (*Arabidopsis*) rupestre; pilis furcatis stellatisque hispidum, foliis radicalibus obovatis caulinis oblongis integerrimis denticulatis, pedicellis calyce hirto longioribus, siliquis pilosis rectis.

Hab. In Himala, alt. ped. 13,000–15,000. Gastoli supra Mána.

Herba erecta, parcè ramosa, palmaris, pilis furcatis stellatisque hispida. Folia crassiuscula hispida; radicalia obovata in petiolum attenuata; caulina sessilia, oblonga, denticulata. Racemi paucifoliati. Pedicelli calyce longiores, ebracteati, fructiferi patentes. Sepala erecta, angustè ovata, acuta. Petala oblonga, angusta, alba. Stamina edentula. Antheræ ovatæ. Glandula utrinque placentaria 1, valvaria 1. Siliqua subteres, compressiuscula, subpilosa. Semina alternatim uniseriata; cotyledones incumbentes.

Affinis *S. contortuplicato.*

Sisymbrium *Columnæ*, omninò similis speciminibus Europæis.

Hab. In Himala, alt. ped. 9000–11,000. Pharkia prope Niti.

Thlaspi *perfoliatum*, non discernendum ab Europæo (fructu immaturo).

Hab. In Himala, alt. ped. 7000–8000. Simla.

Lepidium *incisum* (Ledebour, Fl. Alt. iii. p. 191), omninò eadem ac species Altaica.

Hab. In Himala, alt. ped. 12,000–13,000. Músapáni supra Mána.

Ord. Polygaleæ.

26. Polygala (*Polygalon*) scabra; ramis strictis paucifoliatis foliisque scabris, calycis alis obliquè ovatis 3-nervibus, capsulâ sessili glabrâ.

Hab. Himala, in rupibus apricis frequens, alt. ped. 3000–6000.

Suffrutex; ramis strictis virgatis pedalibus paucifoliatis; petiolis decurrentibus, subangulatis, scabris. Folia distantia, breviter petiolata, linearia, utrinque acuta, mucronata, scabra. Racemi terminales; pedicelli remoti, bracteis 3 scariosis acutis longiores, calyce breviores. Sepala 3 exteriora ovata, 1-nervia, scariosa, interioribus duplò breviora. Alæ obliquæ, ovatæ, 3-nerves. Corolla alis inclusa, rosea; petala lateralia ungue uno latere minutè ciliata, limbo dilatato truncato; carina galeata cristâ fimbriatâ. Capsula glabra, sessilis, obliquè obovata, emarginata, alata.

Affinis *P. roseæ*, differt alis minoribus et capsulâ sessili; a *P. oligophyllâ* et *leptaleâ*, Wall. (quæ meo sensu eadem species est) differt inflorescentiâ laxiore, alis latioribus, et caule minùs alato; ab omnibus hujus sectionis scabritie foliorum.

Ord. Caryophylleæ. Trib. Sileneæ.

27. Silene (*Otites*) multifida; pubescens, caule simplici, foliis lanceolatis ovatisve amplexicaulibus inferioribus in petiolum attenuatis, racemis axillaribus, floribus erectis, calyce viscoso, petalis ecristatis bipartitis; segmentis multifidis.

Hab. Himala, ad alt. ped. 8000–9000, in apricis prope pagum Ghillum, Garhwal Superioris.

Pubescens, pube adpressâ simplici. Caules crassi, stricti, erecti. Folia opposita vel terna, pubescentia, margine undulata; inferiora lanceolata, basi in petiolum amplexicaulem attenuata; superiora ovata, acuta, amplexicaulia. Racemi pauciflori, axillares. Flores erecti vel divergentes nec penduli. Calyx strictus, cylindricus, decem-striatus, breviter 5-dentatus, petalis multo brevior, viscosus. Anthophorus brevissimus. Petala alba, ecristata, 2-partita, segmentis 2-fidis, lobis 2–4-fidis. Stamina pubescentia, breviter exserta. Styli 3–4.

Affinis *S. viscosæ*.

28. Melandrium (*Lychnis*, sect. *Gastrolychnis*) pilosum; piloso-pubescens viscosum, foliis latè ovatis, calyce inflato 10-nervi 5-dentato, petalorum glabrorum laminis bipartitis; segmentis bifidis; dentibus coronariis 2 brevibus.

Hab. Himala, ad alt. ped. 12,000–13,000. Músapáni supra Mána in Garhwal.

Herba 1–2-pedalis, debilis, densè piloso pubescens, viscosa, caule tereti; folia latè ovata, subsessilia, opposita, piloso pubescentia. Ramuli bifoliati, uniflori. Flores terminales axillaresque, solitarii, erecti. Calyx vesiculoso-inflatus, pubescens, viscosus, 10-nervis, 5-dentatus, petalis brevior. Petala alba, glabra, laminis bipartitis, segmentis bifidis, dentibus coronariis 2 brevibus. Genitalia breviter exserta.

Affinis *M. inflato*.

Trib. Alsineæ.

29. Stellaria (*Schizostegium*) paniculata; foliis glabris lanceolatis acuminatis petiolatis marginatis, calyce glanduloso piloso petalis 2-fidis longiore, capsulâ monospermâ.

Hab. In nemoribus, alt. ped. 9000–10,000. Jauglig, mense Octobri.

Ramosissima, ramis fistulosis, elongatis, glaberrimis, lævibus, lucidis, uno latere lineâ pilosâ pilis simplicibus notatis. Folia ovato-lanceolata, acuminata, inferiora petiolata, superiora vix subsessilia; petiolo ciliato; glabra vel minutè scabro-pilosa, nervo submarginata, quandoque crispata. Paniculæ axillares terminalesque, dichotomæ, multifloræ. Pedicelli calyce longiores bracteæque ovatæ acutæ glanduloso-pilosi. Calyx 5-phyllus, glanduloso-pilosus; sepalis ovatis, membranaceo-marginatis, obtusis. Petala calyce breviora, vix ultra medium bifida; segmenta divaricata. Stam. 10; filamenta basi dilatata, subconnexa; antheris ovalibus. Styli 3 breves; ovarium apice rugosum. Capsula 3-valvis; semen solitarium, magnum, aciculatum.

Differt a *S. monospermâ* (*crispatâ*, Wall.) foliis petiolatis et sepalis glanduloso-pilosis.

30. Stellaria (*Larbrea*) decumbens; caulibus subtetragonis radicantibus pilosis, foliis sessilibus subulatis, sepalis glabris acutis, petalis minimis bifidis, stylis 3–4, pedicellis axillaribus solitariis longis.

Hab. Himala, ad alt. ped. 10,000–11,000. Badhrinath. Oct.

Decumbens, ramosissima, ramis subtetragonis breviter pilosis. Folia sessilia, amplexicaulia, subulata, acuta, subtrinervia. Pedicelli axillares, 1-flori, longi. Calyx 4–5-phyllus, glaber, sepalis subulatis, acutis, marginatis, petalis plus duplo longioribus. Petala 3, 4, 5 vel 0, minuta, bipartita, segmentis linearibus divaricatis. Stamina 8–10; filamentis basi dilatatis. Styli 3–4. Capsula 3–4-valvis, valvis 2-fidis. Semina ovoidea, minutè aciculata.

Ord. Malvaceæ.

31. Abutilon oxyphyllum; foliis cordato-ovatis acuminatis crenato-dentatis, pedicellis unifloris, calycis laciniis acuminatis, carpellis 6–8 vix calyce longioribus, staminibus brevissimè monadelphis.

Hab. Himala, ad alt. ped. 2000–3000, prope Zilini in valle Alahnunda, Garhwal.

Suffrutex; ramis teretibus, glabris, pubescentibus vel pilosis. Folia longè petiolata, cordato-ovata, acuminata, plùs minùs grossè crenata crenato-dentata sive dentata, velutina; petiolo apicem versus piloso, infrà pubescente vel glabro. Calyx 5-partitus, velutinus, laciniis acuminatis capsulas fructiferas ferè æquantibus. Corolla rotata, majuscula, flava ($1\frac{1}{2}$–2 pollices in diametro lata). Stamina in columnam brevissimam fornicatam pilosam connexa, filamentis suprà longis liberis filiformibus, antheris equitantibus reniformibus. Styli 6–8 longi. Carpella 6–8, 4–5 sperma, velutina, suturâ tantum piloso-ciliata, in cornu breve rectum divaricatum producta. Semina glabra, rugosa, parcè verrucosa.

Affinis *A. polyandro,* a quo differt calyce longiore. Nomen Wallichianum servavi quia *Sida oxyphylla* nunc in Sidis veris retinenda, nec huc revocanda.

32. ABUTILON RAMOSUM.

β. velutinum nec piloso-viscosum. Provincia Sirhind, ruderatis, Bhilchapper, &c. Differt pubescentiâ velutinâ a plantâ Africanâ (secundum descriptionem Guillemin et Perrottet in Floræ Senegambiæ Tentamine), quæ viscosa; et a speciminibus Kordofanis, quæ pilosa sunt.

Ord. AMPELIDEÆ.

33. LEEA ASPERA (*Wall. in Roxb. Fl. Ind.* ii. p. 468, *in notâ*). Herbacea, foliis bipinnatis pinnatisve; foliolis cordato-ovatis acuminatis utrinque pilosis, cymis axillaribus, antheris liberis.

Hab. Himala, ad alt. ped. 3000–5000.

Herbacea, erecta, 2–4 pedalis, caule pubescente nec crispato. Folia pauca; inferiora bipinnata, superiora uno latere tantùm bipinnata vel pinnata, petiolo exalato; foliolis (5–6 pollices longis, 2–3 latis) cordato-ovatis, subiter acuminatis, æqualiter crenato-dentatis, parallelè penninervibus, utrinque scabris et pilis sparsis (præsertim in medio intra nervos) hispidulis, petiolatis; petiolulis breviter alatis, alâ ad basin folioli expansâ. Cymi decompositi; pedunculi pubescentes (breviusculi, 2–3 poll. longi); bracteis subulatis, hispidis, glandulâ lucidâ terminatis; pedicelli hispidi, bracteolis ovatis obtusis scariosis. Calyx 5-dentatus, dentibus obtusis; petala basi connexa, revoluta, oblonga, obtusa, utrinque glanduloso-scabra. Staminum urceolus brevis; filamentis sterilibus oblongis 2-dentatis; fertilibus petalis oppositis, apice liberis; antheris supra medium affixis, ovatis, introrsùs inter se liberis. Stylus longiusculus, antheras æquans. Bacca nigra.

34. LEEA ALATA. Herbacea, foliis pinnatis, petiolo alato, foliolis subsessilibus oblongis serratis, cymis longè pedunculatis, antheris connexis.

Hab. Himala et in Montibus Sivalicis, ad alt. 3000 ped.

Leea rubra, *Royle, Illustr.* (*nec Blume.*)

Herbacea, erecta; caule scabro, glabro, sulcato. Folia pinnata; petiolo sulcato, alato; foliolis inferioribus brevissimè petiolulatis petiolo alato; superioribus sessilibus, alâ petioli in glandulam reductâ; oblongis, penninervibus, nervis tertiariis cum nervo medio rectum angulum formantibus, reticulatis, glabris, suprà scabris, subtùs lævibus (6–8 poll. longis, 2 latis). Pedunculi longi (8-poll.); cymi decompositi, bracteis caducis; pedicelli densè ferrugineo-pubescentes, bracteolis subulatis, acutis, glanduloso-ciliatis. Calyx 5-fidus, dentibus acutis. Corollæ laciniæ subemarginatæ. Stam. sterilia oblonga, emarginata; antheræ lateribus inter se connexæ, filamentis supra medium affixæ.

Differt a *L. hirtâ* foliolis glabris, sessilibus, petiolisque alatis, apice glanduliferis.

Ord. Balsamineæ.

Gen. Impatiens. *Charactere quoad florem emendato*†.

Sepala 5; duo superiora minima, quandoque nulla; duo lateralia simplicia; inferius magnum, plùs minùs inflatum et calcaratum. *Petala* 5; 1 superius, intra sepala duo squamiformia, magnum, plerumque dorso cristatum (*vexillum*); 4 lateralia, quorum duo utrinque inter se coadunata, unum bilobum efformantia (*alæ*).

* *Racemi axillares terminalesque, subumbellati,* 2–10-*flori, pedicellis bracteolatis; alæ* 2 *calcaratæ.*

§. *Folia sessilia*; *flores purpurei.*

35. Impatiens amplexicaulis; foliis oblongis sensim acuminatis argutè crenato-serratis, galeâ obtusâ calcare subiter incurvo, vexillo subrotundo, capsulâ tereti acutâ.

Hab. Himala, in umbrosis, alt. ped. 7000–8000. Simla, Sambi.

Caulis erectus, parcè ramosus (1–3 pedalis) 4-angularis, ad nodos glandulosus, purpurascens, glaber. Folia sessilia, inferiora opposita, superiora alterna, subamplexicaulia, ad basin glandulâ hemisphæricâ stipulata, oblonga sensim acuminata, argutè crenato-serrata, ser-

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† I have ventured to propose a modification of the character of *Impatiens*, because I consider M. Kunth's theory of the flower to be not entirely correct. He conceives the superior petal to be wanting, and the two superior sepals to be united into the vexillum, regarding the keel usually more or less present on that to be a mark of the junction. But I have found the two superior sepals actually present in some species: they are distinct in *I. amplexicaulis* and *moschata*, herein described, and even more so, though still very minute, in the Cashmir species introduced into England by Dr. Royle under the name of *I. glanduligera*, and figured by him in his 'Illustrations of Himalayan Botany.' In other species a rudimentary scale, or in others, again, a gland supplies their place; while in many I have been totally unable to detect any. I think therefore that I am justified in considering the vexillum as a single petal, and not as composed of two sepals united. I have since found that a similar view has been taken by M. Rœper in the 'Linnæa,' vol. ix. p. 121.

raturis in latere superiore ad medium mucronulatis. Bracteolæ ovatæ membranaceæ. Sepala 2 superiora ad basin vexilli minuta, obliquè oblonga v. falcata, 2–3-dentata, margine glandulosa: 2 lateralia obliquè cordata: inferius galeæforme, subobtusum, subiter in calcar breve ad rectum angulum incurvum obtusum integrum desinens. Petala: vexillum subrotundum: alæ inæqualiter bilobæ, lobo inferiore subrotundo, superiore ovato maculato. Capsula subcylindracea apice acuta. Sapore *Tropæoli nasturtii.*

§§. *Folia petiolata, ovato-lanceolata, basi obtusa.*

36. Impatiens moschata; foliis crenato-serratis serraturis apice mucronulatis glandulis stipulaceis auriculatis, galeâ obtusâ, capsulâ clavatâ.

Hab. Himala, in sylvis, alt. ped. 8000–9000. Mahaseo.

Glaberrima, erecta, ramosa; caulis sub lente canaliculatus, purpurascens, (3–6 pedalis). Folia subverticillata et alterna, grossè argutè serrata, serraturis apice mucronatis, basi obtusa æqualia vel obliqua, apice longè acuminata; petiolo glandulis 2 auriculatis stipulato. Pedicelli apice incrassati, bracteolis ovatis lanceolatisve acutis. Flores rosei. Sepala 2 superiora lateralibus plùs duplò breviora, ovata; lateralia obliquè cordata, vexillo breviora; inferius galeæforme, pallidum, subiter in calcar breve recurvatum desinens. Vexillum alis brevius, subrotundum. Alæ bilobæ, lobo inferiore lanceolato acuto, superiore rotundato apiculato. Capsula subpentagona, subverrucosa, apiculatè fusiformis v. clavata. Semina subsphærico-turbinata, rugosissima, albo- et brunneo-variegata, odore pessimo moschato.

Affinis *I. glanduligeræ,* Royle (Roylei, *Walpers*): differt foliis grossiùs serratis, minùs glandulosa. Affinis etiam *I. macrochilæ,* Bot. Reg. vol. xxvi. t. 8.

§§§. *Folia petiolata, lanceolata, utrinque attenuata, crenato-serrata; mucrone in crenis vel terminali laterali vel basilari in latere superiore.*

a. *Flores majusculi; alæ obliquæ.*

37. Impatiens gigantea; mucrone crenarum laterali, glandulis petiolaribus nigris ampullaceis, galeâ magnâ amphoræformi obtusissimâ subitò in calcar incurvum filiforme desinente, capsulâ tereti.

Hab. Himala, ad alt. ped. 9000–10,000. Hattu, Kamalori, Jauglig, &c.

Herba glaberrima, annua, 4–15 pedalis. Caulis fistulosus (quandoque 5 pollices in diametro) teres, ad nodos glandulis sparsis, ramosus. Petioli utrinque glandulis 2 nigris ampullaceis ad basin folii instructi; crenarum mucrone in medio lateris superioris lateralis.

Racemi plerumque pauciflori; bracteis lanceolatis apice glandulosis. Sepala superiora 0 vel minutissima, lateralia obliquè cordata; inferius apice prolongato acuto, amplum amphoriforme, obtusissimum, subitò calcari tenui rectangulè recurvato terminatum, purpureum. Alæ bilobæ, roseæ, lobis dolabriformibus, inferiore longiore. Vexillum rotundatum, dorso subcarinatum. Capsula teres æqualis, breviter acuta. Semina rugosa.

38. Impatiens amphorata; crenarum mucrone basilari, glandulis stipulaceis pedicellatis, galeâ amphoræformi obtusissimâ; calcare incurvo, alarum lobis inæqualiter dolabriformibus, vexillo cristato, capsulâ lineari subtereti.

Hab. Himala, in sylvis, alt. ped. 5000–7000; vulgatissima. Simla, &c.

Glaberrima, erecta, 1–3 pedalis, purpurascens; caulis ramosus, teres, ad nodos tumidus. Folia alterna, serraturis prope basin mucronulatis; petiolo glandulis 2 pedicellatis stipulato. Pedicelli 2-glandulosi. Flores purpurei. Sepala 2 superiora glanduliformia v. nulla, 2 lateralia obliquè cordata; inferius amplissimum amphoræforme obtusissimum, subitò calcare longiusculo sursùm incurvo terminatum. Vexillum ovatum, extùs carinato-alatum, acutè cristatum. Alæ bilobæ, lobis inæqualibus dolabriformibus. Capsula teres, linearis. Semina striata, rugosula.

39. Impatiens umbrosa; mucronulo serraturarum supra medium laterali, glandulis stipulaceis obtusis sessilibus, pedicellis glandulosis, galeâ subamphoriformi sensim in calcar attenuatâ, capsulâ tereti subtorulosâ.

Hab. Himala, ad alt. ped. 7000–8000 in sylvis. Simla.

Glaberrima, erecta, ramosa, vix purpurascens, 1–2 pedalis; caulis striatus. Petiolus glandulis 2 obtusis stipulatus. Folia alterna, serraturis supra medium lateraliter mucronatis. Pedicelli apice incrassati, glanduligeri. Sepala 2 superiora 0 v. glanduliformia; 2 lateralia obliquè cordata; inferius largum, ampliatum, faucis apice elongato apiculato, ex amphoriformi infundibuliforme, sensim in calcar incurvum attenuatum. Vexillum breve, rotundatum, carinatum, apiculatum. Alæ bilobæ, lobo inferiore longiore oblongo, superiore rotundato. Capsula teres, linearis, subtorulosa. Semina glabra, lævissima, rugosula.

40. Impatiens pallens; mucronibus serraturarum subbasilaribus versus apicem folii longis glanduligeris, glandulis stipulaceis inæqualibus auriculæformibus, pedicellis incrassatis eglandulosis, galeâ sensim in calcar involutum attenuatâ, capsulâ tereti subtorulosâ oligospermâ.

Hab. Himala, ad alt. ped. 3000–6000, ad ripas rivulorum Garhwal.

Glaberrima; caulis basi nudus, teres, striatus, vix ramosus (pedalis); petiolus glandulis 2 inæqualibus cochleatis vel auriculæformibus stipulatus. Crenarum mucrones subbasilares, versus apicem folii longi glanduligeri. Pedicelli apice incrassati, eglandulosi. Sepala 2 superiora minima, vexillo subadnata; lateralia cordata; inferius fauce ampliato campano-infundibuliforme, apice dorso mucrone cristato sensim in calcar elongatum apice subinvolutum attenuatum, intùs maculatum. Alæ bilobæ; lobo inferiore longè obongo, superiore gibbosè rotundato. Vexillum breve, carinatum, apiculatum. Capsula teres, linearis, utrinque attenuata, acuta, subtorulosa, basi longiusculè asperma. Semina pauca 2–4, rugosa.

A præcedenti differt staturâ minore, colore pallidiore, crenarumque mucronibus longioribus subbasilaribus; an satis distincta?

§§§ *b. Parvifloræ, alis plùs minùs anticè planis conniventibus; sepalis lateralibus ovatis nec cordatis, inferiore fauce minùs ampliato, calcare rectiusculo.*

41. Impatiens laxiflora; caule subalato, mucronibus serraturarum basilaribus, glandulis stipulaceis utrinque 3–4 sessilibus.

Hab. Himala, ad alt. ped. 7000–9000, ad ripas rivulorum Serain, &c.

Glabra; caulis erectus, teres, ad nodos tumidus, 2–4 pedalis, petiolis decurrentibus subalatus; mucrones crenarum omninò basilares; petiolus glandulis 3–4 parvis sessilibus stipulatus. Racemi multiflori, pedicellis longis, apice incrassatis, glandulosis, bracteis ovatis in apiculos glanduligeros contractis. Sepala superiora 0; lateralia parva ovata; inferius, fauce brevi in calcar tubulosum rectum vix apice tortum sensim elongatâ, albidum, maculis luteis purpureisque notatum. Alæ bilobæ, lobo superiore erecto obovato pallido luteo-maculato, inferiore plano lanceolato roseo; vexillum rotundatum cucullatum dorso mucronatum. Capsula teres, subtorulosa, seminibus rugosis.

42. Impatiens micranthemum; mucronibus crenarum basilaribus, foliis ad basin glandulis 2 stipitatis utrinque instructis, glandulis stipulaceis sessilibus.

Hab. Himala, ad alt. ped. 9000–10,000. Kranda, Hattu, &c. apricis humidis.

Glabra; caulis erectus, ramosus, teres, glandulis nigris sparsus, petiolo decurrente subalatus, $\frac{1}{2}$–4 pedalis; foliis utrinque glandulis 2 stipitatis prope basin ad marginem instructis; racemi 3–4-flori; bracteis lanceolatis apice glandulosis; pedicelli incrassati eglandulosi;

sepala 2 superiora glanduliformia; lateralia parva lanceolata; inferius tubulosum sensim in calcar rectum prolongatum, fauce brevi suprà apiculatâ. Alæ bilobæ conniventes; lobo superiore elliptico, inferiore rotundato. Vexillum cucullatum, hemisphæricum. Capsulæ subteretes, virides; semina foveolato-rugosa, lineis incrassatis irregulariter notatis. Flores minimi, albidi, galeâ roseo luteoque maculatâ.

β. parva, 4–6 pollicaris, omni parte minor; calcar sæpè in sacculum parvulum reductum.
Hab. Rupibus umbrosis. Hattu.

Forsàn eadem ac *I. candida*, Lindl. in Bot. Reg. vol. xxvi. p. 85.

43. IMPATIENS ELATA; erecta, glabra, ramosa, pallida, glandulis nigris sparsa, crenarum mucronibus subapicularibus ad basin folii glanduligeris, calcare recto, vexillo cucullato, capsulâ tereti, seminibus rugosis.

Hab. Himala, ad alt. ped. 10,000–11,000. Pharkia.

Erecta, 2–4 pedalis, ramosa; caulis pallidè virens, glandulis nigris sparsus, petiolis decurrentibus subalatus; crenarum mucronibus subapicularibus, ad basin folii elongatis glanduligeris. Petiolus glandulis oblongis porrectis stipulatus; racemi pauciflori; pedicelli apice incrassati, glandulosi; flos minimus, albidus; calcar rectum; vexillum cucullatum; alæ subplanæ. Capsula teres, linearis, oligosperma; semina regulariter rugoso-striata.

44. IMPATIENS RACEMOSA (*Wall. Cat.* no. 4730); erecta, parva, floribus luteis, calcare recto, crenarum mucronibus basilaribus.

Hab. Himala, ad alt. ped. 7000–8000. Lingarta in rupibus.

Parvula (4–10 pollicaris), vix ramosa, glaberrima. Caulis infrà teres, suprà subangulatus, maculatus; crenarum mucrones omninò basilares. Bracteolæ minimæ, glandulosæ. Calcar, fauce brevi, longum, rectum v. subincurvum. Vexillum dorso carinato-cristatum, cucullatum. Capsula linearis, teres.

** *Inflorescentia ut suprà in §§§ b. Alæ 3–4-lobatæ v. caudatæ.*

45. IMPATIENS TINGENS; crenarum mucronibus subbasilaribus, glandulis stipulaceis, sepalis lateralibus minimis, calcare subrecto alarum caudas includente.

Hab. Ad ripas rivulorum Himala, ad alt. ped. 8000–9000. Nagkanda, Dhobri, &c.

Caulis teres, ad nodos tumidus, glaber, ramosus, pallidè virens, glandulis nigris sparsus, petiolis decurrentibus subalatus. Petioli utrinque glandulis parvis auriformibus stipulati.

Crenarum mucrones subbasilares; inferiores elongati, glanduligeri. Racemi 2–15-flori; bracteis ovatis apice glandulosis, pedicellis apice incrassatis eglandulosis. Sepala superiora 0; lateralia minima, obliquè ovata, acuta, mucronata; inferius tubulosum margine brevissimo acuto, basi quandoque rugosum, sensim in calcar longum, rectum vel arcuatum prolongatum. Alæ 3–4-lobæ: lobus (petalum) superior 1–2-lobus: segmento inferiore rotundato; superiore dentiformi acuto v. nullo: lobus (petalum) inferior bilobus: segmento superiore semiovali plano, latere recto ad alam alteram approximato; inferiore longo lineari-acuminato, intra sepali calcar porrecto incluso. Vexillum rotundum, cucullatum, dorso vix cristatum. Capsula teres, acuta. Semina rugosa.

Species ab aliis mihi notis distinctissima; variat floribus roseis vel albis, majoribus vel minoribus. Herba 2–3 pedalis, ramosissima; sicca, herbarium colore flavidè fusco tingens.

Ord. GERANIACEÆ.

46. GERANIUM GRANDIFLORUM; pubescens, caule adscendente vix ramoso, foliis longè-petiolatis palmato-5-fidis: segmentis lobato-dentatis, pedunculis foliis longioribus bifloris, sepalis apiculatis, petalis integris, capsulis pilosis.

Hab. Himala, in pascuis elatis alt. ped. 9000–12,000. Mána, Jauglig, &c.

Herba bipedalis; caulibus teretibus, adscendentibus, vix ramosis, pilis simplicibus deflexis pubescentibus. Folia longè petiolata, palmatim 5-partita, segmentis lobato-dentatis, mucronulatis, inferiora rotundata, caulina opposita, basi cordata. Pedunculi axillares, foliis longiores, biflori; bracteis in utroque pedicello binis subulatis, acutis, hirsutis, marcescentibus. Pedicelli et sepalorum nervi pilis subviscosis patentibus tomentosi. Sepala ovata, obtusa, longè apiculata, margine membranaceo-ciliata, intra nervos pubescentia. Petala magna, integra, purpurea. Capsulæ densè tomentosæ; rostro longo, pubescente, scabro.

G. *molle.*

Hab. Himala, alt. ped. 2000–3000. Synj.

G. *Robertianum.*

Hab. Himala, alt. ped. 8000–9000. Pandkesar.

Ord. XANTHOXYLACEÆ.

47. XANTHOXYLON OXYPHYLLUM; frutex aculeatus, foliis alternis pinnatis; petiolo exalato nervisque mediis foliorum quandoque aculeatis, foliolis bre-

viter petiolulatis lineari-lanceolatis acuminatis serratis terminali sursùm inflexo, paniculis paucifloris terminalibus folio multotiès brevioribus, carpellis rubris bivalvibus dispermis stylo persistente apiculatis, seminibus pisi magnitudine: testâ nigrâ lævi nitidâ.

Hab. Himala, in sylvis alt. ped. 4000–5000. In Garhwál Occidentali.

Ord. Ochnaceæ.

48. Ochna collina; suffrutex glaberrimus, ramis teretibus basi stipulis persistentibus squamatis, foliis breviter petiolatis ovato-lanceolatis tenuiter serratis, stipulis intra-petiolaribus apice plerumque bifidis (e duabus lateralibus connexis), pedunculis axillaribus folium æquantibus 3-floris, pedicellis basi bracteatis infra medium articulatis, sepalis 5 latè ovatis, petalis 5 rotundis integerrimis aureis, filamentis antheris subtetragonis brevioribus, stylo indiviso staminibus longiore, stigmate capitato.

Hab. In collibus glareosis sub-Sivalensibus sub *Shoreis robustis,* prope Sakranda, Saharunpoor. Floret Aprili.

Forsàn eadem ac *O. nana,* Royle Illust. vel *O. pumila,* Don, *O. humilis.* Fructum non vidi.

Ord. Rhamneæ.

49. Zizyphus oxyphylla; aculeata, spinis binis breviore vix recurvâ, foliis obliquè ovatis acuminatis, floribus axillaribus solitariis paucisve fasciculatis.

Hab. Himala, ad alt. ped. 4000–7000. Floret Septembri.

Frutex; ramis teretibus purpurascentibus. Folia alterna, petiolata, 3-nervia, ovata, acuminata, basi obliquè subcordata vel cuneata, minutè ac argutè serrata, serraturis mucronatis; utrinque glabra v. sub lente in nervis puberula; spinæ stipulaceæ binæ, longior recta, brevior patens vix recurva. Flores axillares, pedunculati, solitarii vel 3–4 fasciculati; calyx 5-dentatus, dentibus acutiusculis. Petala spathulata, cucullata, antheram amplectentia. Stylus crassus; stigmate subcapitato emarginato. Fructus . . . . .

50. Rhamnus (*Alaternus*) procumbens; ramis prostratis, foliis coriaceis lanceolatis utrinque acutis mucronato-serrulatis, floribus 1–2 axillaribus, stylis 3, petalis 0, drupâ 3-spermâ.

R. rupestris, *Royle Illustr.* p. 169. (*non Scop. nec Vill.*)

Hab. Himala, in rupibus alt. ped. 7000–8000. Deobun. Fl. Junio.

Frutex; rami prostrati ramosi, juniores pubescentes, veteres cortice albido verrucoso. Folia alterna, coriacea, glabra, bistipulata, brevè-petiolata, mucronato-serrata, lanceolata, plerumque utrinque acuta, vel rariùs ovata obtusa. Stipulæ persistentes, subsetaceæ. Pedicelli axillares, uniflori, solitarii vel bini. Calyx 5-fidus; segmentis latis, acutis, 3-nervibus, deflexis, demùm caducis; ideò in fructu quasi circumscissus. Petala 0. Stamina 5, cum calycis segmentis alternantia. Styli 3 longiusculi, divaricati, apice revoluti. Drupæ 3-spermæ.

Affinis *R. Wightiano*; differt foliis multò minoribus, petalis nullis.

51. RHAMNUS (*Frangula*) PURPUREUS; arboreus, inermis, foliis ovatis acuminatis serrulatis, floribus axillaribus solitariis binisve, petalis 0.

Hab. Himala, ad alt. ped. 8000–10,000, in sylvis. Chúr. Floret Junio.

Arbor mediocris, inermis; rami purpurascentes, albo maculati. Folia petiolata, ovata, breviter acuminata, penninervia, leviter ac argutè serrata, serraturis mucronulatis, juniora pube caducâ vestita, citò glabrata. Stipulæ subulatæ, caducæ, basi dilatatâ persistente. Pedunculi 1-flori, 1–3, axillares, nutantes. Calyx 5-dentatus, dentibus acutis. Petala 0. Stamina 5, filamentis brevissimis, cum calycis segmentis alternantia. Styli 3; stigmate capitato emarginato. Fructus .....?

Affinis videtur habitu *R. alpino* at floribus valdè distinctus.

Ord. ROSACEÆ. Trib. AMYGDALINÆ.

52. AMYGDALUS HUMILIS; frutex, foliis breviter petiolatis lanceolatis argutè serratis, floribus sessilibus, calycis tubo longo striato 5-dentato; segmentis brevibus crenulatis intùs puberulis; tubo intùs glabro basi tantum puberulo, petalis brevibus obovatis basi cuneatis glabris, filamentis glabris, stylo longo, ovario glabro, fructu ?

Hab. Himala, ad alt. ped. 9000. Malari in Garhwál Orientali Superiore.

Differt ab *A. nanâ* foliis ratione latitudinis multò brevioribus, tubo calycis longiore, petalisque brevioribus.

Trib. DRYADEÆ.

53. SIBBALDIA CUNEATA; procumbens, foliis ternatis; foliolis cuneatis apice truncatis 2–5-inciso-dentatis, petalis obovatis calycem æquantibus, staminibus 5–10, acheniis glabris striato-rugosis.

Hab. Himala, in rupibus elatis alt. ped. 11,000–14,000. Liti, Chúr, Mána.

Cæspitosa, procumbens, omninò pilis sparsis hirsuta. Folia ternata, petiolata; petiolis longiusculis; stipulis adnatis, oblongis, apice liberis, acutis, scariosis; foliolis ovatis, basi cuneatis, apice truncatis, medio 3–5 lateralibus 2–3-inciso-dentatis, dentibus obtusis mucronatis. Caules floriferi, vel foliis radicalibus breviores pauciflori, vel erecti ramosi multiflori corymbosi; foliis floralibus gradatim difformibus, ultimis lanceolatis. Calycis laciniæ acutæ, interiores lanceolatæ, exteriores breviores, lineares. Petala 5 obovata, integra, obtusa, calycem subæquantia; stamina 5–10, semper 5 cum petalis alternantia, quandoque 1–5 eis opposita. Styli laterales. Ovaria glabra, rugosula, pauca. Receptaculum pilosum; achenia glabra, leviter striato-rugosa.

Variat α. scapis minimis, petalis latioribus; vel β. scapis erectis corymbosis 6-pollicaribus, petalis angustioribus.

A *Sib. procumbente* differt petalis obtusis nec acutis, et multò majoribus. Folia et habitus omninò *Potentillæ cuneatæ,* cujus flores in specimine Wallichiano in herbario Benthamiano verè Potentilleos et majusculos examinavi. Nomen *S. cuneatæ* specimini ex horto Soc. Hort. Lond. a semine culto adjungitur.

Potentilla albifolia, Don et Lehmann, est *Sibbaldia potentilloides,* Camb. in Jacquemont.

54. Rubus hypargyrus; aculeatus, subscandens, ramis tomentosis, foliis pinnatim 3-foliolatis; foliolis grossè et argutè duplicato serratis acutis basi cordatis suprà pubescentibus subtùs cano-sericeis, stipulis linearibus, pedunculis bifloris, sepalis longè acuminatis petalis roseis erectis longioribus.

Hab. Himala, in sylvis alt. ped. 8000–9000. Chúr, Lingarta, &c. Floret Junio.

Frutex subscandens; rami teretes, tomentosi. Aculei parvi, sparsi, breviter uncinati. Folia pinnatim trifoliolata; petiolo aculeato pubescenti; foliolis petiolulatis, cordato-ovatis, acutis acuminatisve, suprà pubescentibus, subtùs cano-sericeo-lanatis; stipulæ lineares acuminatæ. Pedunculi axillares biflori, stipulis breviores. Calyx utrinque densè sericeo-villosus, segmentis latè ovatis, longè acuminatis. Petala erecta, ovata, integra (rosea), calyce breviora. Ovaria sericea. Fructus flavus.

55. Rubus nutans (*Wall. Cat.* no. 738); caule repente inermi setoso, foliis pinnatim trifoliolatis, stipulis bracteisque ovatis scariosis, floribus solitariis longè pedunculatis nutantibus, calyce densè setoso; laciniis erectis cuspidatis petalis brevioribus.

Hab. Himala, ad alt. ped. 9000–10,000. Tungnath, Pandkesar, &c.

Suffrutex; rami procumbentes, repentes, inermes, densè setosi. Folia pinnatim trifoliolata, longè petiolata, petiolis setosis, foliolis subtùs hirsutis suprà pilosis, argutè duplicato-serratis, rotundato-ovatis, apice obtusis sub-3-lobis, lateralibus basi semicordatis, medio cuneato. Stipulæ liberæ, ovatæ, apice denticulatæ, scariosæ, margine ciliatæ. Pedunculi solitarii, axillares et terminales, bibracteati (bracteis stipulis conformibus), uniflori, filiformes. Flores post anthesin nutantes. Calyx extùs densè setosus (setis ferrugineis subhamosis), intùs sericeus; laciniis erectis, latè ovatis, cuspidatis, exterioribus apice foliaceo-laciniatis. Petala alba, obovata, calyce longiora. Ovaria glabra. Fructus globosi, glabri, lætè cerasino-rubri, stylo persistente. Receptaculum pilosum.

Ab indigenis *Ishal* dictus; fructus sapore optimus. Nomen Wallichianum a Vest etiam usum et ideò forsàn mutandum; tum meo sensu "*barbatus*" appellandus.

Trib. Pomaceæ.

56. Cotoneaster rosea; foliis ovatis basi obtusis junioribus araneo-lanatis demùm glabratis nervis et margine tantùm pilosis, cymis paucifloris, calyce extùs lanato demùm margine excepto glabrato.

Hab. Himala, in sylvis. Chúr. Floret Junio.

Arbor mediocris. Rami teretes, purpurei, juniores lanato-sericei, demùm cuticulâ membranaceâ squamosâ decorticatâ glabri. Folia petiolata, ovata, basi rotundato-obtusa, integra, apice acuta, mucronata; juniora utrinque araneo-lanata, demùm glabrata, in nervis et margine tantùm pilosa, subtùs glauca; stipulæ obliquè lanceolatæ, acutæ, scariosæ, caducissimæ. Cymæ axillares terminalesque, paucifloræ; pedunculis sericeo-tomentosis demùm glabris; bracteis lineari-lanceolatis, tomentosis, caducis. Calyx lanatus, demùm margine excepto glabratus; laciniis obtusis, intùs glabris. Petala rotundata, margine crispata, rosea. Stamina glabra, filamentis basi dilatatis. Ovarium densè lanatum. Styli 2 glabri.

Affinis *C. laxifloræ*.

Ord. Combretaceæ.

57. Terminalia (*Myrobalanus*) attenuata; foliis ad apicem ramulorum confertis petiolatis obovatis obtusis basi attenuatis glabris, floribus masculis sessilibus.

Hab. Himala, ad alt. ped. 3000–4000. Jaggatgarh. Floret Junio.

Arbor magna. Folia ad apicem ramulorum ferrugineo-tomentosorum spiraliter confertè disposita, obovata, basi attenuata, apice obtusa, utrinque glabra, minutè punctata; petiolis 2-glandulosis (junioribus) pubescentibus. Spicæ axillares, pendulæ, multifloræ, foliis breviores. Flores inferiores hermaphroditi, superiores masculi, omnes sessiles.

Calyx extùs tomentosus, limbo cyathiformi, intùs basi densè villoso, laciniis revolutis intùs subglabris. Stamina erecta, calycis laciniis longiora. Antheræ rotundæ. Stylus simplex, subulatus. Fructus ovatus.

Ord. Crassulaceæ.

58. Rhodiola imbricata; polygama, foliis imbricatis latè lanceolatis integris acutis, corymbo simplici, laciniis calycinis obtusis apice incrassatis petalis linearibus brevioribus, staminibus petalis longioribus.

Hab. Himala, ad alt. ped. 11,000–13,000. Liti.

Polygama, glaberrima. Rhizoma crassum, odoratum; caules numerosi, foliosi, erecti (pedales). Folia alterna, imbricatim approximata, sessilia, plana, vix carnosa, lanceolata, integra, acuta. Corymbus terminalis, multiflorus, subsimplex. Flores masculi: calycis glabri laciniæ 4 lineares, obtusæ, apice incrassato-subclavatæ, petalis dimidio breviores. Petala 4, linearia, lutescentia. Stamina 8 subæqualia, petalis longiora. Ovaria 4 abortiva. Glandulæ subrotundæ, integræ. Flores fertiles non vidi.

Differt à *R. asiaticâ* foliis crebrioribus latioribus; à *Sedo Himalensi* floribus polygamis tetrameris et foliis integris.

59. Sedum (*sect.* 2.) rubrum (*Royle Ill.* p. 222); caulibus foliosis, foliis oppositis latè ovatis sinuato-dentatis integrisve glaucis, corymbo terminali multifloro, calycis laciniis obtusis petalis acutis subtriplò brevioribus.

Hab. In rupibus, Himala, alt. ped. 9000–10,000. Chúr, Pekha, &c.

Caules numerosi, subadscendentes, foliosi; folia opposita, latè ovata, obtusa, vel sinuato-dentata, inferiora breviter petiolata, superiora sessilia amplexicaulia, vel omnia petiolata integra, carnosa, glauca. Corymbus terminalis, trichotomus. Pedicelli bracteæque ovatæ, obtusæ, glabræ, rubescentes. Calycis glabri rubri laciniæ petalis subtriplò breviores, acutiusculæ. Petala patentia, rubro-purpurascentia, integra, acuta. Stamina 10 subæqualia, petalis breviora, antheris reniformibus. Carpella erecta, breviter stylis apiculata. Glandulæ subrotundæ, integræ.

Affinis *S. Telephio, Gerardiano,* &c.

60. Sedum sinuatum (*Royle Ill. l. c.*); caule simplici erecto, foliis linearibus apice sinuatè 3-dentatis 3-fidisve, floribus axillaribus subcorymbosis, laciniis calycinis obtusis petalis acutis paullò brevioribus, glandulis truncatis integris.

Hab. Himala, in muscosis vel rupibus vel ramis arborum frequens, ad alt. ped. 6000–10,000. Floret Aug., Sept.

Annuum. Caulis erectus, glaberrimus, simplex; folia linearia, basi attenuata, apice sinuatè 3-dentata v. trifida lobis obtusis. Flores axillares terminalesque, corymbosæ, bracteis linearibus. Calycis glabri laciniæ lineares, obtusæ, petalis paullò breviores. Petala lanceolata, acuta, patentia, alba. Glandulæ truncatæ, integræ. Stamina alterna paullò breviora, antheræ fuscæ. Carpella glabra, in fructu erecta, sepala elongata subæquantia.

61. Sedum (*sect.* 3) adenotrichum (*Wall. Cat.* no. 7231); foliis obovatis crassis, scapis erectis paniculatim multifloris, pedunculis calyce petalisque extùs glanduloso-pubescentibus, glandulis emarginatis.

Hab. Himala, in rupibus madidis, alt. ped. 3000–7000.

Radix repens. Caules erecti, basi foliosi, glabri, suprà paucifoliati, glanduloso-pubescentes. Folia crassa, obovata, obtusa, basi cuneata. Paniculæ subdichotomæ, pilis glandulosis pubescentes, aphyllæ. Calycis extùs glandulosi intùs glabri laciniæ acutiusculæ, petalis triente breviores. Petala lanceolata, acuta, apice mucronulata, carnea, nervo medio glanduloso. Stamina 10, petalis breviora, subæqualia. Glandulæ oblongæ, emarginatæ. Carpella 5, stylo persistente apiculata, in fructu erecta.

Affinis *S. villoso.*

62. Sedum rosulatum; repens, foliis rosulatis cuneato-spathulatis obovatisve, scapis erectis subnudis paucifloris, pedicellis calyceque glanduloso-puberulis, petalis emarginatis mucronatis calyce longioribus.

Hab. Himala, in rupibus umbrosis, alt. ped. 7000–9000. Floret Maio. Tang, Sirkanda.

Caulis stolonifer repens; folia rosulata, cuneato-spathulata vel obovata, crassa, integerrima, glabra. Scapi paucifoliati, 2–3-flori. Flores longiusculè pedicellati, majusculi; pedicelli calycesque breviter glanduloso-puberuli. Calycis laciniæ obtusæ, petalis dimidio breviores. Petala obliquè emarginata, mucronulata, alba. Stamina alterna breviora. Glandulæ? Carpella stylis longis apiculata.

63. Sedum mucronatum; caulibus foliosis, foliis linearibus, cymis paucifloris, laciniis calycinis obtusis petalis acutis lanceolatis brevioribus, staminibus alternis brevioribus; antheris mucronatis, glandulis emarginatis.

Hab. Himala, in rupibus apricis, alt. ped. 8000–10,000. Lingarta, Sirkanda, &c. Floret Maio—Septembri.

Rhizoma crassum (odorum). Caules numerosi, teretes, erecti, prostrati v. penduli. Folia linearia, subelliptica, subcarnosa, obtusa, integra vel apice plus minus denticulata, patentia. Cymæ 3–7-floræ, terminales. Calycis glabri laciniæ ovatæ, obtusiusculæ, petalis plùs duplò breviores. Petala lanceolata, acuta, patentia, alba. Stamina inæqualia, epipetala longiora, omnia petalis breviora; antheræ rotundatæ, rubræ, mucronatæ. Glandulæ oblongæ, emarginatæ, majusculæ. Carpella erecta, in stylos longos attenuata, rubescentia.

64. Sedum pauciflorum; caulibus foliosis, foliis linearibus, cymis paucifloris, laciniis calycinis petalis oblongis subobtusis duplò brevioribus, glandulis rotundatis integris.

Hab. Himala, in rupibus apricis, alt. ped. 7000–8000. Kranda, &c. Floret Maio—Sept.

Rhizoma crassum; caules numerosi, teretes, foliosi, prostrati vel penduli. Folia glaberrima, linearia, obtusa, conferta, patentia, integra vel apice denticulata. Cymæ terminales 2–8-floræ. Flores majusculi, patentes. Calycis laciniæ latiusculæ, obtusæ, petalis duplò breviores. Petala oblonga v. sublanceolata, obtusiuscula, alba. Stamina 10, 5 paullò longiora petalis opposita. Antheræ rotundæ, emucronatæ, purpureæ. Carpella in stylum brevem subiter desinentia, in fructu erecta.

Hæc species et præcedens foliis et habitu omninò *S. linearifolio* (Royle Ill. p. 222, et t. 48. f. 1.) similes sunt; at floribus satis distinguendæ, cymis 2–7-floris rarissimè si unquam unifloris petalisque hujus obtusis, istius acutis nec acuminatis.

S. mucronatum ab omnibus (?) congeneribus antheris mucronatis distinctissimum.

65. Sempervivum mucronatum; foliis radicalibus rosulatis lanceolatis glabris mucronatis, scapis foliosis paucifloris, calycis laciniis petalisque glanduloso-pilosis mucronatis, glandulis obliquè truncatis.

Hab. Himala, ad alt. ped. 10,000–12,000. Pharkia prope Niti.

Polygamum. Folia radicalia conferta, rosulata, lanceolata, mucronata, glabra; caulina linearia, mucronata, pilosiuscula, adpressa. Scapi breves (2–6 unciales) foliosi; cymâ pauciflorâ, terminali. Calycis laciniæ lineares, acutæ, glanduloso-pilosæ, petalis triente breviores. Petala nervo medio crasso colorato, alba, puberula, acuta. Stamina alterna breviora; antheris ovatis. Glandulæ parvæ, carnosæ, obliquè truncatæ, integræ.

Omnia mea exemplaria sterilia sunt, ovariis sex abortivis.

Affinis *S. acuminato* in Jacquem. Voyage aux Indes (quod est *Sedum Moorcroftianum*, Wall. Cat. 7228); differt pubescentiâ calycis petalorumque scapisque foliaceis.

66. Sempervivum album; foliis radicalibus rosulatis obcuneatis carnosis, surculis pilosis, scapis unifloris paucifoliatis, foliis caulinis ovatis omnibus

ciliatis, calycis pubescentis laciniis petalis duplò brevioribus, petalis ovatis ciliatis albis.

Hab. Himala, in rupibus, alt. ped. 7000–8000. Kranda. Floret Septembri.

Surculi nudi, pilosiusculi, teretes, apice rosulati. Folia radicalia rosulata, obcuneata, carnosa, pilosiuscula, ciliata, caulina ovata. Scapi breves, erecti, paucifoliati, uniflori. Calycis laciniæ 8, angustè ellipticæ, pilosæ, ciliatæ, petalis multò breviores. Petala 8 magna, ovata, patentia, ciliata, alba, obtusa, basi brevi spatio connexa. Stamina 16 subæqualia, in petalis inserta; antheris rotundis rubris. Glandulæ carnosæ, stipitatæ, apice obliquè truncatæ, denticulatæ. Carpella 8, pilosiuscula, erecta.

Affinis *S. sedoides,* Jacquem. p. 74; differt calyce breviore, &c.

67. Tillæa pentandra (Royle, *l. c.*); ramis erectis foliosis, foliis subperfoliatis laciniisque calycinis subulatis striatis, petalis lanceolatis calyce brevioribus, carpellis ovatis acutis dispermis.

Hab. Himala, ad alt. ped. 4000–6000. Masúri, &c., in rupibus murisve aridis.

Caules repentes; rami numerosi, erecti, confertè foliosi; folia opposita, subperfoliata, subcarnosa, subulata, acuta, mucronata; ramuli floriferi axillares; flores axillares, solitarii, sessiles, vel breviter pedunculati. Sepala 5 subulata, acuminata, lacunoso-striata. Petala 5 angustè lanceolata, acuta, sepalis breviora, rubra. Stamina 5, ovariis breviora; antheris luteis subrotundis acutiusculis. Glandulæ 0? Pistilla 5, ovariis erectis, stylis brevibus, petalis breviora. Carpella minuta, 2-sperma; seminibus ovatis nitidis.

Species notabilis; facie et charactere carpologico omninò *Tillææ,* sed numero partium floralium et statione aridâ diversa. Si quidem *Crassulæ* referatur, nomen mutandum erit in *C. tillæoideam.*

Ord. Saxifrageæ.

68. Saxifraga (*Arabidea*) micrantha; hirsutiuscula, scapo filiformi paucifoliato paniculatim paucifloro, foliis radicalibus longè petiolatis caulinisque subsessilibus ovatis crenato-dentatis basi truncatis, capsulis venosis rugoso-punctatis.

Hab. Himala, ad alt. ped. 9000–10,000. Chúr.

Erecta, pilis sparsis hirsutiuscula, 6–10 uncialis. Folia radicalia, longè petiolata, rotundato-ovata, basi truncata, obtusa, crenato-dentata; caulina subsessilia; demùm floralia lanceolata. Scapus paucifoliatus; pedunculis axillaribus bifloris paniculam laxam formantibus. Pedicelli glanduloso-pilosi. Calycis gamosepali segmenta revoluta, intùs extùsque glabra. Petala parva, alba. Filamenta filiformia, petalis breviora. Styli breves, divaricati. Capsulæ venosæ, rugoso-punctatæ. Semina ovata, striata.

Saxifraga (*Hirculus*) *flagellaris*.

Hab. Himala, ad alt. ped. 16,000–18,000. Rathakona, prope portum Mána.

Differt ab exemplaribus in herbario Benthamiano ex Insulâ Melville et Greenland, caule brevissimo vix ullo, et foliis sepalisque angustioribus oblongis vix ovatis. Folia trinervia, nervis exterioribus dichotomis, ideò pseudo-quinque-nervia, anastomosantibus marginantibus.

Ord. Umbelliferæ.

Trib. Ammineæ.

Gen. Acronema, *Falconer MSS.*

Char. Gen. *Calycis* margo obsoletus. *Petala* lanceolata; in apiculum filiformem rectum acuminata. *Stylopodium* bifidum dilatatum; styli divergentes, apice deflexi. *Fructus* subovatus a latere compressus, subdidymus; *mericarpia* basi gibba apice angustata, jugis 5 æqualibus tenuiter filiformibus, omninò evittata; *carpophorum* liberum, integrum, apice bidentatum. *Semen* teres, convexum, anticè planiusculum.

69. Acronema tenerum; pusillum, glabrum, radice tuberosâ, foliis biternatis; foliolis basi cuneatis trilobatis: laciniis spathulatis mucronatis, umbellis 4–8-radiatis ex-involucratis, umbellulis 3–6-floris, involucelli foliolis 3–4 subulatis parvulis, petalis staminibusque eis brevioribus et stylis longioribus fuscis.

Hab. Himala, ad alt. ped. 6000–7000, supra arbores inter muscos subepiphyta, 2–4 pollicaris. Jul.—Sept.

Sison tener, Wall. Cat.

Heliosciadium? *tenerum*, DeC. Prodr. iv. p. 105.

Genus inter *Ammineas* evittatum, distinctissimum, et habitu notabile. Petalorum apiculus longus, subflagelliformis, ne minimè inflexus.

Gen. Petrosciadium.

Char. Gen. *Calycis* limbus obsoletus. *Petala* ovata, integra, lacinulâ inflexâ. *Fructus* a latere compressus, oblongus, stylopodio pulvinato, stylisque divergentibus reflexis coronatus; *mericarpia* 5-juga, jugis filiformibus æqualibus, valleculis 1-vittatis, commissurâ bivittatâ; *carpophorum* bipartitum, adnatum. *Semen* planum, oblongum, basi angustatum.

70. Petrosciadium cæspitosum; caulibus numerosis basi reliquiis petiolorum marcidis squamatis cæspitosis, foliis omnibus subradicalibus pinnatipar-

titis pube cinereâ tomentosis, foliolis 1–3-jugis subrotundis 3-lobis; segmento medio 3-dentato lateralibus integris, scapis tenuibus puberulis (3–5-uncialibus), involucri et involucelli foliolis subulatis pubescentibus, umbellis 3–4-radiatis, umbellulis 6–10-floris, pedicellis calyceque cinereo-pubescentibus, petalis extùs pubescentibus, staminibus petalis longioribus, fructu pubescenti.

Hab. Himala, ad alt. ped. 10,000–11,000, in rupibus (gneiss), infra Niti.

Herba cinerea, palmaris, facie *Pimpinellæ* sectionem *Tragium* æmulans; valleculis uni- nec trivittatis diversa, necnon petalis integris et carpophoro adnato. A *Petroselino* formâ fructûs omninò aliena est; igitur invitissimus novum genus formavi.

71. Reutera acuminata; erecta, glabra, foliis bi- triternatis; foliolis lanceolatis acuminatis pinnatifidis v. acutè inciso-dentatis, involucri et involucelli foliolis subulatis reflexis.

Hab. Himala, ad alt. ped. 6000–7000, in sylvis umbrosis. Masúri, Chepal, &c.

Erecta, ramosissima, glabra, 2–5 pedalis. Folia bi- triternata, foliolis lanceolatis, acuminatis, pinnatifidis v. inciso-dentatis, dentibus acutis mucronulatis; pinnis primariis supra vaginas sessilibus; ad nervos minutè puberula. Umbellæ oppositifoliæ terminalesque, multiradiatæ, pedunculis gracilibus. Involucri involucellique foliola subulata, margine tenui scariosa, integra v. subpinnatifida, reflexa. Umbellulæ 8–12-floræ, floribus interioribus interdùm sterilibus, pedicellis gracilibus in fructu nutantibus. Calycis margo obsoletus. Petala ovata, integra, apiculo brevi involuto, caducissima, luteo-virescentia. Fructus (junior compressus) maturus didymus, stylopodio conico rugoso stylisque reflexis coronatus; mericarpia 5-juga, lævia, jugis filiformibus, demùm subobsoletis, valleculis multivittatis.

72. Bupleurum rupestre; annuum? multicaule, foliis linearibus basi breviter membranaceo-vaginantibus marginatis revolutis acuminatissimis, umbellis terminalibus inæqualiter 2–4-radiatis, involucro diphyllo; foliolis lanceolatis acuminatis subperfoliatis, umbellulis plurifloris, involucelli foliolis 7–8 basi connexis latè lanceolatis obovatisve acuminatis flores superantibus, petalis ovatis apice involutis, fructu latere compresso disco magno nigrescente stylisque brevibus rectis coronato, mericarpii jugis 5 acutè costatis subalatis, valleculis omnibus et commissurâ bivittatâ.

Hab. Hímala, ad alt. ped. 11,000–12,000, in rupibus ad cacumen montis Chúr.

Affinis *B. tenui* et *virgato*; involucelli foliolis pluribus fructuque subalato distincta.

Trib. Selineæ.

73. Œnanthe corticata; caulibus decumbentibus foliosis, foliis pinnatisectis 1–2-jugis; foliolis latè ovatis inciso-serratis, involucri et involucelli foliolis linearibus reflexis, mericarpii jugis marginalibus corticato-incrassatis.

Hab. In Indiâ Boreali-Occidentali, rivulis stagnisque. Prov. Sirhind, Radaur.

Glabra, decumbens; caulis ramosa, fistulosa, foliosa. Folia pinnatisecta, inferiora petiolata, bijuga, superiora subsessilia, ternatisecta, foliolis latè ovatis, inciso-serratis; vaginâ brevi. Umbellæ oppositifoliæ terminalesque, multiradiatæ. Umbellulæ pluriflorae; involucri et involucelli foliola linearia, reflexa. Calycis laciniæ acutæ. Petala ovata, integra, apiculo inflexo, alba, lineâ dorsali fuscâ. Stylopodium breve, conicum, calycis laciniis auctis brevius. Fructus subglobosus, calyce stylisque rectis coronatus. Mericarpia 5-juga, jugis 3 dorsalibus incrassatis, marginalibus majoribus corticatis; valleculis 1-vittatis, commissurâ bivittatâ; carpophorum indistinctum. Semen dorso convexum, subtrigonum.

Affinis *Dasylomati latifolio,* et fortè congener. Differt autem (cum *D. latifolio*) a diagnose genericâ, calycis laciniis longis nec margine obsoleto, stylisque longiusculis nec brevibus. Semen vero ut in *Dasylomate* subtrigonum.

Trib. Angeliceæ.

74. Angelica glauca; glabra, foliis triternatis; foliolis lanceolatis inciso serratis subtùs glaucis, umbellis pluriradiatis subæqualibus, involucri involucellique foliolis subulatis.

Hab. Himala, ad alt. ped. 8000–10,000. Kamalori, Hattu, &c.

Elata, glabra (6–12 pedalis); caulis fistulosa. Folia triternata, foliolis lanceolatis, inciso-serratis, mucronatis; lateralibus quandoque lobatis; subtùs glaucis, suprà olivaceo-viridibus. Umbellæ terminales et oppositifoliæ, longè pedunculatæ æqualiter pluriradiatæ; involucri involucellique foliolis subulatis, marcidis. Calycis margo obsoletus. Petala elliptica, extùs puberula, elliptica, apice involuta, nec apiculata; stamina petalis duplò longiora. Stylopodium in flore magno pulvinatum. Fructus dorso compressissimus; stylopodio non aucto brevi stylisque longis crassiusculis reflexis coronatus. Mericarpia jugis 5, dorsalibus 3 filiformibus, lateralibus amplis aliformibus; valleculis univittatis; commissurâ 2–4-vittatâ planâ. Semen anticè leviter concavum, dorso sub vittis exsulcatum, vix semiteres.

Indigenis *Chura* dicta, aromatica. An verè Angelica? semen magis compressum et anticè leviter concavum.

Gen. Oreocome.

Char. Gen. *Calycis* limbus 5-fidus; laciniis subulatis. *Petala* ovata, apiculo inflexo plùs minùs emarginato. *Fructus* a dorso compressus, stylopodio stylisque reflexis coronatus; *mericarpia* 5-juga, jugis alatis, marginantibus amplis, valleculis 1-vittatis, marginalibus quandoque bivittatis; commissurâ 2–4-vittatâ. *Semen* anticè planum vel subconcavum, dorso sub valleculis exsulcatum; *carpophorum* liberum bipartitum.

75. Oreocome elata; foliis 4–5-pinnatisectis, caulinis superioribus 3-pinnatisectis; pinnis primariis ad vaginæ apicem sessilibus: laciniis inciso-dentatis acutis, involucelli foliolis linearibus, valleculis dorsalibus 1-marginalibus 1–2-vittatis: commissurâ 4-vittatâ, semine anticè plano.

Hab. Himala, in sylvis, alt. ped. 8000–10,000. Mahaseo, Chúr.

Perennis, elata, 4–10 pedalis, tenuiter puberula. Caulis fistulosus, striatus. Folia inferiora longissimè petiolata, 4–5-pinnatisecta; caulina tripinnatisecta; in his pinnis primariis ad apicem vaginæ sessilibus; omnium laciniis inciso-dentatis acutis; in nervis puberula, ceterùm glabra. Umbellæ oppositifoliæ terminalesque, longè pedunculatæ, multiradiatæ. Involucri foliola linearia, plùs minùs caduca. Involucella lineari-subulata, nervo medio et margine ciliata, persistentia, integra. Calycis glabriusculi laciniæ subulatæ. Petala apiculo inflexo subobcordata; filamenta eis paullò longiora. Ovarium a latere compressum. Styli breves, in stylopodio pulvinato deflexi. Fructus ut suprà; valleculis dorsalibus 1-, marginalibus 1–2-vittatis; commissurâ 4-vittatâ. Semen anticè planum, dorso sub vittis exsulcatum.

76. Oreocome filicifolia; foliis inferioribus 4–5-pinnatisectis superioribus tripinnatisectis; pinnis omnibus petiolatis: segmentis pinnatifidis lobis angustis lanceolatis acutis mucronatis, involucelli foliolis biformibus lanceolatis pinnatifidisque, valleculis dorsalibus uni-marginalibus uni- bivittatis: commissurâ 4-vittatâ, semine anticè subconcavo.

Hab. Himala, in sylvis, alt. ped. 9000–10,000. Kamalori, Hattu, &c.

Erecta, puberula, 2–8 pedalis, caule fistuloso striato. Folia inferiora longè petiolata, 4–5-pinnatisecta; caulina superiora 3-pinnatisecta, pinnis primariis paullò supra vaginam ortis, petiolatis; foliolis pinnatifidis segmentis integris laciniatisve angustè lanceolatis, acutis, mucronatis; secus nervos puberula, ceterùm glabra. Umbellæ oppositifoliæ terminalesque, longè pedunculatæ, multiradiatæ; involucri foliolis linearibus, integris vel apice pinnatifidis; involucelli foliolis biformibus, aliis herbaceis linearibus pinnatifidis laciniis subulatis, aliis lanceolatis margine scariosis apice integro acuto sive pinnatifido, persistentibus. Calycis laciniæ subulatæ, petalis triente breviores. Petala obovata, intùs carinata, extùs nervo subferrugineo notata, apiculo inflexo plùs minùs emarginata. Filamenta petalis subduplò longiora. Styli breves, in stylopodio mediocriter pulvinato reflexi. Fructus ut suprà; valleculis latè univittatis, marginalibus quandoque bivittatis, commissurâ 4-vittatâ planâ. Semen anticè leviter excavatum, dorso altè sub vittis exsulcatum.

Ambæ species aromaticæ, odoratæ, ab indigenis *Khes* (id est *crinis*, unde nomen, ὄρεος κόμη, montis crinis) dictæ; valdè affinis *Selino Candollii* (*Peucedano Wallichiano*, DeC. Prodr. iv. p. 181. *Selino tenuifolio*, Wall.) et *Pleurospermo cicutario*, Royle Ill., quæ etiam hùc revocanda. A *Selino* differunt calycis laciniis subulatis nec margine obsoleto; commissurâ 4- nec 2-vittatâ.

O. elatum ab *O. Candolliano* differt foliorum segmentis acutis nec acuminatis, pinnisque primariis in foliis superioribus sessilibus nec petiolatis; *O. filicifolia* foliis multò tenuiùs sectis (ferè ut in foliis *Athyrii filicis fœminæ*), et involucello biformi.

Trib. PEUCEDANEÆ.

77. CORTIA VAGINATA; recta, glabra, foliis bipinnatis; foliolis lanceolatis argutè duplicato-serratis, involucelli foliolis linearibus, calycis laciniis subulatis, stylis erectis demùm divaricatis, valleculis dorsalibus 1- marginalibus 2-: commissurâ 6-vittatis.

Hab. Himala, ad alt. ped. 9000–11,000, in apricis graminosis. Chúr, &c., Kamalori, Hattu, Garhwál.

Perennis, erecta; caulis fistulosus, striatus, glaber, 2–3 pedalis; folia secus nervos et margine puberula, ceterùm glabra; caulina vaginâ longâ petiolata, et supra pinnas infimas membranaceo-stipulata. Umbellæ multiradiatæ, oppositifoliæ terminalesque, pubescentes; involucri foliola caduca et involucelli persistentia lineari-lanceolata, plùs minùs pinnatifida, pubescentia. Umbellulæ plurifloræ, pedicellis involucello brevioribus; floribus subradiatis. Calycis laciniæ longæ, subulatæ, glabræ. Petala exteriora subcordata, interiora integra, apiculo inflexo subemarginata. Stamina petalis longiora; antheris cærulescentibus. Styli perlongi, erecti, demùm divaricati nec reflexi. Fructus dorso compressus (junior a latere): mericarpia 5-juga, jugis 3 breviùs, 2 marginalibus longiùs alatis, altero mericarpio aretè adpressis; valleculis dorsalibus 1-, marginalibus 2-, commissurâ 6-vittatis. Semen anticè subplanum, dorso leviter sulcatum.

A *Cortiæ* charactere differt formâ petalorum.

78. CORTIA ELATA; erecta, foliis bipinnatisectis; foliolis ovato-lanceolatis pin-

natifidis: lobis inciso-serratis marginatis ciliolatis mucronatis, involucelli foliolis subulatis, calycis laciniis brevibus, valleculis dorsalibus 2–3-marginalibus bivittatis commissurâ 6-vittatâ.

Hab. Himala, in apricis graminosis, alt. ped. 7000–9000. Mahaseo, &c.

Erecta, glabriuscula, bi- tripedalis. Folia bipinnatisecta; foliolis ovato-lanceolatis, pinnatifidis; lobis inciso-serratis, serraturis acutis, mucronatis, marginatis, ciliolatis. Umbellæ longè pedunculatæ, oppositifoliæ terminalesque, polygamæ, multiradiatæ. Umbellulæ multifloræ, involucro nullo v. caduco, involucelli foliolis subulatis. Flores ♂: calycis limbus brevissimè acutè 5-dentatus; petala lineari-lanceolata, apiculo acuminato inflexo, adnato. Flores ♀: fructus dorso compressus, stylis reflexis brevibus coronatus; mericarpia 5-juga, dorsalibus 3 minùs, marginalibus ampliùs alatis, altero mericarpio adpressis; valleculis dorsalibus bi- trivittatis, lateralibus 3-vittatis, commissurâ 6-vittatâ. Semen compressum, anticè planum, dorso sub valleculis leviter sulcatum.

Valdè affinis *Levistico arguto*, Lindl. in Royle Ill., quod congener videtur. Fructus ferè *Selini* facie, alis adpressis nec separatis differt et vittis plurimis; an in genere *Cortiâ* admittendum dentibus calycinis brevibus stylisque reflexis alienum?

Hæ duæ species satis distinctæ a *Cortiâ Lindleyi* habitu et formâ foliorum, inter se calycis et petalorum formâ stylisque differunt; forsàn potiùs ad *Conioselinum* intra *Seselineas* referendæ *.

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* I have no doubt in assigning a place to my new genus *Oreocome* in the *Angeliceæ*, as the marginal wings of the mericarps are distinctly divergent, although one of the species belonging to it has been referred to *Peucedanum* by DeCandolle; but with regard to the place of those plants which I have referred to *Cortia* I have some doubt, the wings being not so closely adpressed as in the typical *Peucedaneæ*. The fruit, however, exactly resembles that of *C. Lindleyi*, though Dr. Lindley has referred (in Royle's Illustrations) what appears to me, from a cursory examination, to be a congener with these, to *Levisticum*. In fact, the difference between *Peucedaneæ* and *Angeliceæ* is entirely one of degree; the character of the "raphe marginal" or "central," as given by DeCandolle, being contrary in the first place to theory, and secondly, to fact. I have specially examined, with Mr. Bentham, fruits of indubitable *Heraclea* and *Peucedana*, and found the raphe central; again, it is difficult to say what amount of curvature in the albumen is sufficient to constitute a campylosperm seed. In *Oreocome filicifolia*, *Angelica glauca* and *Cortia vaginata*, herein described, the seed is slightly hollowed out in front, but not I think sufficiently so to remove them from the genera to which I have referred them, though I suppose a similar excavation in the seed of *O. cicutaria* is the reason why Dr. Lindley referred it to *Pleurospermum*. I likewise suspect that *Ligusticum* (*Laserpitium*, Wall. List. no. 584) *coniifolium* is also referable to *Oreocome*; but as there is no ripe fruit in the specimens in the Herbarium of the Linnean Society, I cannot be sure on that point. I observe that a similar remark on the unsatisfactory nature of the subordinal and generic characters of this family has been made by M. Boissier.

79. HERACLEUM (*Sphondylium*) HIRSUTUM; foliis pinnatis bipinnatisve; foliolis semicordatis 3-sectis trilobisve: lobis ovatis acutis inæqualiter inciso-serratis longè petiolatis breviter vaginatis.

Hab. Himala, ad alt. ped. 6000–7000, in sylvis umbrosis. Simla, &c.

Herba perennis, debilis, hirsuta, 1–3 pedalis, ramosa. Folia pinnata v. bipinnata, longè petiolata; vaginâ brevi, viridi; foliolis semicordatis, trisectis trilobisve, lobis ovatis, acutis, inæqualiter inciso-serratis, serraturis acutis mucronulatis. Umbellæ longè pedunculatæ, terminales; involucri caduci et involucelli foliolis linearibus, acutis, hirsutis. Flores albi, radiati; calycis laciniæ acutæ; petala emarginata v. exteriora subbifida, apiculo a fissurâ orto inflexo. Stamina petalis longiora. Styli basi recti, stylopodio brevi conico sensim accreti, apice reflexi. Fructus compressus, alâ latâ basi præsertim ampliatâ circumdatus, obovatus; mericarpiis jugis 3 dorsalibus tenuissimis, 2 marginalibus in alam expansis; valleculis 1-vittatis, commissurâ bivittatâ.

Trib. CAUCALINEÆ.

Gen. PSAMMOGETON (ψάμμος, *arena*; γείτων, *vicinus*).

CHAR. GEN. *Calycis* limbus obsoletus. *Petala* obcordata, lacinulâ ex fissurâ orta inflexâ. *Styli* basi conico subrecti. *Fructus* teres; *mericarpia* jugis 5 primariis filiformibus, setas glochidiatas gerentibus; secundariis simplici serie setosis; valleculis sub jugis secundariis 1-vittatis; commissurâ bivittatâ planâ. *Semen* albumine leviter excavato. *Carpophorum* bipartitum, liberum.

Genus, si verè *Caucalineis* adferendum, *Turgeniæ* et *Torili* affine; calycis limbo obsoleto, jugisque secundariis simpliciter setoso-aculeatis distinctum. An jugis secundariis veris nullis ad Smyrnieas revocandum? involucri foliis membranaceis *Hymenolænæ* affine.

80. PSAMMOGETON BITERNATUM; annuum, pubescens, ramis stellatim decumbentibus, foliis biternatisectis; lobis basi cuneatis 3-dentatis dentibus acutis mucronatis suprà glabris subtùs pilis patentibus pubescentibus, umbellis oppositifoliis longè pedunculatis 6–10-radiatis; pedicellis subglabris, involucro 3-phyllo; foliolis linearibus acutis membranaceo-marginatis apicem versus breviter ciliatis, involucelli foliolis lanceolatis acuminatis ciliatis membranaceis nervo medio herbaceo, petalis exterioribus majoribus bifidis junioribus purpurascentibus, staminibus filiformibus eis longioribus.

Hab. In arenosis Ind. Prov. Bor. Occ. Ambala, Balawali. Januario—Maio.

Subord. Cœlospermeæ.

Gen. Scaphespermum.

Char. Gen. *Calycis* margo 5-dentatus; laciniis subulatis, caducis. *Petala* obovata, integra, apiculo inflexo. *Stylopodium* tumidum, depressum. *Styli* longi, reflexi. *Fructus* subglobosus; *mericarpia* 5-juga, jugis filiformibus æqualibus, valleculis 1-vittatis, commissurâ 2–4-vittatâ; *carpophorum* liberum, bipartitum. *Semen* anticè longitudinaliter concavum; dorso leviter sub valleculis sulcatum.

81. Scaphespermum trilobum.

Hab. Himala, in glareosis, alt. ped. 10,000–11,000; prope Niti.

Herba 1–2 pedalis, perennis; caules breves, erecti, ramosi, ramis puberulis. Folia parva, triloba v. ternatisecta, utrinque pubescentia; foliolis basi cordatis, subrotundis, trilobis, grossè dentatis, dentibus breviter mucronulatis. Pedunculi longissimi, oppositifolii et terminales, puberuli; umbellâ 6–7-radiatâ. Involucri foliola subulata, hirsuta, caduca; involucelli conformia, persistentia. Umbellulæ multifloræ, flore uno sessili. Calycis hirsuti laciniæ subulatæ, caducæ. Petala extùs villosa. Fructus hirsuto-pubescens. Commissura vittis 2 distinctissimis majoribus marginalibus, 2 centralibus tenuioribus interdùm evanidis.

Genus distinctum; facie *Pimpinellas* spectat, at characteribus omnibus carpologicis alienum.

Ord. Loranthaceæ.

82. Loranthus (*Symphyanthus*) elatus; tetramerus, junior totus ferrugineo-tomentosus demùm glaber, ramis teretibus lævibus, foliis petiolatis ovatis, racemis 2–3 axillaribus 7–10-floris laxis, floribus longiusculè pedicellatis, corollæ tubo curvo laciniis plus triplò longiore fissuris vix æqualibus.

Hab. Himala, in sylvis, ad pedum 9000 altitudinem.

Rami teretes, glabri, læves, juniores ferrugineo-tomentosi. Folia opposita, petiolata, venosa, ovata, basi subcordata vel attenuata, apice obtusa vel acuta; juniora ferrugineo-tomentosa, tomento pulverulento caduco glabrata. Racemi 2–3 axillares, 7–10-flori, laxi. Pedicelli divaricati, recti, longiusculi, glabrati, unibracteati. Bracteæ adpressæ, rotundæ, ovario triplò breviores, pulverulentæ. Calycis limbus brevissimus subnullus truncatus. Corolla extùs puberula, tetramera, longè tubulosa, incurva, vix regularis; fissurâ anticâ paulò longiore, posticâ breviore, tubo medio inflato, laciniis linearibus reflexis plus triplò longiore (9 lineas longo) intùs glabro; lineis suturalibus glabris. Filamenta apice brevissimo spatio libera, glabra, lævia; antheræ terminales, erectæ, tantùm exsertæ. Stigma capitatum.

Nomen propter elevationem stationis. In Salicibus præcipue crescit.

83. LORANTHUS (*Scurrula, Pentameræ*) IMBRICATUS; glaber, ramis verrucosis, foliis suboppositis petiolatis obovatis, racemis fasciculatis axillaribus multifloris erectis, pedicellis erectis imbricatis, corollæ tubo incurvo laciniis reflexis plus duplò longiore, filamentis breviter liberis glabris, corollæ lineis suturalibus ad faucem tantùm squamosis.

Hab. In sylvis Dehra Dhun prope Kharak, in arboribus variis.

Glaberrimus, ramis teretibus verrucosis. Folia subopposita, petiolata, obovata, basi attenuata, coriacea. Racemi fasciculati, axillares, erecti, multiflori. Pedicelli subadpressi, imbricatim conferti, breves vix ovario longiores, unibracteati; bracteâ parvâ, rotundâ, ovario triplò breviore, adpressâ, glabrâ. Calycis glabri limbus liber, $\frac{1}{2}$ lineam longus, truncatus. Corolla irregularis, fissuris 2 anticis ad trientem longitudinis fissis, posticâ lateralibus paullò breviore; tubo extùs glabro incurvo laciniis reflexis plus duplò (nec triplò) longiore (9 lin. longo), intùs ad faucem tantùm lineis suturalibus squamoso-verrucosis. Filamenta breviter libera, exserta, glabra (antheris breviora); antheris terminalibus erectis. Stylus antheras superans, striatus. Stigma capitatum.

84. LORANTHUS LINEATUS; glaber, foliis suboppositis, racemis nutantibus paucifloris, corollæ tubo longo laciniis reflexis triplò longiore intùs usque ad medium lineis suturalibus squamato-verrucosis, filamentis breviter liberis glabris.

Hab. Himala, in vallibus, alt. ped. 2000–3000. Girri valle.

Glaber; rami rugosi, teretes; folia subopposita, oblonga, breviter petiolata, basi attenuata, coriacea, subavenia, 5–6 pollices longa, 2–3 lata. Racemi fasciculati, axillares, pauciflori, nutantes; pedicelli breves, recurvati, unibracteati; bractea adpressa, ovario quadruplò brevior, rotundata. Calycis limbus brevis, truncatus. Corolla irregularis, ad mediam fissa, incurva; tubo laciniis reflexis (5 lineas longis) triplò longiore (15 lin.) medio inflato, extùs glabro, intùs ad medium lineis suturalibus squamoso-verrucosis. Filamenta antherarum erectarum longitudine libera, glabra, lævia. Stigma subcapitatum.

Valdè affinis *L. bicolori* (*longifloro*, W. et A.) sed differt filamentis glabris nec setis retrorsis hispidulis, et corollâ breviore.

Ord. Caprifoliaceæ.

85. Lonicera (*Xylosteum, Cuphantha*) oxyphylla; foliis lineari-lanceolatis acuminatis subglabris, ovariis basi connexis, corollis hinc gibbis, bracteis subulatis ovario duplò longioribus.

Hab. Himala, ad alt. ped. 9000–10,000. Chúr. Floret Junio.

Frutex vel arbor parva; ramuli teretes albidi. Folia brevè petiolata, lineari-lanceolata, acuminata, subglabra, pilis paucis minutè ad nervos marginesque subciliata. Stipulæ magnæ, ovatæ, obtusæ, scariosæ, caducæ. Pedunculi biflori, axillares, petiolis duplò longiores; bracteis subulatis, ovario duplò longioribus; bracteolis utrinque 2 oblongis obtusis ovario duplò brevioribus. Corolla pallidè rubra, tubo hinc valdè gibbo. Ovaria basi tantùm connexa. Calycis limbus truncatus, laciniis 5 brevissimis setiformibus. Baccas non vidi.

Species notabilis ut cum *L. heterophyllâ* Jacquemontii sola hujus sectionis adhuc in Himalâ reperta.

86. Lonicera (*Isica*) parvifolia; procumbens, foliis oppositis fasciculatisve obovatis brevissimè petiolatis glabris, pedunculis folio longioribus bifloris, bracteis 2 subulatis ovario longioribus, corollâ dorso gibbâ, ovariis glabris in unum connexis.

Hab. Himala, ad alt. ped. 11,000–12,000. Chúr, Badhrinath. Floret Junio.

Frutex glaber; rami procumbentes, cæspitosi; folia opposita vel in ramulis parvis fasciculata, obovata, brevissimè petiolata, glabra, squamis scariosis ciliatis suffulta. Pedunculi axillares, folio longiores, biflori, 4-bracteati. Bracteæ 2 inferiores ovario duplò longiores, subulatæ, apice ciliatæ, dorso corollæ oppositæ, 2 laterales adpressæ, ovario duplò breviores, rotundatæ, obtusæ. Calycum limbi breves inter se connati, ex 10- 9-dentati, dentibus obtusis integris. Corolla tubuloso-campanulata, basi dorso gibba, alba; limbo breviter subæqualiter 5-lobo, lobis rotundatis. Stamina 5 (vel abortu 2), subexserta; antheris lineari-oblongis, equitantibus. Stylus subexsertus; stigmate capitato. Ovarium glabrum, calycis dentibus coronatum. Fructus lætè rubens, edulis.

Affinis *L. microphyllæ* et *angustifoliæ*.

Ord. Rubiaceæ. Trib. Hedyotideæ.

87. Ophiorhiza nana; hispidula, foliis radicalibus longè petiolatis caulinisque ovatis, floribus terminalibus solitariis cymosisve, stipulis linearibus, corollæ tubo calyce plus duplò longiore.

Hab. Himala; in rupibus calcareis madidis tempestate pluviosâ cum *Cyrtandraceis* crescit, ad alt. ped. 6000–8000. Huthipeon. Floret Junio.

Herba parva, uncialis, omninò hispidula. Radix tuberosa. Folia radicalia longè petiolata, rotundato-ovata, basi subcordata, caulina brevè petiolata, opposita, ovata, utrinque hispidula, subtùs glaucescentia, petiolis ciliatis. Stipula utrinque 1, foliacea, linearis, acuta, ciliata. Flos solitarius, vel cyma 3–5-flora terminalis. Calycis hispiduli limbus 5-fidus, ciliatus, lobis acutis. Corolla infundibuliformis, alba, extùs pilosiuscula; tubo calyce duplò longiore; limbo 5-dentato, plicato, lobis acutis. Stamina ad basin tubi affixa, filamentis brevibus filiformibus, antheris lateribus inter se subconnexis oblongis. Stylus basi urceolatus.

Affinis videtur *O. perpusillæ*, Blume.

Trib. Galieæ.

88. Galium (*Leiogalium*) acutum; glaberrimum, caulibus prostratis radicantibus ramosissimis 6-angularibus glabris, foliis senis lineari-lanceolatis acutissimis mucronatis, floribus axillaribus utrinque solitariis, pedunculis foliis brevioribus defloratis erectis, corollæ albæ lobis acutis, staminibus corollâ brevioribus, stylo bifido ramis divaricatis staminibus longiore, stigmatibus capitatis, fructu granulato-scabro.

Hab. Himala, ad alt. ped. 10,000–11,000. Badhrinath. Floret Octobri.

Affine *G. pumilo*, sed nervis foliorum minus prominentibus; a *G. saxatili* differt foliis lanceolatis nec ovatis, et inflorescentiâ.

89. Galium (*Trichogalium*) asperuloide; repens, glabriusculum, caulibus erectis glabris, foliis verticillatis (verticillis distantibus) octonis lineari-lanceolatis mucronatis serrulato-ciliatis, cymis axillaribus terminalibusque corymbosis, fructu hispido.

Hab. Himala, in sylvis, alt. ped. 8000–10,000.

Perenne, repens, glabriusculum. Caules numerosi, erecti, glabri, verticillis distantibus. Folia verticillata, octona, lineari-lanceolata, utrinque acuta, mucronata, lætè virentia, pilis sparsis adpressis utrinque hispidula, margine pilis albis serrulato-ciliata, (1–1½ poll. longa, 4–5 lineas lata). Cymæ axillares terminalesque, dichotomo-corymbosæ; bracteæ lineares, demùm setaceæ. Corollæ rotatæ laciniæ patentes, acutiusculæ, genitalibus longiores. Stamina 4. Styli duo a basi distincti, breves. Fructus hispidus.

Facies *Asperulæ odoratæ*.

Ord. DIPSACEÆ.

90. MORINA BREVIFLORA; foliis linearibus sinuato-lobatis spinosis: floralibus ovatis acuminatis spinosissimis, involucro truncato spinoso, calycis lobis bifidis; segmentis acutis spinosis, corollæ tubo calyce plus duplò longiore, filamentis breviter liberis apice pilosiusculis.

Hab. Himala, ad alt. ped. 10,000–11,000. Pharkia, prope portum Niti.

Folia radicalia linearia, sinuato-lobata, glabra (6–9 uncialia), lobis 1–3-dentatis, dentibus longè spinosis, sinubus serrulatis spinulosis. Scapus erectus (1–2 pedalis), sub-4-angularis, infrà glaber, suprà pubescens, purpurascens, verticillis (circum 5) superioribus floriferis subapproximatis. Folia caulina verticillata, sessilia, amplexicaulia, inter se connexa, radicalibus similia sed gradatim minora; floralia ovata, acuminata, spinosissima, basi molliter villosiuscula, apice glabra, viridia nec (ut in *M. longifoliâ*) rubra. Flores numerosi, axillares. Involucrum 1-florum, tubulosum, molliter tomentosum, 6–8-nerve, 6–16-denticulatum, dentibus spinosis; spinis 2 multò longioribus, calycis laciniis oppositis easque superantibus. Calyx ad apicem ovarii constrictus, villosus, ceterùm subglaber; limbus tubuloso-campanulatus, bipartitus, lobis bifidis, segmentis acutis spinosis. Corollæ tubus gracilis, calycis limbo plus duplò nec triplò longior, puberulus; limbus bilabiatus $\frac{2}{3}$, lobis obtusis. Staminum filamenta 2, dianthera, antheris obliquis, corollæ adnata, brevissimè libera vix exserta, apice minutè pilosa nec barbata, 2 sterilia in labio inferiore subsessilia. Semen solitarium rugosum. Flores odorati, odore *Lonicerœ.*

Differt a *M. polyphyllâ* verticillis distantioribus, involucro truncato nec dentato; a *M. longifoliâ* foliis floralibus spinosis; a *M. Wallichianâ* et *M. Persicâ* staminibus vix nec longè exsertis, pilosis nec barbatis, et corollâ multo breviore; a *M. Coulterianâ* lobis calycinis spinosis.

Ord. COMPOSITÆ. Trib. VERNONIACEÆ.

91. VERNONIA (*Tephrodes*) RHOMBOIDEA; hirsuta, caulibus erectis ramosis, foliis petiolatis rhomboideis grossè mucronato-dentatis, involucri squamis acuminatis mucronatis, receptaculo fimbrillato.

Hab. Himala, ad alt. ped. 5000–6000, in graminosis. In valle fl. Mandagni, Garhwal Orientalis. Octobri.

Herbacea, erecta; caulis ramosus, ramis teretibus villoso-hirsutis. Folia petiolata, alterna vel subopposita, latè rhomboidea, grossè dentata, dentibus acutis mucronulatis, subtùs lanata, suprà hirsuta; basi longè in petiolum attenuata, petiolo non decurrente; floralia linearia v. subulata. Corymbi axillares terminalesque, pedunculis hirsutis. Capitulum cylindricum, multiflorum, homogamum. Involucri squamæ extùs pubescentes, basi hirsutæ, intùs glabræ; exteriores breves, interiores gradatim longiores, lineares, acuminatæ, mucronatæ. Corollæ omnes pentameræ, tubulosæ, laciniis linearibus, revolutis, apice glandulosis, barbellatis. Stamina 5 antheræque glabræ. Styli rami longi, scabri. Achenium teres, villosum. Pappus duplex, serie exteriore brevi, interiore longiore; setis tenuibus scabris. Receptaculum alveolatum, breviter fimbrillatum.

92. Vernonia oligocephala; herbacea, pilis adpressis puberula, caulibus brevibus 1–3-floris, foliis linearibus integris pauci-dentatisve margine revolutis, capitulis pedunculatis subsolitariis, involucri squamis lanceolatis acutis mucronatis apice laceris, pappo 1-seriali æquali.

Hab. In graminosis, sub Himala. Paota, Dehra Dhun. Floret Martio—Junio.

Herbacea, perennis; caules suberecti, 2–4-unciales, puberuli. Folia sessilia, linearia, margine revoluto integro vel dentibus paucis remotis glandulosis, utrinque pilis adpressis puberula. Capitula majuscula, terminalia, subsolitaria, pedunculis longis, striolatis, 1–2-foliatis, foliis subulatis. Involucrum imbricatum, ovoideum, multiflorum. Squamæ extùs pubescentes, intùs glabræ, ciliatæ, exteriores lanceolatæ acuminatæ, interiores latè lanceolatæ acutæ mucronulatæ ad apicem margine submembranaceo-laceræ. Corollæ purpureæ, omnes ☿ tubulosæ, graciles, 5-fidæ, laciniis linearibus. Stamina 5; antheris ecaudatis, apice breviter appendiculatis. Styli rami cylindrici, revoluti, extùs puberulo-scabri. Achenium teres, pubescens. Pappus simplex, uniserialis, setis asperis æqualibus, albus.

Affinis *V. revolutæ*! differt squamarum formâ et staturâ, &c.

Trib. Eupatorieæ.

93. Eupatorium (§ *Cannabina*) dicline; hirsutum, foliis 3-sectis: lobis lanceolatis grossè dentatis, corymbis compositis multifloris, involucri squamis obtusis interioribus scariosis coloratis.

Hab. Himala, ad alt. ped. 6000–7000. Tapuban, in valle fl. Dhauli, Garhwal Orientalis. Octobri.

Erectum, hirsutum, 3–4 pedale. Caules teretes. Folia opposita, subsessilia, inferiora trisecta segmentis lanceolatis vel superiora lanceolata plùs minùs 3-lobata, grossè inciso-serrata, acuta, utrinque hispida. Corymbi decompositi, terminales, confertim multiflori. Pedunculi pubescentes. Capitula dioica v. polygama? 5–6-flora. Involucrum imbricatum, cylindricum; squamæ circiter 10, 5 exteriores breves pubescentes, 5 interiores longiores subæquales glabræ, omnes obtusiusculæ margine scarioso carneo, subdenticulatæ.

Flores fœminei omnes tubulosi, pappo breviores. Stamina 5 antheris sterilibus, v. nulla. Styli rami 2 vel 3, longissimè divaricati, papillosi. Achenia nigra, subcompressa, pentagona, lævia, glandulosa. Pappus uniserialis; setis scabris, basi brevissimè connexis. Receptaculum stipitatum, alveolatum. Flores masculos, capitula plurima frustrà perquisitus, non inveni.

Affine *E. cannabino*, involucri squamis paucioribus, floribus diclinibus, necnon hirsutis, distinctum.

94. Adenocaulon himalaicum; foliis rotundatis subreniformibus repandis mucronato-dentatis, capitulis 12–20-floris, antheris obtusis.

Hab. Himala, in sylvis, alt. ped. 7000–9000, intra Nagkunda et Kotgurh; Padma Khal in Garhwal Occidentali.

Erectum, araneoso-lanuginosum. Caulis teres, striatus, parcè ramosus. Folia alterna, longè petiolata, rotundato-subreniformia, in petiolum decurrentia, repanda, mucronulato-denticulata, suprà glabra ad nervos tantum glanduloso-puberula, subtùs niveo-tomentosa, superiora minora. Ramuli axillares et terminales sub-3-cephali, bracteis setaceis. Pedunculi monocephali, longi, floriferi lanuginosi, post anthesin elongati pilis capitatis glanduloso-hispidi viscidi. Capitula solitaria, monœca. Flores exteriores fœminei, 6–12; interiores 16–24 masculi. Involucri squamæ 5, ovatæ, post anthesin reflexæ. Flores ♀ uniseriales, campanulati, 4-fidi, tubo brevi, laciniis patentibus obtusiusculis. Styli rami breves, lanceolati, plani. Achenia clavato-cylindrica, incurva, basi attenuata, glabra, apice pilis capitatis viscidis glanduloso-hispida, stellatim patentia. Pappus 0. Flores ♂ 3-seriales tubulosi, tubo brevi, limbo 4–5-fido, laciniis revolutis acutiusculis. Stamina 4–5; antheris utrinque muticis, obtusis, exsertis. Stylus sterilis, indivisus, apice capitatus, antheras superans. Receptaculum breviter conicum, vix punctatum.

Species aliæ hujus generis hucusque cognitæ ambæ Americanæ. Hæc primâ facie *A. bicolori* simillima, sed foliorum formâ, capitulis plurifloris, antherisque muticis nec acutè-appendiculatis, stylisque brevioribus satis distinguenda.

Trib. Asteroideæ, § Astereæ.

95. Aster ferrugineus; suffrutex, ramis ferrugineo-pubescentibus, foliis omnibus lineari-lanceolatis utrinque acutis subtùs glaucis araneosis suprà puberulis, corymbis multifloris, capitulis longè pedicellatis, squamis involucri carinatis margine scariosis ciliatis, floribus radii circiter 12, pappo uniseriali ferrugineo.

Hab. Himala, ad alt. ped. 10,000–12,000, prope Badhrinath. Octobri.

Suffrutex 3–4 pedalis, ramosissima; rami teretes, juniores ferrugineo-pubescentes. Folia omnia lineari-lanceolata, utrinque acuta, in petiolum brevem attenuata, margine subrevoluto integra vel minutè mucronulato-denticulata, subtùs glauca araneoso-pubescentia, suprà puberula. Corymbi terminales, multiflori; capitula longè pedicellata. Involucri squamæ inæquales, apice scariosæ, ciliatæ, dorso carinatæ, in anthesi arctè imbricatæ, posteà laxæ. Flores radii pauci circiter 12, ligulis ellipticis breviter tridentatis, lilacini. Styli rami breviter exserti, lineares; pappus disci conformis. Flores disci hermaphroditi, infundibuliformes, limbo 5-fido, laciniis revolutis, lutei. Stamina 5; antheris basi ecaudatis, apice breviùs appendiculatis. Styli rami breves, lanceolati, plani. Achenium compressum, pilosum. Pappus setosus, uniserialis; setis inæqualibus, serrato-scabris, ferrugineis. Receptaculum alveolatum, marginibus dentatis.

§ Bellieæ.

96. Myriactis oleosa; erecta, glabra, ramis rigidis, foliis inferioribus lyratis pinnatifidis petiolatis superioribus lanceolatis sessilibus mucronato-dentatis hispidulis, capitulis subsphæroideis, involucri squamis biserialibus, receptaculo in radio muricato in disco tuberculato.

Hab. Himala, in ruderatis, alt. ped. 6000–8000.

Caulis erectus, glaber, ramis rigidis brevibus. Folia inferiora petiolata, lyrata et pinnatifida, obtusa, superiora sessilia lanceolata acuta integerrima mucronulato-denticulata, utrinque hispidula vel subglabra, subtùs pallidiora. Ramuli pauciflori. Pedunculi axillares terminalesque, monocephali. Capitulum sphæroideum; floribus radii innumeris fœmineis, disci numerosis hermaphroditis. Involucri squamæ biseriales, exteriores longiores herbaceæ, interiores scariosæ lineari-lanceolatæ acutæ.

Flores radii ♀ breviter ligulati; tubo brevi, pilis articulatis capitatis glanduloso; ligulâ ovatâ, integrâ, tubo paulò longiore. Achenia obliquè ovata, compressa, marginata, lævia, glabra, tenuissimè striata, basi stipitata, stipite in receptaculo persistente.

Flores disci ☿ tubulosi, tubo brevi glanduloso, limbo 4-fido, laciniis latis acutis. Stam. 4; antheris ecaudatis, apice breviter appendiculatis. Styli rami breves, acuti. Achenia compressa, obovata; costis 4 incrassatis, duabus marginem formantibus, duabus lateralibus quandoque evanidis, in tuberculis sessilibus. Receptaculum subcylindraceum, in circumferentiâ cum stipitibus persistentibus florum radii muricatum, in disco subplano tuberculatum.

Semina oleifera, unde nomen specificum.

Affinis *M. Nepalensi*, sed habitu rigidiore capitulis majoribus glabritieque distincta, floribus radii integris nec emarginatis.

97. Myriactis (*vel potiùs Botryadenia*) gracilis; hirsutiuscula v. subglabra, involucri squamis subuniserialibus æqualibus margine scarioso vix lacero, floribus radii vix biserialibus.

Hab. Himala, in sylvis, ad alt. ped. 8000–9000. Nagkanda.

Herba annua, hirsutiuscula; caulis erectus, ramosus. Rami striati, pilis brevibus albis vix hirsuti. Folia alterna, petiolata, ovato-lanceolata, basi in petiolum attenuata, apice acuminata, repando-dentata, dentibus mucronulatis subglabris, utrinque sub lente pilis parvis albis sparsè (præsertim in nervis) puberula, suprà lætè viridia, subtùs pallida; superiora lineari-lanceolata, integra, subsessilia. Ramuli oligocephali. Pedunculi longi, graciles, bracteis subulatis quandoque nullis, 1-cephali. Capitula parva, radiata; floribus radii vix biserialibus, disci numerosis tetrameris. Involucri squamæ subuniseriales, subæquales, nullis in pedunculo sejunctis, lineari-lanceolatæ, acutæ; exterioribus herbaceis, pilosis, marginatis, apice scarioso colorato subintegro; interioribus scariosis, nervo medio tantùm herbaceo, margine vix lacero nec ciliato.

Flores radii ♀ vix biseriales, ligulati; tubo brevi glanduloso, ligulis angustis revolutis apice integris lilacinis albidisve; stylus purpureus, ramis rectis. Achenia conformia.

Fl. disci ☿ lutei, infundibuliformes, tubo glanduloso hirsuto, limbo 4-fido, laciniis acutis. Stam. 4; antheris ecaudatis, apice brevissimè appendiculatis. Stylus luteus; ramis acutis, lineis stigmatosis marginantibus ante apicem desinentibus. Achenia lævia, glabra, nitida, compressa, obovata, basi attenuata, cicatrice in apicem notata, margine incrassato, lateribus planis. Receptaculum tuberculatum.

Differt a *M. Gmelini* squamis involucri vix bi- nec 3-serialibus, exterioribus non brevioribus nec ullis in pedunculo sejunctis; a *M. Wallichii* (quæ etiam 4-mera est, dùm *M. Gmelini* 5-mera) squamis paucioribus nec lacero-ciliatis, ligulis vix bi- nec triseriatis, capitulis minoribus et habitu graciliore. At forsan tres in unam conjungendæ sunt, et meâ sententiâ a *Myriactine* avellendæ, et generi *Botryadeniæ* rursùm referendæ: a *M. Nepalensi* et *M. oleosâ* differunt plurimis notis, præcipuè formâ receptaculi, acheniis radii et disci conformibus, radii floribus longiùs ligulatis.

§ Conyzeæ.

98. Conyza polycephala; erecta, ramosissima, infernè glabra supernè puberula, foliis lineari-lanceolatis acuminatis distanter serrulatis glabris, corymbis paniculatis foliosis, pedicellis 1-cephalis, capitulis multifloris, fl. radii numerosis ♀ brevissimè tubulosis 3-dentatis; disci ☿ 2–5 quinquefidis roseis, squamis involucri linearibus margine scariosis acuminatis biserialibus.

Hab. In Indiæ provinciis boreali-occidentalibus, ad ripas fluviorum. Dadupur ad Jumnam, Bhogpur ad Gangem, &c.

Herbacea, erecta, ramosissima, perennis, 3–4 pedalis, infernè glabra, supernè puberula. Rami teretes. Folia lineari-lanceolata, acuminata, distanter serrulata, glabra, scabriuscula, basi attenuata, subsessilia. Corymbi paniculati, ramosissimi, foliosi; pedicellis 1-cephalis, plùs minùsve pubescentibus, bracteatis. Capitula multiflora, subcylindrica. Involucri squamæ lineares, acuminatæ, margine scariosæ, biseriales, exteriores paulò breviores, medio glanduloso-puberulæ, ceterùm glabræ.

Flores radii ♀ innumeri, brevissimè tubulosi, tubo truncato 3-dentato, stylo 6plò breviore. Flores disci ☿ 2–5, tubulosi, 5-fidi, albido-rosei. Antheræ ecaudatæ, breviter appendiculatæ, purpureæ. Styli rami plani, lineares, puberuli. Achenia ovata, compressa, puberula. Pappus simplex, albus, longus, 1-serialis; setis paucis, scabriusculis, vix basi in annulum connexis; discalis et radialis omninò conformis. Receptaculum planum, asperum.

CONYZÆ subgenus novum.

Involucrum laxum, biseriale, 10-phyllum; squamis ovato-lanceolatis, margine hyalino lato, æqualibus, acutis. *Pappus* radii pauci-setosus; disci biserialis, pluri-setosus, brevior ac rigidior. *Receptaculum* radio tuberculatum, disco planum.

99. CONYZA MARGINATA; decumbens, hirtella; foliis lanceolatis obtusis basi attenuatis, corymbis oligocephalis, involucri squamis latè lanceolatis margine hyalinis, floribus radii ♀ brevissimè tubulosis 3-dentatis; disci paucis ☿, pappo discali radiali rigidiore breviore et crebriore.

Hab. In arvis arenosis prope Lodihana, prov. Sirhind, Ind. Bor.-Occ. Floret Aprili.

Annua, decumbens, pilis planis albis hirsutiuscula. Rami purpurascentes. Folia oblongo-lanceolata, basi attenuata, apice obtusa, integra v. denticulata. Corymbi oligocephali, pedicellis gracilibus (plerumque 5). Capitula subcylindrica, multiflora. Involucrum laxum, 10-phyllum. Squamæ biseriales, ovato-lanceolatæ, margine lato hyalinæ, æquales, apice acutiusculæ, sublaceræ, mucronulatæ, 5 exteriores paulò latiores.

Flores radii ♀ innumeri, tubo brevissimo truncato 3-dentato extùs piloso stylo multoties breviore. Pappus 1-serialis; setis basi in annulum connexis, tenuissimis, scabriusculis, albis v. rufescentibus.

Flores disci ☿ 6–10, tubulosi, purpurei, tubo 5-dentato. Antheræ ecaudatæ, apice breviter appendiculatæ. Styli rami lanceolati, extùs pubescentes. Achenium lateraliter compressum, ovatum, minutissimè pilosum. Pappus biserialis; setis in annulum basi connexis, subæqualibus, scabris, rigidioribus brevioribusque quam in radiali. Receptaculum in radio elevatum tuberculatum, in disco cavum punctatum.

100. Phagnalon niveum; decumbens, niveo-lanuginosum, foliis lineari-lanceolatis sessilibus amplexicaulibus margine revolutis, involucri squamis subulatis acuminatis exterioribus lanuginosis interioribus scariosis.

Hab. Himala, in rupibus, in valle fl. Dhawli prope Simangente, Garhwál Orientalis. Oct.

Suffrutex niveo-lanuginosa, semipedalis; ramis decumbentibus ramosis. Folia amplexicaulia, breviter decurrentia, lineari-lanceolata, apice obtusa, margine revoluta. Pedunculi solitarii, 1-cephali, terminales axillaresve unibracteati. Capitula cylindrica, arctè imbricata, squamis 1–2 sejunctis suffulta. Involucri squamæ subulatæ, acuminatæ, exteriores breviores lanuginosæ, interiores scariosæ.

Flores radii pluriseriales ♀ tubulosi, breviter 4-dentati, stylo exserto. Achenia et pappus conformia.

Flores disci pauci ☿ tubuloso-infundibuliformes, 5-fidi. Antheræ basi breviter caudatæ, apice appendice oblongâ, emarginatâ. Styli rami breves, apice truncati, hirtelli nec penicillati. Achenia compressa, pilosa. Pappus uniserialis albus, setis paucis scabriusculis. Receptaculum planum, brevissimè alveolatum.

Differt a *P. saxatili* foliis amplexicaulibus squamisque lanuginosis; a *P. rupestri* squamis acutis.

Genus forsan ad *Gnaphalieas* potiùs referendum, ob styli ramos truncatos *Senecioideos*, antherasque caudatas. Caudas antherarum quamquam breves in *P. saxatili* etiam inveni, difficiliter detectas.

Inulæ subgen. novum, Leucactis.

Flores radii 1-seriales, fœminei, ligulati, heterochromi, 3-dentati. *Involucri* squamæ exteriores laxæ, foliaceæ. *Pappus* setis capillaribus, scabris, apice paulò incrassatis. *Antherarum* appendices emarginatæ.

101. Inula nitida; caulibus erectis junioribus hispidis demùm glabratis, foliis lanceolatis utrinque attenuatis distanter denticulatis v. integris dentibus mucronulatis margine breviter revolutis, pedunculis axillaribus terminalibusque corymbum laxum formantibus, involucri squamis pluriserialibus: exterioribus apice foliaceis laxis: interioribus scariosis ovatis brevibus: intimis oblongis longioribus: omnibus acutis ciliatis, ligulis albis.

Hab. Himala, ad alt. ped. 8000–9000, in rupibus. Tilona Khal, Garhwál Orientalis. Sept.

Perennis, herbacea v. suffruticosa; caules erecti, parcè ramosi, juniores pilis articulatis hispidi, demùm glabrati. Folia lanceolata, utrinque attenuata, breviter petiolata, acuta, penninervia, nervis obliquis, distanter dentata vel subintegra, dentibus calloso-mucronulatis, margine breviter revoluto, pilis paucis basi bulbosis brevibus hispidula, ceterùm glabra, lævia, nitida. Pedunculi axillares terminalesque, 1–3-cephali, corymbum laxum formantes, tomentosi. Capitula multiflora. Involucri squamæ imbricatæ, pluriseriales: exteriores (unâ serie) laxæ, apice foliaceæ, hispidè pubescentes; interiores secundæ seriei subscariosæ, ovatæ, ceteris breviores; internæ tertiæ seriei oblongæ, scariosæ; omnes acutæ, ciliatæ.

Flores radii ♀ uniseriales; ligulis albis, patentibus, 3-dentatis. Styli rami lineares. Achenia conformia.

Flores disci lutei, numerosi ☿, longe tubulosi, 5-dentati, margine incrassato, dentibus acutiusculis. Stam. 5; antheris basi longè bicaudatis, caudis setiformibus, apice appendice brevi, oblongâ, emarginatâ. Styli rami longi, lineares. Achenium teres, pubescens. Pappus longus, albus, uniserialis, setis scabris apice paulò incrassatis, pilis supremis achenii quasi calyculatus.

102. Inula asperrima; hispidè hirsuta, caulibus subflexuosis ramosis, foliis lanceolatis subsessilibus acutè grossè dentatis utrinque hispidè hirsutis, ramulis sub 1-cephalis, involucri squamis exterioribus 2-serialibus foliaceis: interioribus scariosis apice acutis subfoliaceis ciliatis.

Hab. Himala, in rupibus, alt. ped. 5000–8000. Masuri, Simla, Sirmúr. Floret Maio—Novembri.

Perennis, suffruticosa; caulibus ramosis; rami flexuosi, erecti, pilis longis articulatis hispidè hirsuti. Folia alterna, lanceolata, subsessilia, utrinque acuta, utrinque pilis articulatis basi bulbosis hirsuta, bulbis persistentibus aspera, in nervis molliter hirsuta, grossè dentata, margine revoluta, dentibus calloso-mucronulatis (3 poll. longa, 1 lata). Ramuli axillares, monocephali. Capitula majuscula, radiata. Involucri squamæ pluriseriales; exteriores 2–3-seriales laxæ, foliaceæ, hirsutæ, interiores scariosæ, apice acutæ, subfoliaceæ, omnes ciliatæ, lineares vix lanceolatæ (secundi ordinis nec ovatæ nec extimis breviores ut in præcedenti).

Flores radii uniseriales albi, ligulis 3-dentatis. Styli rami divergentes, puberuli. Achenia conformia.

Flores disci plurimi ☿ longè tubulosi, tubo glabro breviter 5-dentato, margine incrassato. Stam. 5; antheris longè caudatis, caudis setiformibus, apice appendice oblongâ, emarginatâ. Styli rami longi, lineares. Achenium teres, pilosum, pilis superioribus pappi seriem exteriorem æmulantibus. Pappus 1-serialis, albus, setis scabris, apice paulò incrassatis.

Affinis videtur *Inula nervosa*, Wall. no. 70, DeC. quæ forsan eædem sectioni referenda si flores radii albi; differt autem ab his pappo apice magis barbellato, et formâ squamarum involucri appendicumque antherarum.

Subtrib. Eclipteæ.

103. Blainvillea hispida; hispida, foliis oppositis petiolatis latè ovatis basi cuneatis apice breviter acuminatis dentatis, capitulis axillaribus, pedunculis petiolis plùs duplò longioribus, florum radii ligulis latis 3-dentatis: acheniis 3-aristatis; disci biaristatis sæpè aristis 0.

Hab. Himala, in arvis, alt. ped. 4000–5000. Junio.

Annua, erecta parcè ramosa, hispida. Caulis striatus. Folia opposita, longiusculè petiolata, latè ovata basi cuneata, v. rhomboidea apice breviter acuminata, dentata, utrinque pilis adpressis solitariis geminisque hispida ($1\frac{1}{2}$–$3\frac{1}{2}$ pollices longa, $\frac{1}{2}$–$2\frac{1}{2}$ lata). Pedunculi axillares, 1-cephali, petiolo plus 2plò longiores. Involucri squamæ laxæ, 5 exteriores herbaceæ, latè lanceolatæ, acutæ, extùs hispido-puberulæ; interiores cum paleis conformes, flores arctè amplectentes, scariosæ, oblongæ, apice truncatæ, lacero-dentatæ, puberulæ, acutè carinatæ, carinâ hispido-ciliatâ. Flores radii 5, tubo brevissimo, ligulâ latâ, basi cuneatâ, apice 3-dentatâ, flavâ. Achenium 3-angulare, basi angustatum, apice truncatum, apice angulisque hispidum, rugosum. Pappus, junior duplex; interior coroniformis lacerus, marcescens; exterior 3-dentatus; posteà in aristas 3 basi barbatas (sæpè abortivas), auctus. Flores disci paleis arctè amplexi, tubulosi, 5-dentati. Stam. 5; antheris nigris, basi truncatis, ecaudatis, apice breviter appendiculatis. Styli rami breves, acuti, extùs pilosi, intùs lineis stigmatosis marginantibus apicem ferè attingentibus, confluentibus. Pollen echinatum. Achenium rugosum, compressum, basi angustatum, 4-angulare v. angulis 2 evanidis, angulis et apice truncato hispidum. Pappus, junior duplex, interior ut in ♀, exterior 4-dentatus, dentibus 2 in aristas auctis.

Differt a *B. latifoliâ,* DeC. v. p. 492, pedunculis petiolo multò longioribus, floribus flavis.

104. Blainvillea alba; puberula, foliis alternis suboppositisque brevè petiolatis angustè lanceolatis longè acuminatis mucronato-serratis, pedunculis 1-cephalis petiolo plùs 4plò longioribus, florum radii ligulis obcordatis, acheniis rugosis radii 3-aristatis disci biaristatis v. exaristatis.

Hab. Pinjor Dhún, in arvis, Prov. Sirhind, Indiæ Bor.-Occ. Sept.

Annua, erecta, dichotomè ramosa; rami infrà glabri, supernè puberuli; folia alterna, opposita v. subopposita, brevè petiolata, subtrinervia, angustè lanceolata, basi attenuata, apice longè acuminata, acuta, serrata, serraturis mucronulatis, utrinque pilis brevibus adpressis hispidulè puberula. Pedunculi 1-cephali, axillares et subaxillares terminalesque, puberuli, petiolis plus 4-plò longiores. Capitula pauciflora, erecta. Involucri squamæ exteriores 4–5 foliaceæ, latè lanceolatæ, acutæ, extùs puberulæ, trinerviæ, ciliatæ; interiores scariosæ, cum paleis conformes, oblongæ, truncatæ, apice laceræ, hispidulæ, carinatæ, flores arctè amplectentes. Flores radii albi 4–5; tubo brevi, ligulâ obcordatâ (ferè ad medium bifidâ). Stylus exsertus, ramis planis acutis. Achenia triquetra, angulis acutis hispidis basi angustatis, triaristata, pappo interiore coroniformi marcescente, rugosa, sæpè sterilia. Fl. disci ☿ circiter 8–10, tubulosi, breves, 5-fidi, albi. Stam. 5; antheris nigrescentibus, basi obtusis, ecaudatis, apice appendiculatis. Styli rami acuti, extùs papilloso-pubescentes, intùs lineis stigmatosis marginantibus. Achenium subtriquetrum, apice et angulis hispidulum, ceterùm glabrum, rugosum; pappo interiore marcido, exteriore in aristas 2 (raró 3) aucto.

Differt a præcedenti formâ et pubescentiâ foliorum ligularumque et colore. An *B. latifolia* var. *angustifoliæ*, DeC.? at pedunculis longis et formâ foliorum, quæ serrata nec grossè dentata, ligularumque differt.

Trib. Senecionidæ. Subtrib. Anthemideæ.

105. Pleiogyne cardiosperma; junior villosa, glabrata, ramis prostratis, foliis pinnatifidis, pedunculis 1-cephalis, floribus radii brevissimè bilabiatis; disci tubulosis 4-meris, acheniis radii obcordatis bialatis; disci exalatis.

Hab. In Prov. Sirhind et Saharunpoor, Ind. Bor.-Occ., inundatis. Jan.—Dec.

Annua, radiatim prostrata; junior pilis longis tenuibus villosa, demùm glabrata glauca; rami striati (3–6 unciales). Folia alterna, pinnatifida, apice dilatata, segmentis inferioribus terminalibusque integerrimis, mediis inciso-dentatis pinnatifidisve, omnibus acutis apice callosis, sessilia, amplexicaulia nec decurrentia. Pedunculi axillares 1-foliati, graciles, 1-cephali. Capitula explanata. Involucri squamæ 2-seriales, oblongæ, margine scariosæ, obtusæ, integræ, glabræ, 1-nerves, florum longitudine. Flores radii ♀ 3–4-seriati, plurimi: corolla brevissima tubo nullo, vel ligulata ligulâ ovatâ integrâ, vel bilabiatâ labio altero breviore, persistens. Stylus longè exsertus, breviter 2-fidus. Ovarium ovatum, glabrum, stipitatum. Achenium maturum compressum, obcordatum, æqualiter bialatum, alis basi angustioribus, apice achenium et corollam stylumque persistentes superantibus, latioribus. Flores disci ☿ plurimi, 4-fidi, tubo angusto brevi, suprà campanulato 4-dentato. Stamina inclusa. Stylus breviter 2-fidus; ramis truncatis, apice brevissimè penicillatis. Achenia ovata, glabra, compressa, exalata. Receptaculum planum, in radio stipitibus persistentibus muricatum, in disco punctatum.

Cotula anthemoides γ, DeC. p. 79, species distinctissima acheniorum alis æqualibus et basi angustatis nec ovatis uno latere latiori, corollâ bilabiatâ nec tantùm ligulatâ, necnon glabritie et facie laxiore.

106. Artemisia (*Abrotanum*, § *Polycarpæa*) hypoleuca; caule cano-tomen-

toso infernè glabro, foliis bipinnatifidis; segmentis pinnatifidis integrisve acutis mucronulatis suprà tomentosis subtùs niveo-lanuginosis, capitulis ovoideis, involucri lanuginosi squamis linearibus acutis.

Hab. Himala, ad alt. ped. 7000–8000. Nagpur in Garhwál Orientali.

Erecta; caules angulosi, infernè glabri, suprà cano-tomentosi. Folia sessilia, bipinnatifida; segmentis pinnatifidis integrisve, plerumque cuneatis 3-fidis; laciniis lineari-lanceolatis acutis mucronatis; suprà tomentosa, subtùs niveo-lanuginosa. Spicæ axillares terminalesque, 12–4-cephali. Capitula sessilia, foliolo subulato acuto hirsuto bracteata, ovoidea, densè lanuginosa. Squamæ extùs lanatæ, lineares, acutiusculæ, nervo medio tantùm herbaceæ, scariosæ, apice sublaceræ; interiores hyalinæ. Flores radii ♀ tubulosi, truncati, squamis breviores; styli rami longi, lineares, divaricati v. revoluti. Flores disci ☿ tubulosi, 5-dentati, dentibus acutis, purpurei. Stam. 5; antherarum appendiculis acutis, scariosis. Styli rami breves, truncati. Achenia glabra, striata.

107. ARTEMISIA REVOLUTA; caulibus pubescentibus demùm glabratis, foliis bipinnatifidis; segmentis linearibus revolutis suprà glabris subtùs canotomentosis, capitulis sessilibus ovoideis, squamis pubescentibus carinatis oblongis obtusis sublaceris.

Hab. Himala, ad alt. ped. 8000–9000. Júma in Garhwál Orientali.

Erecta; caules ramosi, pubescentes, demùm glabrati, angulati, purpurascentes. Folia bipinnatifida, segmentis linearibus revolutis acutis callosis, suprà glabra, subtùs canotomentosa. Spicæ axillares terminalesque, paniculam angustam formantes. Capitula sessilia, ovoidea, foliolo subulato bracteata. Squamæ exteriores herbaceæ, pubescentes, sublanuginosæ, carinatæ; interiores scariosæ, obtusæ, 1-nerviæ, sublaceræ. Flores radii ♀ truncati, disci 5-meri purpurei. Achenium subteres, ovoideum, minutè striatum, nitidum.

108. ARTEMISIA WADII; erecta ramosa, foliis quadripinnatifidis: segmentis dentatis integrisve acutis glabris; superioribus linearibus stipulatis, paniculis amplis laxis, capitulis pedicellatis globosis luteis, involucri squamis lanceolatis ovatisque glabris.

Hab. In horto Clar. Equ. Wade, apud Lodihana, verosimiliter ex seminibus Cashmiricis.

Erecta, ramosa; ramis acutè angulatis glabris. Folia glabra v. secus nervos puberula; inferiora quadripinnatifida, segmentis explanatis dentatis integrisve acutis, petiolata, ad basin petioli laciniis duabus stipulæformibus pinnatifidis, etiam ad basin pinnæ laciniâ simili pinnatifidâ 1; superiora sensim minora, ultima linearia, omnia stipulata, laciniâ stipulari folio simili. Racemi graciles, axillares terminalesque, paniculam laxam amplam formantes. Capitula pedicellata, globosa, nutantia, lutea. Involucri squamæ obtusæ, glabræ; exteriores parvæ, lineares, herbaceæ; secundi ordinis lanceolatæ, nervo medio herbaceo; interiores latè ovatæ, scariosæ, enerves. Flores radii ♀ breviter tubulosi, extùs glandulosi; stylus breviter exsertus. Flores disci ☿ tubulosi, lutei; antherarum appendicibus acutis, submucronatis; styli rami truncati, penicillati. Ovaria glabra. Achenia matura non vidi.

Affinis videtur *A. ponticæ*, DeC. no. 90; differt paniculâ laxiore, foliis glabris v. puberulis nec incanis, floribus ♀ glandulosis. Odoratissima, etiam post 5 annos sicca.

109. ARTEMISIA (*Monocarpæa*) STRICTA; subglabra, caulibus strictis, foliis parvis pinnatifidis sessilibus: segmentis linearibus, spicis axillaribus cauli adpressis oligocephalis, capitulis ovoideis subglabris, squamis ovatis v. lanceolatis scariosis acuminatis, floribus radii ♀ urceolatis, acheniis glabris striatis.

Hab. Himala, ad alt. ped. 10,000–11,000. Pharkia.

⊙ Caulis erectus, striatus, ramis nullis, subteres, striatus, pilis paucis debilibus subglaber. Folia parva, bipinnatifida v. pinnatifida, sessilia, laciniis 2 stipuliformibus linearibus; segmentis linearibus, cuneatis, acutis, mucronulatis. Spicæ axillares, cauli adpressæ, terminalesque, oligocephalæ. Capitula sessilia, ovoidea. Squamæ involucri ovatæ et lanceolatæ, acutæ; exteriores subglabræ, herbaceæ, latiores; interiores angustæ, scariosæ, acuminatæ. Flores radii ♀ pauci, urceolati, tubo apice coarctato bidentato basi inflato, achenio latiores; styli longè exserti, ramis brevibus linearibus, sæpè steriles. Flores disci ☿ tubulosi; antherarum appendicibus acutissimis; styli rami breves, truncati, penicillati. Achenia parva, teretia, glabra, striata, nitida, disco epigyno parvo apiculata. Receptaculum conicum nudum.

Affinis videtur *A. pinnatifidæ*.

Subtrib. GNAPHALIEÆ.

110. LEONTOPODIUM MONOCEPHALUM; repens, cano-lanuginosum, foliis ovatis rosulatis, capitulo terminali solitario foliis involucrantibus auctis densè lanatis circumdato, squamis sphacelatis acutis mucronatis.

Hab. Himala, ad alt. ped. 12,000–15,000. Gastoli versus portum Mána.

Repens, omninò densè cano-lanuginosum; rami prostrati, apice rosulati. Folia ovata, obtusa, cano-tomentosa; in ramo fertili superiora majora, densissimè lanâ lutescente involuta (eo absterso acuta) involucrantia. Capitulum solitarium, terminale. Squamæ sphacelatæ, mucronatæ, interiores angustæ. Flores radii tubulosi ♀, truncati, pauci; disci tubulosi, 5-fidi, laciniis angustis; antheris fuscis, longè caudatis; styli rami breves, truncati, penicillati. Pappus pilosus, setis apice dilatatis serrato-scabris, achenio multò longior. Receptaculum parvum, nudum.

Subtrib. EUSENECIONEÆ.

111. SENECIO PEDUNCULATA; annua, erecta, ramosissima, puberula, foliis petiolatis pinnatifidis: laciniis linearibus obtusis glabris, floralibus setaceis, capitulis longè pedicellatis laxissimè corymbosis erectis cylindricis, floribus radii 5 ligulatis, acheniis puberulis striatis.

Hab. Himala, ad alt. ped. 8000–11,000. In valle fl. Dhawli, Garhwál Orient.

Annua, erecta, ramosissima, puberula (pilis paucis sparsis albis); folia petiolata, pinnatifida, laciniis linearibus obtusis, floralia setacea. Capitula longè pedunculata, axillaria terminaliaque, corymbum laxissimum formantia, erecta, cylindrica. Involucri squamæ biseriales; exteriores brevissimæ, adpressæ; interiores erectæ, lineares, acutæ, margine scariosæ, apice sphacelatæ, post anthesin deflexæ. Flores radii ♀ 5 brevè ligulati; disci tubulosi, 5-fidi; antherarum appendicibus obtusis. Pappus simplex, sericeus, vix scaber. Achenium puberulum, striatum. Receptaculum planum, punctatum.

112. SENECIO LÆTA; erecta, tenuiter lanuginosa, demùm glabrata, foliis caulinis petiolatis v. amplexicaulibus lyratis basi plus minus pinnatifidis segmentis obtusis, capitulis pedunculatis paucis vix corymbosis majusculis, floribus radii 4-nervibus, acheniis glabris.

Hab. Himala, ad alt. ped. 9000–10,000. Badhrináth.

Caules erecti, lanugine tenui vestiti, demùm glabrati. Folia caulina inferiora petiolata, petiolis amplexicaulibus, superiora auriculata, suprema sessilia, omnia lyrata, infrà plus minus pinnatifida, segmentis obtusis. Capitula pedunculata, pauca, vix corymbosa, majuscula. Involucri squamæ extùs pilosæ, exteriores brevissimæ, interiores oblongæ, acutæ, ciliolatæ, marginatæ, sphacelatæ. Flores radii ♀ (circiter 15) longè ligulati, patentes, 4-nerves, nervis 2 submarginantibus, 3-dentati, aurei. Flores disci tubulosi; antheris 5 appendice acutiusculâ, filamentorum articulis nodosis. Pappus simplex, pilis serrato-scabris. Achenia glabra, apice incrassato.

Affinis *S. Chrysanthemoidi* var. *stipulatæ*; differt capitulis paucis majoribus, laciniisque foliorum obtusis.

113. SENECIO FLEXICAULIS; subglabra, ramis flexuosis, foliis petiolatis pinna-

tifidis: segmentis lateralibus oblongis irregulariter dentatis terminali longè acuminato; floralibus lanceolatis, paniculâ subsecundâ flexuosâ, pedicellis apice tumidis squamellatis, floribus radii 12–13 extùs pubescentibus 4-nervibus, acheniis hispidulis 5-costatis.

Hab. Himala, ad alt. ped. 7000–8000, in valle Vishnuganga, Garhwál Orientalis.

Erecta, ramosa (nec verè scandens), minutissimè puberula v. subglabra; ramis flexuosis, striatis. Folia petiolata, pinnatifida, basi angustata, segmentis lateralibus oblongis, terminali 3-angulari basi subtruncato, apice longè acuminata, irregulariter sinuato-dentata, dentibus mucronatis; subtùs pallida, glabra; floralia lineari-lanceolata, integra. Panicula laxa, subsecunda, flexuosa. Pedicelli apicem versus tumidi, squamellati. Involucrum ovoideum biseriale; squamæ exteriores 5 brevissimæ, adpressæ; interiores (circiter 13) erectæ, basi subcoalitæ, oblongæ, acutæ, scariosæ, marginatæ, apice pubescente, ciliolatæ, sphacelatæ. Flores radii 12–13 ♀, ligulâ ovali brevissimè 3-dentatâ, 4-nervi, extùs pubescentes, flavi. Stylus acheniumque conformes. Flores disci ☿ tubulosi, 5-dentati, e flavo rubescentes. Antheræ semi-exsertæ; appendice brevi obtusâ, filamenti articulo vix nodoso. Achenium hispidulum, 5-costatum, subpentagonum. Pappus sericeus, setis scabriusculis.

Affinis *S. Hindsii*, Benth., et *S. campylodes*, Wall.; differt floribus pluribus, folioque acuminato, petiolato.

114. Madaractis lanuginosa; cano-lanuginosa, foliis petiolatis ovatis sinuato-dentatis subtùs cano-lanuginosis, corymbis 3–4-floris, acheniis radii glabris calvis disci pilosis papposis.

Hab. In rupibus ad Mándú, Montibus Vindhiæ, Indiæ Centralis. Januario.

Suffruticosa, ramis diffusis, cano-lanuginosis, demùm glabris. Folia petiolata, ovata, grossè sinuato-dentata, dentibus callosis, suprà tomentosa, glabrata, subtùs cano-lanuginosa; petiolo laciniâ stipulæformi et sæpè in medio laciniis 1–2 oblongis aucto, laminam subæquante. Ramuli axillares, 3–4-cephali, vix corymbosi; capitula subhemisphærica. Involucri basi lanuginosi squamæ exteriores breves, apice sphacelatæ, interiores lineares margine scariosæ acutæ, post anthesin reflexæ. Flores radii steriles 12–13, stylo omninò nullo, tubo longo involucrum superante, ligulâ amplâ, lanceolatâ, 5-dentatâ, 4 nervi, flavâ, patente. Achenia longa, teretia, glabra, apice calva. Flores disci tubulosi, numerosi ☿ 5-meri; stam. 5, filamentis ad articulum nodosis; antheris ecaudatis, appendice ovatâ acutiusculâ. Styli rami truncati, penicillati. Achenia costata, pilosa. Pappus achenio paulò longior, pilosus, setis albis scabris.

Trib. Cynareæ. Subtrib. Carlineæ.

115. Saussurea sacra; densè lanata, foliis linearibus runcinatis subtùs cano-tomentosis, corymbo terminali polycephalo folia involucrantia lanâ ferrugineâ densè obtecta superante.

Hab. Himala, ad alt. ped. 13,000–16,000, supra Badhrináth versus portum Mána.

Erecta, palmaris, tota lanâ densè vestita, basi paulò glabrata. Radix perpendicularis, furcata. Caulis erectus, fistulosus, simplex, densè foliosus, basi reliquiis marcidis foliorum squamatus. Folia patentia, petiolata, linearia, runcinata, laciniis acutiusculis margine revolutis, (lanâ abstersâ) suprà glabra, subtùs cano-tomentosa; superiora sensim majora, integerrima, lanâ ferrugineâ densiùs involuta. Capitula numerosa, in corymbo terminali subglomerata, folia involucrantia superante. Squamæ lineares, integræ, lanatæ. Flores tubulosi, tubo longo filiformi, fauce campanulati. Antheræ longæ, appendice acutâ, basi breviter setoso-caudatæ. Stylus basi bulbosus, nodo sub ramis brevibus incrassato penicillato. Achenia glabra, basi teretiuscula, apice 4-angularia, striolata. Pappus duplex; exterior setosus, brevior, albus, setis serrato-scabris; interior squamoso-pilosus, duplò longior, sordidus, squamis setaceis basi in annulum concretis, plumosis. Receptaculum setosum.

In templis apud Badhrináth sanctissimis Indorum pro Nelumbio uti donum in sertis offertur; ideo "sacram" nominavi; hoc usu in templis Kedamath, Pungnath, &c. *S.* (*Aplotaxis*, DeC.) *obvallata* occurrit, ambæ a monticolis Indicè *Kunwal* (id est, *Nelumbium*) appellantur. *Aplotaxis obvallata* et *discolor* (DeC.) sunt *Saussureæ* veræ; series exterior pappi cito decidit, quapropter in sicco sæpe *Aplotaxidis* faciem præbent. Nomen *discolor* mutandum et *S. piptathera* vocanda propter setas exteriores caducas.

116. Aplotaxis scaposa; foliis radicalibus obovatis in petiolum attenuatis suprà scabris subtùs cano-tomentosis, scapis 3-cephalis, capitulis pedunculatis basi arachnoideis.

Hab. Himala, ad alt. ped. 4000–7000, in graminosis apricis vulgata.

Rhizoma crassum. Folia omnia radicalia, obovata, in petiolum attenuata, integerrima v. subpinnatifida, suprà scabra pallidè, subtùs cano-tomentosa. Scapi aphylli, 3-cephali, pedunculis longis 1-bracteatis arachnoideis (6–12 pollicaribus). Capitula subglobosa, basi arachnoidea. Squamæ imbricatæ, exteriores breviores, subpungentes, interiores scariosæ, subulatæ, acutæ. Flores tubulosi, fauce ventricosi; antherarum appendices rigidæ, exsertæ; caudæ breves, glabræ, pellucidæ. Stylus ad nodum puberulus, ramis brevibus acutis. Pappus exterior e squamellis latis, fuscis, basi interioris arctè adpressis, coroniformis, persistens; interior squamoso-pilosus, squamis setaceis, uniserialibus, albis, plumosis, basi in annulum concretis, caducus. Receptaculum squamosum, squamis piliformibus achenia æquantibus.

117. Aplotaxis foliosa; erecta, ramosa, parcè arachnoidea, foliis lyrato-pinnatifidis amplexicaulibus subtùs cano-tomentosis suprà scabris, pedunculis terminalibus 1-cephalis paniculam racemosam foliosam formantibus, acheniis rugoso-scrobiculatis apice cupulâ denticulatâ coronatis, pappo plumoso.

Hab. Himala, ad alt. ped. 8000–9000, in sylvis, infra Badhrináth.

Erecta, ramosa, arachnoideo-lanata, demùm subglabrata. Rami striati, teretes. Folia lyrata v. runcinata, amplexicaulia nec decurrentia, auriculata, laciniis obtusis mucronato-denticulatis, suprà subglabra scabriuscula, subtùs cano-tomentosa. Ramuli florales axillares, 1-cephali, pedunculo terminali 1-squamato, paniculam racemosam foliosam formantes. Capitula ovata, squamæ laxè imbricatæ, lineares, subspinoso-mucronatæ, exteriores basi arachnoideæ apice glabræ, interiores basi glabræ apice ciliatæ. Flores tubulosi, tubo longo, fauce campanulatâ, purpurascentes. Stam. 5, filamentis glabris, antheris longis, basi bicaudatis setis glabris, apice appendice brevi acutâ. Stylus vix sub ramis pubescentibus incrassatus. Achenia teretiuscula, obliquè subcurva, rugoso-scrobiculata, apice cupulâ denticulatâ solidâ pappo calycante persistente superata. Pappus 1-serialis, in annulum concretus, plumosus. Receptaculum squamosum; squamis laciniatis, setosis, achenia superantibus.

Subtrib. Centaureæ.

118. Tricholepis nigricans; foliis lanceolatis dentatis subtùs adpressè pubescentibus suprà scabris, capitulis terminalibus solitariis, squamis involucri exterioribus basi dilatatâ glaberrimis intimis oblongis apice puberulis.

Hab. Himala, in graminosis, ad alt. ped. 7000–8000. Madmesar, Garhwál Orient.

Caules erecti, puberuli, striati, ramosi: folia petiolata, inferiora latè lanceolata dentata, superiora angustè lanceolata integerrima v. basi pinnatifida dentata, suprà glabriuscula scabra, subtùs pilis adpressis densè pubescentia; (sic in exemplaribus meis, at verosimiliter ut in alteris speciebus hujus generis formâ maxime variabili). Capitulum majusculum, terminale, solitarium. Involucri squamæ nigrescentes, basi ovatæ, longè subulatim acuminatæ, inferiores laxæ nec reflexæ glaberrimæ, intimæ oblongæ scariosæ apice tenuiter puberulæ. Flores albo-flavescentes; filamenta papillosa; antheræ apice appendice acutâ, basi 2-caudatæ, caudis inæqualiter laceris. Stylus nodo puberulo, ramis a nodo divergentibus glabriusculis; bulbo basali ovoideo. Achenium glabrum, apice annulo brevi persistente coronatum. Pappus pluriserialis, setis ciliato-scabris inæqualibus basi breviter in annulum concretis, caducus.

Differt a *T. elongatâ* et *T. furcatâ* squamis exterioribus basi dilatatis. In omnibus meis exemplaribus *T. elongatæ* involucri squamæ plùs minùs arachnoideæ sunt nec glabræ, et styli rami divaricati, quamquam sæpè in juniore facie connectuntur; ideo character Candollianum emendatum est. *T. furcata* squamis apice pilosis distinctissima est, squamis etiam inferioribus reflexis cognoscenda. Genus meâ sententiâ potiùs ad *Serratuleas* referendum est.

Subtrib. SERRATULEÆ.

Gen. STICTOPHYLLUM.

CHAR. GEN. *Capitulum* multiflorum, homogamum. *Involucrum* ovoideum, squamis regulariter imbricatis, ex ovatis oblongis, exappendiculatis. *Receptaculi* fimbrillæ in squamas integras furcatasve setosas productæ. *Corolla* 5-fida, subregularis; fauce sensim ampliatâ 5-nervi, basi incrassatâ bulbosâ. *Stam.* filamenta papillosa; antheræ appendice acutâ; caudis 2 brevibus sublaceris. *Pollen* globosum echinulatum. *Stylus* basi bulbosus, coronâ epigynâ denticulatâ, ad nodum penicillatus, ramis brevibus extùs puberulis, lineis stigmatosis filiformibus marginantibus. *Achenium* areolâ terminali centrali, basilari laterali, incurvum, angulatum, costatum, glabrum, læve, annulo integro brevi superatum; *pappus* pluriserialis; pilis inæqualibus, plumosis, basi liberis, persistentibus.—Folia *punctata* (στικτὸς, punctatus, φυλλὺν, folium).

119. STICTOPHYLLUM GLABRUM.

Hab. In graminosis siccis sub-Sivalicis, Prov. Saharanpur prope pagum Mozaffarabad. Martio.

Caules breves, scaposi, basi foliosi, suprà foliolo 1–2, bracteati, 1–2-cephali, angulares, glabri (4–6 pollicares). Folia lineari-oblonga, sessilia, integra, apice obtusiuscula mucronata, margine breviter revoluto, glabra, punctata; nervo medio crasso, lateralibus duobus prope basin ortis subparallelis, nervulis cum eis et rursùm cum medio anastomosantibus. Involucri squamæ scabriusculæ, glabræ; exteriores breves, ovatæ, tum lanceolatæ, herbaceæ, apice acutiusculæ mucronulo revoluto; intimæ oblongæ, scariosæ, acumine longo hispidulo. Antherarum appendicibus valvis duplò brevioribus; caudis articulum filamenti vix æquantibus, obtusis, glabris. Pappus sordidus.

Genus pappo plumoso persistente, pilis liberis et squamis involucri exappendiculatis distinctum, hinc facie florum *Serratulæ*, illinc foliorum punctatorum *Tricholepidis sectioni Ochanopappo*, affinis videtur.

CICHORACEÆ.

120. LACTUCA (*Scariola cyanea*) ARVENSIS; glaberrima, erecta, foliis pinnatifidis; segmentis obtusis: caulinis sagittato-amplexicaulibus, corymbo laxo, squamis biserialibus, acheniis marginatis utrinque 3-nervibus rugosis.

Hab. Himala, in arvis ruderatisque frequens, ad alt. ped. 3000–7000. Simla, &c.

Annua, erecta, glaberrima, parcè ramosa. Folia radicalia alternatim interruptè pinnatifida, segmentis repandis rotundatis obtusis; caulina subintegerrima, basi sagittata, amplexicaulia, auriculâ obtusiusculâ. Corymbus terminalis, laxus, pedicellis longis unibracteatis. Involucri squamæ biseriales, marginatæ, post anthesin reflexæ; exteriores interioribus oblongis obtusis triplò breviores, ovatæ, acutiusculæ. Corollæ 3-dentatæ, cyaneæ. Achenium compressum, ellipticum, latè marginatum, utrinque 3-nerve, rugosum, nigrum, rostro difformi pallido duplò breviùs. Pappus simplex, e cupulâ rostri stellatim patens, niveus. Receptaculum scrobiculatum.

121. YOUNGIA GLAUCA; glaberrima, caulibus subdecumbentibus foliosis, foliis petiolatis radicalibus obovatis integerrimis dentatis caulinis lanceolatis plùs minùs pinnatifidis, pedunculis monocephalis axillaribus terminalibusque, acheniis striatis apice scabris ceterùm glabris.

Hab. Himala, ad alt. ped. 10,000–11,000. Niti.

Perennis, glaberrima; caules numerosi, subdecumbentes v. foliosi. Folia radicalia petiolata, obovata, integerrima, sinuato-dentata; caulina petiolata, ovata v. lanceolata, plus minus pinnatifida v. sinuato-dentata vel integra, glauca. Pedunculi 1-cephali, axillares terminalesque. Involucri squamæ exteriores calycantes, breves, obtusæ; interiores 8 erectæ, obtusæ, quarum 3 exteriores angustiores lineares, 5 margine scarioso oblongæ. Flores circiter 8, lutei. Achenia compressa et trigona, utrinque attenuata, striata, glabra, apicem versus scabra. Pappus sessilis; setis tenuibus scabrellis niveis. Ab aliis *Youngiis* inflorescentiâ diversa, sed characteribus floralibus congener.

122. MELANOSERIS SAXATILIS; suberecta, foliis caulinis pinnatipartitis; lobis obtusis terminali rhomboideo acutiusculo basilaribus amplexicaulibus, pedunculis 1–2-cephalis paniculam laxam corymbosam formantibus, pappo exteriori squamis brevibus inæqualibus interiorem calyculante, acheniis striatis rostro paulò longioribus.

Hab. Himala, ad alt. ped. 7000–8000, in rupibus madidis, supra Pandkesar. Sept., Oct.

Perennis, suberecta, 1–1½ pedalis, glabra. Folia caulina inferiora pinnatipartita; lobis lateralibus trapezoideis apice sinuatis integris, terminali angustè rhomboideo acutiusculo; basilaribus latò dilatatis rotundatis amplexicaulibus: floralia sensim minora, lanceolata, basi amplexicaulia. Ramuli floriferi axillares, pedunculos 1–2 monocephalos axillares et corymbum terminalem laxè pauciflorum gerentes, paniculam amplam foliosam formantes. Capitulum cylindricum, basi bracteolâ ovatâ cordatâ pilosâ stipatum, majusculum, multiflorum. Squamæ oblongæ, extùs pilis longis fuscis parcè villosæ, triseriales; intimæ 3 breves; secundi ordinis 5, interioribus duplò brevioribus; superiores 8, quarum duæ intimæ subscariosæ apice tantùm pilosæ. Corollæ cyaneæ (circiter 24), apice 5-dentatæ, glabræ. Achenia compressa, lanceolata, decem-striata, scabra, rostro (vix conformi, apice tantùm difformi,) achenio paulò breviore torto. Pappus ex cupulâ terminali ortus, duplex. Series exterior brevis (margo cupulæ elongatus) e squamulis piliformibus lævibus acutis inæqualibus; interiore pilis tenuibus rigidulis fragilibus niveis. Receptaculum alveolatum.

123. Melanoseris paniculata; erecta, basi glabra supernè pilosa, foliis longè petiolatis lyratis pilosiusculis scabris; lobo terminali acuminato, paniculâ racemosâ terminali efoliatâ polycephalâ, capitulis pedunculatis solitariis nutantibus, pappo exteriore minutissimo squamoso-ciliato, acheniis latè marginatis utrinque 5-nerviis.

Hab. Himala, in sylvis, alt. ped. 7000–9000. Garhwál.

Perennis, erecta, 3–5-pedalis, basi glabra, supernè pilosa. Caulis striatus, strictus, foliosus. Folia omnia longè petiolata, lyrata, pinnatisecta, parcè pilosa, scabriuscula, lobis lateralibus ovatis oblongisve, rotundato-obtusis acutiusculisve, integris, terminali ovato, acuminato, basi cuneato v. subcordato, sinuata, mucronato-denticulata. Panicula terminalis, ultrapedalis, basi tantùm foliosa; bracteis linearibus subulatisve ciliato-scabris. Capitula pedicellata, nutantia, solitaria, cylindrica. Squamæ involucri exteriores breviores, plùs minùs pilis albis hirsutæ; interiores acutiusculæ, plerumque glabræ. Corollæ cyaneæ (circiter 16–20), apice 5-dentatæ, dentibus glandulosis. Achenia angustè obovata, compressa, latè marginata, illinc scabra, latere utrinque 5-nervia, sublævia, nigra; rostro subconformi torto, apice in cupulam dilatato. Pappus duplex; exterior e margine cupulæ squamis brevissimis minutis, æqualibus; interior setis rigidulis albis crebrè serrato-scabris. Succus lacteus.

Genus *Melanoseris* a clar. Decaisne (in Jacquemont, Voyage aux Indes) constitutum, intermedium inter *Mulgedium* et *Lactucam*; ab utroque satis distinctum, et charactere a cupulæ margine pappi seriem exteriorem mentiente addito facilè recognoscendum. Huc etiam *Mulgedium cyaneum* (DeC. 8) et *M. rapunculoide* (DeC. 7) revocanda et *Lac-*

tuca hastata (Wall. et DeC. 45). Pappus exterior *M. cyaneæ* et *M. hastatæ* similis *M. paniculatæ* est minutissimus; in *M. rapunculoide* longior æqualis, at brevior quam in *M. saxatili.*

Mulgedium macrorhizum, cui maximè affinis *M. saxatilis* (suprà), ni fallor huc referendum est pappo exteriore distincto; at propter fructus immaturos quoad longitudinem rostri incertus sum.

Mulgedium sagittatum, Royle Illust. tab. 61, et DeC. *l. c.* eadem est ac *Lactuca longifolia* (DeC., no. 18) errore quodam *Lactucis xanthinis* relata; vera est *Lactuca* nec *Melanoseris,* rostro omninò difformi virescenti, et cupulâ solidâ nec ciliatâ.

Ord. Campanulaceæ.

124. Cephalostigma hirsuta; ramosa, omninò pilis carnosis hirsuta, paniculata, calycis laciniis linearibus corollâ vix brevioribus, stylo corollam paulò superante, capsulâ 3-valvi.

Hab. Himala, ad alt. ped. 4000–6000. Banásar.

Annua, 1–6 uncialis, ramosa, omninò pilis patentibus carnosis hirsuta. Folia obovato-lanceolata, inferiora in petiolum attenuata, superiora sessilia, sinuato-subcrenata, subcarnosa. Pedunculi foliis longiores, axillares terminalesque, paniculam laxam formantes. Calyx extùs densè carnoso-pilosus, laciniis basi distantibus linearibus acutis. Corollæ rotatæ tubo brevissimo; laciniæ vix calyce longiores, lineares, pallidè cærulescentes, pilosiusculæ. Stamina filiformia, antheris liberis, laciniis corollinis breviora. Stylus corollâ sublongior; stigmate capitato, subtrilobo. Capsula apice dehiscens, trivalvis. Semina acutè triquetra, glabra.

125. Cyananthus microphylla; caulibus prostratis puberulis, foliis oblongis lanceolatisque suprà glabris subtùs adpressè pubescentibus, corollâ fauce villosâ calyce duplo longiore.

Hab. Himala, ad alt. ped. 10,000–12,000. Mána. Sept., Oct.

Rami numerosi, filiformes, teretes, striati, substrigosè puberuli, diffusè prostrati v. penduli. Folia brevissimè petiolata v. subsessilia, oblonga v. lanceolata, suprà glabra, subtùs adpressè pubescentia, ad apicem rami approximata, acutiuscula. Flos terminalis, cæruleus. Calyx campanulatus, 5-fidus, laciniis acutiusculis, pilis nigrescentibus densè hirsutus, corollâ duplò brevior. Corolla tubulosa, limbo patente 5-partito apice glabro, intùs ad faucem villis longis albis vestita. Stamina 5 filiformia, basi dilatata, in coronulâ hypogynâ inserta. Antheræ cordato-ovatæ, acutæ, connatæ. Ovarium liberum, 5-loculare, polyspermum, sensim in stylum attenuatum; stigmate 5-partito. Ovula oblonga, glabra, prope basin placentæ centralis inserta.

126. Cyananthus barbata; densè cinereo-pubescens, foliis ovatis integris serrulatisve, calycis laciniis linearibus acutis tubum corollæ ferè æquantibus, corollæ limbi segmentis 5 intùs basi extùs apice pilis paucis longis barbatis.

Hab. Himala, ad alt. ped. 9000–10,000. Túngnáth.

Collum sublignosum; rami numerosi, filiformes, penduli vel prostrati, substriati, pilosi, uniflori. Folia brevè petiolata, ovata v. ovato-lanceolata, integra vel apice serrulata, utrinque, subtùs densissimè, adpressè pilosa; suprema confertiora, subinvolucrantia. Flos terminalis, solitarius, cæruleus. Calyx inflatus, ovoideo-campanulatus, ad medium 5-fidus, laciniis linearibus acutis corollæ tubum subæquantibus, densè pilis olivaceis basi nigrescentibus vestitus. Corolla tubulosa, limbo patente 5-fido, segmentis apice pilis longiusculis barbatis, intùs pilis albis ciliata, fauce tamen aperta. Antheræ connatæ. Capsula 5-locularis, apice vacua, loculicidè dehiscens; valvis dorso carinatis, acutis, cornuiformibus. Semina oblonga, obtusa, compressa; testâ tenui glabrâ, minutissimè sub lente striolatâ, apiculatâ; embryo parvus, orthotropus, in medio albuminis carnosi, eo dimidiò brevior.

Differt a *C. integrifoliâ* foliis minoribus pilosioribus, calyce longiore, corollæ laciniis apice barbatis, nec glabris ut in *C. integrifoliâ*. In *C. lobatâ* pilis brevibus nigris barbellatæ sunt*.

Ord. Jasmineæ.

127. Jasminum Roxburghianum (*Wall. Cat.* no. 2870); scandens, ramis teretibus pubescentibus, foliis petiolatis latè ovatis utrinque densè tomentosis obtusis acuminatisve, petiolis articulatis, pedunculis 3-floris v. paniculis dichotomis terminalibus, calyce densè tomentoso: laciniis subulatis tubum æquantibus corollæ tubo quadruplò brevioribus, bracteis articulatis subulatis subclavellatis, corollæ laciniis plerumque 7 lanceolatis acutis.

Hab. In dumetis prope Sadhaura inter ditiones Seikhenses, Ind. Bor. Occ.

A *J. elongato* distinctissimum.

Ord. Primulaceæ.

128. Lysimachia glandulosa; caulibus debilibus angulosis, foliis brevè petiolatis alternis ovatis rubro-glandulosis, pedunculis folio brevioribus axil-

* The insertion of the stamens and the structure of the ovary and capsule in this genus are at complete variance with those of *Polemoniaceæ*, and place it among *Campanulaceæ* near *Wahlenbergia*, with which it also agrees in habit, milky juice, and almost every other character, differing only in the free calyx, in the same way that *Lobelia xalapensis* differs from *L. Cliffortiana*.—G. Bentham.

laribus, calycis laciniis lanceolatis nervo medio hirsutis acutis corollam glandulosam æquantibus, filamentis liberis.

Hab. Himala, ad alt. ped. 4000–5000, in rupibus aridis. Tikri in Sirmur.

Debilis, parcè pubescens; caulibus angulosis. Folia brevè petiolata, alterna, ovata, suprà pilis paucis glandulisque rubris aspersa, subtùs secus nervos pubescentia, ceterùm glabra, crebrè glandulosa. Flores axillares, pedunculo folio breviore glanduloso. Calycis laciniæ lanceolatæ, nervo medio crassiusculo ciliato, hirsutæ, acutæ, corollam æquantes. Corolla lutea, glandulis rubris utrinque aspersa et ciliolata; laciniis ellipticis, obtusis. Stamina in fauce corollæ inserta, libera, laciniis 3plo breviora, antheris glandulosis. Capsula glabra, breviter striata, calyce brevior.

Affinis *L. alternifoliæ* (DeC. 34); differt calycis laciniis latioribus corollæ angustioribus, pedunculis staminibusque brevioribus, magis hirsuta et glandulosa.

129. Lysimachia ferruginea; repens, ferrugineo-hirsuta, foliis oppositis brevè petiolatis ovatis, pedunculis axillaribus petiolo longioribus, calycis laciniis lineari-lanceolatis acuminatis corollâ brevioribus, corollæ laciniis rotundatis, filamentis ad medium ferè monadelphis.

Hab. Himala, in rupibus umbrosis prope pagum Nohra in monte Chúr, alt. ped. 7000–8000. Junio.

Repens, ferrugineo-pubescens. Caules teretiusculi. Folia opposita, brevè petiolata, ovata, basi vel cuneata vel subcordata, in petiolum attenuata, utrinque pilis articulatis ferrugineis hirsuta. Pedunculi axillares, petiolo longiores (in exemplaribus meis Himalaicis folio breviores, in Peninsularibus longiores). Calycis laciniæ lineari-lanceolatæ, acuminatæ, corollâ breviores, hirsutæ. Corollæ rotatæ laciniæ rotundatæ, obtusæ, glandulis nigris adspersæ. Filamenta ad medium ferè monadelpha, sterilia nulla, stylo breviora.

Differt a *L. debili* (DeC. 36) pubescentiâ crebriore, corollæ laciniis rotundatis nec ovatis acutiusculis, pedunculis longioribus petiolisque brevioribus (in *L. debili* pedunculi petiolos vix æquant), filamentis brevioribus longiùs monadelphis.

Ord. Gentianeæ.

130. Cicendia microphylla; annua, caule erecto tenui parcè ramoso 4-angulari, foliis minimis subulatis paucis, floribus terminalibus solitariis, calycis 5-partiti laciniis linearibus acutis scarioso-marginatis tubum corollæ æquantibus, corollæ hypocraterimorphæ laciniis acutis, staminibus

ad faucem insertis; antheris immutatis omnibus fertilibus, ovario ovato, stylo longo, stigmate capitato.

Hab. Himala, in graminosis, alt. ped. 5000–7000. Mandal, Garhwal.

Herba parvula, 1–3 pollicaris; foliis 1–2 lineas longis; flore flavo.

131. Gentiana (*Chondrophyllum*) cephalodes; caule filiformi, apice foliis paucis capitulum 3–4-florum involucrantibus, capsulâ breviter stipitatâ apice rotundatâ ciliolatâ emarginatâ, stylo bifido utrinque reflexo.

Hab. Himala, in glareosis, alt. ped. 5000. Banásar.

Annua, 1–2 pollicaris. Caulis erectus, teres, basi nudus, apice capitulum 4–5-florum foliis involucratum gerens. Folia 4–6 sessilia, latè obovata, obtusa, mucronata, interiora minora, decussatim opposita, arctè involucrantia. Flores in capitulo sessiles. Calyx membranaceus, 5-dentatus; laciniis nervo medio subherbaceo acutis, mucronatis, corollæ plicas æquantibus. Corollæ 5-fidæ intùs nudæ laciniæ angustæ, acutæ; plicæ integræ vel 2–3-dentatæ, acutæ. Stamina ad medium tubi inserta; filamentis filiformibus; antheris parvis, versatilibus, luteis. Ovarium brevè stipitatum, cuneato-obovatum, apice marginatum, ciliolatum, emarginatum; post anthesin stylis brevibus, filiformibus, liberis, utrinque revolutis, stigmatibus apicalibus introrsis, extùs puberulis. Capsula bivalvis; valvis ad medium patentibus, reflexis, apice rotundatis, emarginatis, ciliolatis. Semina ovoidea; testâ nervis crassiusculis reticulatâ.

Species distinctissima; affinis videtur *G. marginatæ*.

132. Gentiana (*Pneumonanthe* *) stipitata; caulibus prostratis, foliis lanceolatis ovatis obovatisve margine ciliolatis mucronatis, calycis laciniis foliaceis spathulatis carinatis mucronatis, corollæ laciniis mucronatis plicis integris dentatisve, antheris liberis, capsulâ longè stipitatâ.

Hab. Himala, ad alt. ped. 9000–11,000. Mána.

Collum crassum, reliquiis foliorum obsitum. Caules prostrati, radiantes, rosulati, glandulis albis pruinosi, foliosi. Folia radicalia plerumque lineari-lanceolata, caulina opposita, ovata vel obovata, terminalia majora involucrantia, omnia mucronata, margine subcartilagineo minutè ciliolata; petiolis brevibus, membranaceis, amplexicaulibus. Flores terminales, solitarii, magni, cærulei, extùs olivacei. Calycis campanulati laciniæ magnæ, foliaceæ, spathulatæ, carinatæ, mucronatæ, corollæ tubo duplò breviores. Corolla magna campanulata; tubo sub 5-angulari, intùs nudo; limbo subpatente 5-fido, laciniis acutiusculis, mucronatis; plicis obtusè 3-dentatis vel acutiusculè integris. Stamina prope basin tubi inserta, filamentis basi dilatatis, antheris flavis liberis. Stylus longiusculus, antheras superans, bifidus; ovario subtereti, fusiformi, utrinque attenuato, longè stipitato, stipite in anthesi conduplicato demùm elongato. Semina ovalia, rugoso-reticulata.

Variat foliis latioribus, corollæ laciniis vix mucronatis. Túngnáth.

Affinis *G. ornatæ* et *G. Cashmerianæ*; formâ foliorum et calycis laciniarum majorum distincta.

133. Gentiana nubigena; subacaulis, foliis oblongo-linearibus laciniisque calycinis obtusis margine lævibus, corollâ tubuloso-campanulatâ, antheris liberis.

Hab. Himala, ad alt. ped. 16,000–17,000, prope portum Mána.

Collum nudiusculum; folia rosulata, oblongo-linearia, angusta, obtusa, margine subcartilagineo, lævia. Caulis brevis, 1-florus; foliis 4 amplexicaulibus, decussatis, conformibus; plerumque foliis radicalibus brevior. Calyx membranaceo-tubulosus; limbo 5-fido, laciniis oblongis, obtusis, distantibus, tubo duplò brevioribus. Corolla tubuloso-campanulata, (limbo continuo) calyce duplo longior; lobis 5 ovatis, obtusis; plicis triangularibus, acutiusculis, integris dentatisve. Filamenta basi dilatata; antheræ liberæ, luteæ, stylo emarginato superatæ. Fructum non vidi.

Valdè affinis *G. Frœlichii* (DeC. 143), at distincta antheris liberis, foliis caulinis longioribus conformibus obtusis, calycisque laciniis obtusis, nec ut in *G. Frœlichii* plerumque acutiusculis.

134. Pleurogyne carinata; foliis subsessilibus ovatis obtusis, calycis laciniis acutis corollâ brevioribus, corollæ laciniis basi bisquamatis squamis laciniatis, capsulâ acutâ subcompressâ utrinque carinatâ.

Hab. Himala, ad alt. ped. 10,000–11,000. Badhrináth.

Annua, multicaulis: caules acutè quadrangulares. Folia subsessilia, omnia opposita, ovata, obtusa. Pedicelli longi, filiformes, axillares terminalesque. Calyx 5-partitus; laciniis lanceolatis, acutis, corollâ brevioribus. Corolla rotata, ad basin ferè 5-partita; laciniis lanceolatis, patulis, acutis, basi squamis 2 oblongis laceris instructis. Stamina 5; filamentis basi æqualibus, subpatulis; antheris versatilibus, cæruleis. Stylus nullus. Stigmata in dorso ovarii decurrentia. Capsula acuta, subcompressa, utrinque carinata, sessilis. Semina subglobosa, nitida, sub lente tenuissimè rugosula.

Habitus omninò *P. carinthiacæ*, at satis diversa.

135. Ophelia pratensis; caule tetragono, foliis sessilibus linearibus, calycis laciniis acutis corollâ 4-merâ subduplò brevioribus, corollâ rotatâ: laci-

niis ovatis obtusiusculis; foveis solitariis apice fimbriatis squamulâ lævi vix ciliatâ tectis.

Hab. In pratis sub-Sivalicis, Prov. Sahâranpur.

Annua, erecta, glabra (1–4 pedalis); caulis tetragonus, ramosus; folia omnia opposita, sessilia, linearia, 1–3-nervia ($1\frac{1}{2}$–3 pollices longa, 2–4 lineas lata). Pedunculi axillares, 1–3-flori, paniculam amplam formantes. Flores 4-meri, ochroleuci. Calycis laciniæ acutæ, corollâ subduplò breviores. Corolla rotata; laciniis latè ovatis, obtusiusculis; foveis solitariis, orbiculatis, apice tenuiter fimbriatis, squamulâ lævi apice vix ciliato-lacerâ tectis. Stamina 4, filamentis basi breviter monadelphis, conniventia, antheris luteis, ovaria æquantia. Stylus nullus. Stigmata 2 distincta obtusa. Capsula glabra, compressa, apice attenuata, obtusiuscula. Semina orbiculata, compressa, rugosa, placentis subspongiosis juxta suturas immersa.

136. SWERTIA TETRAGONA; erecta, ramosa, caule tetragono, foliis omnibus oppositis angustè lanceolatis acutis, calycis laciniis lineari-lanceolatis corollam subæquantibus, corollâ subcampanulatâ 5-merâ; laciniis acutis; foveis binis oblongis utrinque fimbriatis, stigmate subbilobo subreniformi.

Hab. Himala, ad alt. ped. 6000–8000. Simla, Tungru, graminosis.

Annua, erecta, ramosa ($\frac{1}{2}$–2 pedalis). Caulis alato-tetragonus. Folia omnia opposita, angustè lanceolata, brevissimè petiolata v. sessilia, acuta, 1–3-nervia. Pedunculi ramulique floriferi axillares. Calycis laciniæ 5, lineari-lanceolatæ, corollam subæquantes. Corolla subcampanulata, vix rotata; laciniis lanceolatis acutis; foveis geminis oblongis utrinque fimbriatis. Filamenta ad fissuram corollæ inserta, basi vix latiora, divergentia; antheræ liberæ, cærulescentes. Ovarium filamentis brevius; stigmate obtuso, subreniformi, subbilobo. Capsula dorso ad apicem breviter carinato-cristata. Semina minima, subsphærica, rugosiuscula. Placentæ membranaceæ utrinque juxta suturas positæ.

Habitus *Opheliæ*, structura *Swertiæ*.

Ord. CONVOLVULACEÆ.

Trib. CUSCUTEÆ.

137. CUSCUTA CAPILLARIS; capillacea, glomerulis sessilibus bracteâ latâ cauli adpressâ suffultis, floribus sessilibus, calyce ad medium bifido; segmentis obtusis corollâ triente brevioribus dorso incrassatis, corollâ campanulatâ segmentis rectis acutiusculis; squamis nectariferis minimis laciniatis, filamentis infra faucem insertis planis basi dilatatis; antheris reniformibus,

ad medium laciniarum corollæ porrectis, stylis 2 longiusculis sensim in stigmata subclavata incrassatis, ovario depresso obtuso, capsulâ ad apicem corollâ marcidâ tectâ 4-spermâ, seminibus compresso-orbiculatis.

Hab. Himala, ad alt. ped. 9000. Malári, in Garhwál Superiore, in herbis alpinis variis. Statura *C. minoris.*

138. Cuscuta anguina*; caulibus filiformibus, racemis solitariis geminisve, pedunculo exsquamato, flore singulo pedicellato (rariùs subsessili) bracteolato, calycis ad basin 5-partiti laciniis obtusis vel acutiusculis lacinias corollæ reflexas attingentibus, squamis nectariferis 5 fimbriatis, antheris ad faucem corollæ omninò sessilibus subtrigonis acutis flavis semi-exsertis, stigmatibus in ovarii acutiusculi apice sessilibus trigonis acutis.

Hab. Himala, ad alt. ped. 5000–7000, in herbis variis. Pipalkoli, Garhwál.

Corolla vix $1\frac{1}{2}$–2 lineas longa; calyx $\frac{1}{2}$–$\frac{3}{4}$ lin. longus.

Differt a *C. reflexâ* pedunculis 2-squamatis stylisque sessilibus, ab eâ et *C. macranthâ* antheris omninò sessilibus, corollæ laciniis magis revolutis, staturâ minore et racemis gracilioribus.

Ord. Nyctagineæ.

139. Oxybaphus himalaicus; viscosus, foliis petiolatis ovatis basi rotundatis cordatisve, floribus in involucro solitariis tetrandris.

Hab. Himala, ad alt. ped. 7000–8000, in valle flum. Dhauli.

Annuus, omninò pilis viscosis densè hirsutus. Caulis teres, ascendens, articulatim dichotomus. Folia opposita, petiolata, ovata, basi rotundata v. cordata, apice obtusiuscula, suprà parcè subtùs magis viscoso-pilosa, ciliata. Pedunculi axillares, longi, solitarii, paniculam laxam dichotomam formantes, in fructu nutantes. Involucrum campanulatum, membranaceum, 5-dentatum, extùs densè viscido-pilosum, uniflorum. Calyx corolliformis, majusculus, roseus, supra ovarium contractus tubulosus, limbo plicato expanso. Stamina 4 inclusa, antheris cruciatis. Fructus monospermus, cum involucro caducus. Semen albumine farinaceo copioso, turbinatum.

Valde affinis *O. Cervantesii*; species Himalaica notabilis in genere hucusque omninò Meridionali-Americano.

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* This name is given in allusion to a superstition of the mountaineers, that crows are in the habit of plucking off sprigs of this and *C. macrantha*, and dropping them into running water, when the sprig becomes a serpent and fit food for the crow. They likewise imagine that the possession of the *root* of the *Cuscuta* confers the power of invisibility, and passing through locks, bars and doors unhindered.

Ord. Thymeleæ.

140. Stellera concinna; perennis, caulibus herbaceis virgatis, foliis latè lanceolatis acutis, capitulo terminali multifloro.

Hab. Himala, ad alt. ped. 10,000–11,000. Pharkia prope Niti.

Glabra; collum subterraneum, perenne, sublignosum. Caules numerosi, virgati, erecti, teretes, foliosi, herbacei. Folia subsessilia, latè lanceolata, acuta, inordinatè disposita. Capitulum terminale, multiflorum, subglobosum. Calyx hypocraterimorphus, limbo 5–6-fido. Stamina 10–12, quorum 5 (v. 6) ad medium tubi, 5 (v. 6) prope faucem inserta; filamenta filiformia, antheris oblongis introrsis breviora; coronulâ hypogynâ brevissimâ denticulatâ. Ovarium hirsutum, uni-ovulatum, ovulo pendulo. Stylus ovario brevior, filiformis; stigma capitatum. Fructum maturum non vidi.

Flores albidi, tubo rubro, odoratissimi. Inflorescentiâ *S. Chamæjasme*, foliis *S. altaicæ*.

Ord. Santalaceæ.

141. Thesium himalense (*Royle Illustr.*); foliis linearibus 1-nervibus, flore 3-bracteato, calycis laciniis barbatis, staminibus nudis, fructu laciniis ad basin involutis coronato.

Hab. Himala, in apricis glareosis. Chepál, Pauri in Garhwál.

Glauca, glabra; caules ramulosi, procumbentes. Folia linearia, crassiuscula, 1-nervia. Racemi terminales. Pedicelli longiusculi, 1-flori. Flores 3-bracteati; bracteis 2 æqualibus, unâ elongatâ ceteris duplò triplòve longiore. Calyx ovario adnatus, limbo ultra medium 5-partito; laciniis acutiusculis, intùs supra staminum insertionem barbellatis. Filamenta glabra, antherâ defloratâ duplò longiora, in calycis laciniis subcucullatis nidulantia. Stylus longiusculus; stigmate capitato. Ovula 2, ad apicem placentæ liberæ utrinque pendula. Fructus calyce indurato, laciniis ad basin involutis, coronatus. Semen solitarium, pendulum.

Facie omninò *T. intermedio* similis; differt ab omnibus Europæis laciniis calycinis barbatis staminibusque glabris; unde intermedium intra sectiones clar. Endlicheri *Euthesium* et *Frisca.*

Ord. Asphodeleæ.

142. Uropetalum Hysudricum; floribus erectis, perianthii subcylindracei laciniis exterioribus ad medium reflexis, interioribus erectis apice tantùm patentibus, bracteis pedicellis brevioribus, foliis linearibus canaliculatis scapo brevioribus.

Hab. In Ind. Or. Prov. Bor. Occ. prope Lodihana, et in Pentapotamiâ. *Hysudricum* a flumine Hysudro (Sutlej) dictum.

Bulba tunicata. Folia linearia, canaliculata, glabra, (6–9 pollicaria,) scapo dimidio ferè breviora. Scapus multiflorus, erectus (1–1½ pedalis); bracteæ scariosæ, ovatæ, apice acuminatæ, pedicellis erectis breviores. Flores erecti. Perianthium subcylindraceum, 6-fidum; laciniæ 3 exteriores longiores, magis fissæ, ad medium reflexæ; interiores erectæ, apice tantum patentes; albidum, viridi-costatum. Filamenta 6, laciniis opposita, ad medium eorum inserta. Antheræ sagittatæ, liberæ, virescentes. Stylus ovarium subæquans, crassus; stigmate vix clavato, trisulcato. Ovarium triloculare, loculis polyspermis; ovulis (8–9) compressis, dolabriformibus. Capsula basi vix angustior, triloba, perianthii marcidi segmentis interioribus apice coalitis tecta. Semina compressa, suborbiculata, marginata, nigra; albumine carnoso; embryone axili, recto.

Valde affinis *U. serotino*; differt autem pedicellis bracteis longioribus, et perianthio magis fisso; capsulâ subæquali.

Ord. Commelyneæ.

143. Commelyna (*sect.* 2. *β. Kunth*, vol. iv. p. 52) maculata; hirsuta, caulibus procumbentibus, foliis ovato-lanceolatis utrinque hirsutis acutis in vaginis hirsutis fauce barbatis breviter petiolatis, involucro turbinato subobtuso 2–3-floro, capsulâ chartaceâ sublævi maculatâ.

Hab. Himala, ad alt. ped. 5000–6000. Syri.

Caules geniculati, radicantes, procumbentes, ramosi, subangulares, supernè hirsuti, infernè uno latere tantum pilosi, plerumque colorati. Folia ovata, lanceolata, acuta, 11–13-nervia, utrinque hirsuta, tenuia, petiolo brevissimo in vaginâ subsessilia; superiora quandoque difformia vaginâ explanatâ, sub involucro bracteantia, maculata. Vagina cylindracea, hirsuta, apice barbata. Involucra pedunculata vel sessilia, turbinato-cucullata, subtriangularia, utrinque obtusiuscula, hirsuta, nervosa, maculata, pedicellis duobus uno sterili altero 2–3-floro; pedunculi intra vaginas squamis membranaceis maculatis suffulti. Pedicelli glabri, fructiferi nidulantes. Flos pallidè cæruleus; sepala interiora 2 unguiculata, cærulea, tertium sessile, pallidius. Stamina 2 longiora antheris minoribus luteis, tertium brevius antherâ majore flavâ. Parantheræ æquales, subcruciatæ. Stylus declinatus. Capsula sublævis, straminea, maculata, apiculata, 3-locularis, loculicidè dehiscens, loculis 1-spermis; semen subteres, hilo longo lineari, papillâ oppositâ glabrâ, ceterùm rugosum. Embryo sub papillâ in testâ excavatâ nidulans, trochleatus; albumine magno, carnoso.

144. Commelyna striata; foliis lineari-lanceolatis acuminatis puberulis, va-

ginis ciliatis, involucris turbinatis apice acutis, pedicellis solitariis 2–3-floris, capsulâ striatâ.

Hab. Himala, ad alt. ped. 3000–4000, Lakhwari, in valle Jumnæ.

Caules ramosi, radicantes, procumbentes, vix puberuli, striati, teretiusculi. Folia lineari-lanceolata, acuminata, basi attenuata, 7–9-nervia, suprà scabriuscula, subtùs molliter magisque puberula. Vagina nervosa, maculata, puberula, fauce pilis longis albis ciliata. Involucra axillaria v. terminalia, squamis hyalinis maculatis foliisque variè difformibus depauperatis suffulta, basi lobis coalitis turbinata, apice acutè apiculata, nervosa, maculata. Pedicellus solitarius, glaber, 2–3-florus, fructifer nidulans. Sepala 3 exteriora hyalina, ovata, maculata; interiora cærulea, 2 longè unguiculata lætiora, tertium sessile pallidius. Stamina 2 longiora antheris minoribus cæruleis, tertium brevius antherâ majore flavâ. Parantheræ cruciatæ, luteæ. Capsula subfusca, 3-locularis, striata, vix maculata, loculis 1-spermis.

Habeo etiam specimen prope Madras lectum speciei novæ huic affinis; sed fructus deest, undè describere nequeo. Ab hâc differt involucro longiore minùs turbinato marginato, foliisque angustioribus.

Gen. Streptolirion.

Char. Gen. *Sepala* 6 hyalina, persistentia; exteriora latiora, interiora linearia. *Stamina* 6 perfecta; filamentis supra medium barbatis; antheris bilocularibus, loculis brachiatim divaricatis apice dehiscentibus. *Stylus* erectus, stigmate capitato puberulo. *Ovarium* 3-loculare; loculis 2-ovulatis, ovulis ad medium placentæ centralis affixis. *Capsula* chartacea, 3-locularis, trivalvis, loculicidè dehiscens. *Semina* in quoque loculo duo superposita, inferius pendulum, superius erectum, angulata, irregulariter rugoso-sulcata, hilo lineari, papillâ (embryostegâ) parvâ depressâ ei oppositâ. *Embryo* testâ sub papillâ productâ lateribus circumdatus, in albumine carnoso subfarinaceo excavato nidulans.—Herba *volubilis, habitu et perianthio a* Tradescantiâ *distinctissima; charactere carpologico maximè affinis.*

145. Streptolirion volubile; glaberrimum, foliis cordatis longe petiolatis (Tab. II.).

Hab. Himala, ad alt. ped. 6000–7000. In valle fluminis Dhawli, super herbas scandens. Tapuban et Lata. Floret Sept., Oct.

Caulis basi radicans, supernè ascendens, volubilis, glaber, teres, ramosus. Folia longè petiolata, ampla, cordato-ovata, acuminata, lævissima, glaberrima, tenuia. Petioli basi vaginantes (parte liberâ vaginâ duplò longiore) vaginâ apice truncatâ ciliatâ. Ramuli floriferi axillares terminalesque; folia involucralia gradatim difformia, brevissimè petiolata, evaginata vel sessilia, cordato-ovata, acuta vel subcomplicata, præsertim in fructu, vel patentia. Racemi 2–6-flori, flore superiore sæpe sterili; bracteis hyalinis, lanceolatis. Sepala 6, albida, hyalina; tria exteriora elliptica, acutiuscula; 3 interiora angustè linearia, apice paulo dilatata. Stamina 6; filamenta supra medium pilis luteis barbata. Antheræ 6, versatiles; loculis quadratis brachiatim divaricatis, demum apice fissis. Ovarium sensim in stylum attenuatum; stigmate capitato, puberulo. Capsula ovata, obtusè trigona, apiculata, glabra, lævis, trivalvis. Semina angulata (in quoque loculo duo) truncato-trigona, rugoso-sulcata.

EXPLANATION OF THE PLATE.

Tab. II.

Fig. 1. *Streptolirion volubile,* of the natural size.
Fig. 2. Flower, slightly magnified.
Fig. 3. A stamen.
Fig. 4. Pistillum.
Fig. 5. One of the valves of the capsule.
Fig. 6. Transverse section of capsule.
Figs. 7 & 8. Seeds in different points of view.
Fig. 9. Embryo.

M. P. Edgeworth. delin.

E. S. Weddell.

IV. *On the Indian Species of* Balanophora, *and on a new Genus of the Family* Balanophoreæ. *By the late* William Griffith, *Esq., F.L.S. &c. &c.*

Read June 18, 1844.

Balanophora, *Forst. Nov. Gen.* 50. *Jussieu, Gen. Pl.* 445. *Richard in Mém. du Mus.* viii. 431. *Endl. Melet.* fasc. 1, 12; *Gen. Pl.* 74. no. 718. Cynopsole, *Endl. Gen. Pl.* 74. no. 719. Langsdorffia, *Arnott* (*non Martius*) *in Hooker, Ic. Plant.* t. 205, 206.

Char. Gen. *Flores* mono-dioici. *Masculi* bracteâ suffulti. *Perianthium* 4- (rariùs 3- v. 5-) sepalum, æstivatione valvatum. *Stamina* monadelpha, 3–5, sepalis opposita (in *B. polyandrâ* indefinita); antheræ (specie polyandrâ exceptâ) biloculares. *Rudimentum pistilli* nullum. *Flores fœminei* nudi. *Ovaria* simplicia, unilocularia, in stylos subulatos persistentes producta, plura in stipitibus communibus apice glanduloso-ampliatis ex axi spicæ oriundis sita. *Fructus* sicci, formâ situque ovariorum. *Ovulum* pendulum ex apice ovarii cavitatis (in *B. polyandrâ* tantùm observatum). *Embryo* indivisus, albuminiformis, carnoso-cereus.

Plantæ *radicum parasiticæ, fœmineæ fungiformes.* Caules *squamis loco foliorum imbricati, ex axi communi irregulari lobatâ, fungorum instar, erumpentes.* Capitulum *terminale, pro mole plantæ maximum, cylindraceo-conicum.* Masculi *et* fœminei *in speciebus mihi cognitis diclines.* Flores masculi *odoris sæpiùs ingrati, ochroleuci vel pallidi, sæpiùs anthesi peractâ nigrescentes.* Antheræ *magnæ.* Flores fœminei *numerosissimi, minuti, simplicissimi.* Pistilla *Muscorum et Hepaticorum quorundam pistilla omninò simulantia.* Stigma *verum obsoletum.*

Obs.—Specierum diagnosis difficilis, in posterum speciminum vivorum accuratiore examinatione corrigenda. Odor et color partium fusiùs notandi.

1. Bal. Burmannica; dioica, squamis laxè imbricatis, bracteis truncatis parùm canaliculatis, columnâ staminum elongatâ, antherarum loculis basi discretis. (Tab. III.)

Hab. Regnum Burmannicum, ad pedes clivorum calcareorum prope speluncas Trochla editas, fluminis Salueen.

Flores masculi 5-sepali; perianthium extùs carneum demùm sanguineum.

2. Bal. affinis; dioica, squamis laxè imbricatis, bracteis truncatis parùm canaliculatis, columnâ staminum brevi subrotundâ, loculis antherarum basi confluentibus. (Tab. IV.)

Hab. Colles Khasiyani, in umbrosis rupestribus.

Bal. Burmannicâ minor, an verè distincta? Perianthium 4–5-sepalum, pallidum. Antheræ inter se minùs cohærentes.

3. Bal. alveolata*; dioica, squamis arctè imbricatis, bracteis profundè canaliculatis inter se favi instar dispositis, columnâ staminum subrotundâ. (Tab. V.)

Hab. Colles Khasiyani, in sylvis densis apud Lumbree alt. 6000 ped., et in locis umbrosissimis sub rupibus calcareis, Churra Punjee, alt. 4000 ped.

An *B. dioica*, R. Br.?† Statura quàm in *Bal. Burmannicâ* minor. Color pallidus. Axis communis insigniter verrucosa. Flores masculi longiusculè pedicellati. Perianthium et stamina speciei præcedentis.

4. Bal. picta; dioica, squamis distantibus laxis (luteis), spicâ fœmineâ oblongâ obscurè sanguineâ. (Tab. VI.)

Hab. Montes Mishmeenses, jugi Himalayani, Laimplang Thayah, altitudine 4000–5000 ped.

5. Bal. (*Polyplethia*) polyandra; dioica, columnâ stamineâ brevi latâ, antheris indefinitis. (Tab. VII.)

Hab. Colles Khasiyani.

Digitalis; squamæ laxè imbricatæ, sæpè aspectu subverticillatæ. Spica mascula elongata. Bracteæ vix canaliculatæ. Flores distantiores, lati, 4-sepali. Caput columnæ transversè oblongum, loculis numero indefinitis reticulatum. Spica fœminea oblonga vel subglobosa.

In the Catalogue of the East Indian Herbarium distributed by Dr. Wallich, the following names occur: *Balanophora dioica*, R. Br.; *Bal. Indica*, Herb. Wight; *Bal. typhina*, Wall.; and *Bal. gigantea*, Wall., doubtfully proposed as an undescribed genus, *Sarcocordylis*‡. Of these, three are probably identical with species herein described, but I have no means of ascertaining the fact.

* By *alveolata* I wish to express the honeycombed appearance of the male spike.

† There is little doubt that this is really the species named *Bal. dioica* by Mr. Brown in Dr. Wallich's List, no. 7246, and figured in Dr Royle's 'Illustrations,' t. 78 *a*.—Secr.

‡ *Bal. gigantea*, Wall. List, no. 7249, "Gen. Nov.? *Sarcocordylis*, Wall.," is a true *Balanophora*, and

Obs. I.—I have experienced considerable doubt in referring these plants to *Balanophora*.

In all my notes, especially those made while associated with Dr. Wallich, during the Tea Deputation into Upper Assam, I have considered them, from that botanist's suggestions, to be species of his *Sarcocordylis*, rather than of *Balanophora*.

In M. Endlicher's 'Genera Plantarum,' the character of *Balanophora*, with the exception perhaps of that of the female, seems considerably different from that of the plants in question, which is rather that of *Cynopsole**; but that genus, although its female flowers would seem to have been unknown, is placed in a tribe characterized by having a bilocular ovarium! Indeed, up to the time of my reaching the Botanic Gardens, I had no grounds whatever for referring these plants to *Balanophora*, except a figure in Dr. Royle's 'Illustrations†,' which is stated to represent the *Bal. dioica* of Mr. Robert Brown ‡, a Nepalese plant referred by him to *Balanophora* in his memoir on *Rafflesia* §. My doubts, however, did not entirely end here; for in Forster's figure of *Bal. fungosa*, on which he founded the genus, the spikes are represented as bearing male flowers below and female above, a remarkable circumstance; the receptacles would also appear to bear pistilla over their whole surface. Then again, so late as 1838, Dr. Walker Arnott represents a plant in Hooker's 'Icones Plantarum,' which, excepting the apparent want of bracteæ to the male flowers, and the appearance of the styles, perhaps to be explained by the adherence of pollen-grains, is evidently a congener of Mr. Brown's *Bal. dioica*, and of the species I have endeavoured to illustrate. This Dr. Arnott makes a *Langsdorffia*, a genus which appears to me sufficiently distinct from the *Balanophora* of Forster.

I have no later information regarding these plants, although probably Dr. Arnott has elucidated them in the 'Annals of Natural History.' I believe

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apparently not distinct from *Bal. globosa*, Jungh. in Nov. Act. Acad. Nat. Cur. vol. xviii. suppl. 1. p. 210. t. 2; *Bal. Indica*, Herb. Wight (illustrated by Dr. Arnott in Sir W. J. Hooker's 'Icones Plantarum,' t. 205–6, and in the 'Annals of Natural History,' vol. ii. p. 36), is distinct from any other published species; and *Bal. typhina*, Wall. List, no. 7248, appears to be identical with *Bal. picta*, Griff., above characterized.—Secr.

* Genera Plantarum, 74. no. 719.

† Illustrations of Botany, &c. t. 99 or 78 *a*.

‡ Illustrations of Botany, &c. p. 330.

§ Linn. Trans. xiii. p. 227, in a note.

also the *Balanophoreæ* of Java have received some attention, but I am ignorant of the results*.

Obs. II.—My materials for illustrating these plants are extensive, consisting of drawings of one species made from the recent plants, and of a plentiful series of specimens preserved in spirits.

All the species agree in having an amorphous tuberiform mass, which may be considered as the common axis. This mass is firmly united to the woody system of the roots of the stock, which are ramified in its substance, the bark ceasing along the places of union. The cellular tissue of the mass adheres firmly to the divisions of the roots, which appear to terminate in an abrupt manner. Some of the specimens look like zoophytes adhering to foreign bodies. This common mass or axis is much lobed; the surface is always more or less, and often to a high degree verrucose, the verrucæ being variously lobed, and having an appearance that suggests the idea of their being of an excretory nature. Internally the common mass is mainly composed of cellular tissue, the cells in many instances containing nuclei, and often viscid matter. The vascular bundles are many, without any very evident arrangement, except towards the axes or stems, to which they will be found to converge. They are composed of lax fibres, filled (after maceration at least) with grumous tissue, and short, annular, sometimes partly unrollable vessels.

Within the common mass the buds are developed, being protected during their earlier stages by the superficies of the mass, as well as by their own scales, which are then very closely imbricated. The buds subsequently protrude through the common covering, derived from the superficies of the mass, which remains in the shape of an irregularly torn annulus or wrapper.

The flower-bearing axes or stems, which appear perhaps generally to be one to each lobe of the common mass, are not isochronous in development. Instead of leaves they present imbricated uncoloured scales. The main bulk of the stem is of nucleary cellular tissue, traversed by longitudinal vasculo-fibrous fascicles, which supply the scales. In the female spikes these are

* Since I wrote the memoir on *Balanophora*, I have seen Junghuhn and Gœppert's papers in the 'Nova Acta Academiæ Naturæ Curiosorum,' but I cannot get them translated. At any rate, my conclusions were derived independently of the papers alluded to.—*Mr. Griffith in a Letter to Mr. R. H. Solly, dispatched from Calcutta April* 10*th*, 1843.

much ramified in the circumference, but they do not, I think, pass into the receptacles or into any of the pistilla.

The scales have no cuticle or internal cavities, they never present green colouring matter, and are generally colourless and blackened about their points. They are of a fleshy substance, and are provided with several simple vascular fascicles.

The bracteæ, which are only developed in the male spikes, are fleshy, abruptly truncate, and more or less canaliculate. In the species in which they are most so, owing to their lateral edges being partly at least in apposition, the flowers appear enclosed in alveoli; and this is particularly evident after the fall of the flowers, when the head of the spike presents a honeycombed appearance. *Bal. dioica,* as represented in the figure cited*, would appear to have cyathiform or involucelliform bracteæ; this probably is a mistake. The vascular bundles are obsolete, appearing rather as streaks of discoloured tissue; in them I have only observed fibres similar to those surrounding the vessels in the longitudinal bundles of the axis.

The perianthium, which exists only in the male, is composed of 4 or 5 sepals; if 5, the fifth is anticous; their æstivation is valvate, their substance fleshy. I have not detected in them any vascular fascicles, although there is some appearance of their existence within each margin.

The stamina are completely monadelphous, and, except in *Bal. polyandra*, are equal in number and opposite to the segments of the perianthium. From having observed certain irregular appearances in the anthers of *Bal. alveolata* (see Tab. V. fig. 8.), I think that the type of the anthers of *Bal. polyandra* may still be reduced to that of the other species. The centre of the antheriferous part of the column has presented one or two large patches of discoloured tissue. The anthers are very large, consisting of two large cells folded longitudinally into the shape of a horseshoe; they have no endothecal special apparatus; they open longitudinally; their number and structure are best ascertained before dehiscence. The pollen presents nothing peculiar.

The female stems are, so far as regards scales, &c., like those of the male, but they present no bracteæ, although round the base of the head there appears a tendency in some to their development.

* Royle's Illustrations, t. 99, or 78*a*.

The female spike to the naked eye has a papillose and a subverrucose appearance; under an ordinary magnifier it appears covered with truncate, areolate, opake bodies, separated from each other by what appear to be hairs. The truncate areolate bodies will be found on examination to terminate small branches of the spike, on which are arranged (and perhaps exclusively so) the pistilla or female flowers, the styloid terminations of which are the hairs alluded to.

These pistilla are generally stalked, and appear to be entirely composed of cellular tissue, every cell containing a nucleus. The ovarium is generally ovate, and presents externally the appearance of having a cavity containing a nucleus. This would seem to be its true structure, judging from *Bal. polyandra.* It is gradually attenuated into a style, which, in its earlier stages at least, is closed at the apex, and does not present any surface like that of an ordinary stigma. The tissue before fecundation is transparent and uncoloured; subsequently to that, the style becomes more or less, often completely, obscured by brown colour.

The ovulum, which was only observed in *Bal. polyandra,* and probably in its impregnated state, appeared to be pendulous from the apex of the cavity of the ovarium; its constitution was essentially similar to that of the matured embryo. Of its earlier stages I have no knowledge.

The pistilla at very early periods are mere ovato-conical extensions of the surface of the spike round the bases of larger extensions of the same surface, which subsequently form the receptacles.

There is very little difference beyond discoloration and a brittleness of tissue between the pistilla of the other species and the fruits of *Bal. picta,* in which alone I have observed them in their seemingly ripe state; they have nearly the same size and precisely the same disposition.

The embryo in this species appeared to be free; it is a cellular, undivided, albuminous-looking body, of a fleshy, waxy substance; the cells which compose it are rendered opake by grumous, molecular and oleaginous matter, which by pressure may be made to escape into the fluid of the field of the microscope in the form of globular bodies of unequal size, which, as I have mentioned, might be mistaken for spores or grains of pollen.

Obs. III.—The most remarkable parts of the structure of this genus appear to me to be, the extraordinary simplicity of the female flowers, and the remarkable productions of the surface of the spike on which they are arranged.

From not having observed any change in the numerous pistilla (previously to examining *Bal. polyandra* and *Bal. picta*), although the browning of the style, and in some cases adherence of pollen-grains to it, had been distinctly seen, doubts had suggested themselves to me regarding the true nature of the above parts; and these were increased by examinations at very early periods, which did not present any state of the (subsequent) pistilla at all analogous to what occurs perhaps universally in Phænogamous Angiospermous plants; and also by the permanence and evident importance of the termination of the remarkable receptacles. The same apparent imperfection of the female flowers appears to have struck most observers*; and prior to the determination of the point by the examination of the two species alluded to, I was inclined perhaps to consider this remarkable genus as presenting, at least in the specimens before me, an instance of abortion of pistilla, connected with a remarkable gemmiform apparatus.

The resemblance of the pistilla to the pistilla of *Musci*, and more especially to those of some evaginulate *Hepaticæ*, is exceedingly curious and complete; and the same may be said of the effects produced by the action of the pollen on the styles. Indeed, in the development of the female organ, the continuous surface of the style before fecundation, and its obvious perforation after†, *Balanophora* presents a direct affinity to a group of plants, with which otherwise it has not a single analogy.

If these highly remarkable points of structure are borne in mind, I think that it must be conceded that *Balanophora* can in no wise be associated with such highly-developed families as *Rafflesiaceæ* and *Cytineæ*, which, especially the former, are in my opinion to be taken as exhibiting a highly complex formation of even both sexes.

* See Arnott's characters in Hooker's Icon. Pl., *loc. cit.* &c.

† In *Bal.* (*Polyplethia*) *polyandra* it is not uncommon to find grains much like the pollen-grains, and nearly of the same size, adhering to the style. Generally I have observed them adhering to it a little below the apex. The discoloration and lengthened maceration hindered me from tracing them down the canal of the style, which in this species was rarely observed to present so wide a separation or laceration of the parts forming its extreme apex as in the other species.

OBS. IV.—In the present state of our knowledge the *locus naturalis* of the family to which this genus belongs must, it appears to me, at best be founded on conjecture. The assistance of physiology is in the first place essential. Of all the notions* however regarding it, that of Agardh, as given by Endlicher and Schott in their '*Meletemata*'†, appears to me the most plausible, although he would seem to include *Cynomorium* in the family, and to make it the typical genus. Although I have not observed these plants to have milky juice, or am inclined to lay much stress on some of the signs of affinity given by Agardh, yet in the separation of the sexes, the valvular æstivation of the perianthium, and the apposition of the stamina to its component parts, there are perhaps some signs of affinity; and although the development of the pistilla of *Balanophora* appears to me an insurmountable objection, still they resemble in texture the pistilla of some *Urticeæ* as much, if not more, than those of any other plant.

As a mere hypothesis, then, I would consider *Balanophoreæ*, judged of chiefly by *Balanophora*, as the homogeneous embryo form of *Urticinæ*, forming a direct passage in one, and usually the more perfect structure, to *Musci* and *Hepaticæ*. But in this, as in all other very doubtful cases, it is much more advisable to consider them as aliens than to force them into any subkingdom, class or order. As aliens, every observing botanist's eye will be upon them. As undoubted citizens, they may find, under authority, places anywhere, and will certainly cease to be general objects of observation.

PHÆOCORDYLIS, *Griff.*‡

CHAR. GEN. Sexus diclines. *Mas*: ignotus. *Fœm.*: *Ovaria* nuda, in axi spicæ sessilia, pilis cellulosis (paraphysiformibus) immersa. *Stylus* filiformis, deciduus (exsertus).

* Richard considered it allied to *Hydrocharideæ* and *Aroideæ* and *Aristolochieæ*, especially *Cytinus*, and to be placed between the former, which terminate the Monocotyledonous, and *Aristolochieæ*, which commence the Dicotyledonous series (*Ann. Mus.* viii. 434). Almost all writers seem to consider it as Monocotyledonous.

† Fasc. 1. p. 9. Obs. II.

‡ This genus approaches very closely to *Rhopalocnemis*, as described by Junghuhn in the 'Nova Acta Academiæ Naturæ Curiosorum,' vol. xviii. suppl. 1. p. 213; but appears to differ in the absence of the extraordinary structure of the "fila globulifera" attributed to that genus by its author.—SECR.

Stigma obtusum. *Fructus* siccus, pilis (immutatis) immersus, compressus, striatus, apice papillosulus.

Planta *robusta, habitu et evolutione* Balanophoræ, *tota brunnea.* Spica *oblonga, areolata, oculo nudo velutina.*

Genus *Balanophoræ* vicinum, discrepans præsentiâ pilorum paraphysiformium, pistillo perfectiore, stylo deciduo, fructuque apice papillosulo.

Phæocordylis areolata.

Hab. In sylvis densissimis Collium Khasiyanorum, ad Mumbree; altitud. 6000 ped.

Descr. Axis informis, subglobosa, carnosa, superficie verrucosâ; verrucæ simplices vel sæpiùs variè lobatæ. Caules clavati, spithamæi vel pedales, erecti, basi annulo volvari variè diviso cincti. Squamæ (loco foliorum) carnosæ, horizontales, obsoletè pyramidales, (apicibus planis truncatis,) parvæ, subspiraliter dispositæ, infimæ approximatæ, superiores distantiores. Spica crassa, oblonga, aspectu ferrugineo-velutina, obsoletè areolata, areolis centro elevatis. Pili (paraphysiformes) densissimè aggregati, superficiem ferè totam spicæ occupantes, lineari-clavati, rariùs simplices, frequentiùs e cellularum oblongarum seriebus binis vel imò ternis conflati, apice emarginati vel 3-dentati. Cellulæ basin versus diaphanæ, globulas diaphanas, inæquales, in massulas irregulares congestas continent; cellulæ apicis rotundatæ, materie grumosâ obscuratæ. Fructus pilis obsiti et immersi, sessiles, basi latâ affixi, oblongo-elliptici, compressi, longitudinaliter striati, apice subpapillosi, cicatrice styli obscurè notati, brunnei. Pericarpium siccum, subcrustaceum. Embryo carnoso-cereus, albus, aspectu albuminis, pendulus? compositus e cellulis irregularibus mutuò firmè adhærentibus, materie moleculari repletis. Pistilla abortiva plura; ovaria oblonga, compressa, ferè plana, striata, 1-locularia; stylus longè exsertus, filiformis; stigma obtusum.

Obs. I.—This species was only observed in an advanced state and of one sex in the journey of the Assam Deputation across the Khasiya Hills, A.D. 1835–36.

Obs. II.—The general anatomy of this plant appears to be the same as that of *Balanophora.* The vessels however appear to be more developed; they are scarcely unrollable. It is not so remarkable as *Balanophora* for the presence of nuclei in the component parts of the cellular tissue.

Its parasitism would appear to be precisely the same. The chief difference in habit from *Balanophora* arises from its larger annulus and its more minute scales, which rather resemble the bracteæ of the male flowers of *Balanophora* than the scales (or leaves) of that genus.

Obs. III.—In the description which I originally made, there are remarks which would lead me to suspect that a perianthium, or something analogous to it, (in which case it would approach nearer to *Scybalium*,) may exist; but in my later examinations, by which I have been guided on this point, I find no trace of any tube enveloping the style.

The abortive pistilla have a considerable resemblance to those of *Balanophora*, but the tissue is much less lax and is obscured by brown colour. Although there have appeared to me to be traces of a cavity in the upper part of each, I have not been able to ascertain the existence of any body analogous to an ovulum, or any pre-existing state of the subsequent embryo. The structure of the style is also perhaps more indicated by analogy than by actual observation, owing to its opacity.

Obs. IV.—The results of all the examinations of the fruits have been the same; the embryo appears to be entirely cellular, and not to present any obvious attachment. The cellular tissue is dense and firm; if viewed under pressure and by transmitted light, it appears to be homogeneous, the cells containing a mucilaginous fluid and much molecular matter.

This matter on its escape carries along with it an envelope of mucilage, and assumes, when perfectly free in the field of the microscope, a globular appearance. It may in this state be easily mistaken for a spore, or a grain of pollen deprived of its outer coat.

Obs. V.—The structure of the hairs in which the fruits are imbedded is remarkable, from the analogy it appears to me to present with the paraphysiform appendages of *Drepanophyllum* and certain *Neckeræ*, and also with the bodies which I suspect are the male organs of *Filices*.

Obs. VI.—I am ignorant whether this plant is a congener of or the same with *Balanophora gigantea*, doubtfully proposed by Dr. Wallich as a new genus in his Catalogue, No. 7249 *.

Obs. VII.—The genus I take to differ essentially from *Balanophora* by the presence of the remarkable paraphysiform hairs or processes which cover the surface of the spike, by the areolation of this part, the sessile solitary ovaria, deciduous styles, and the subpapillose apex of the fruit. The conformation of the pistillum is also on the whole more perfect.

* See note ‡ on p. 94.—Secr.

Langsdorffia of Martius * (not Arnott †) differs in the absence of the areolation and the peculiar hairs, the stalked ovaria crowned with papillæ, and the highly developed stigmatic surface. With the females of both *Helosis* and *Scybalium* it agrees in the structure of the hairs and of the fruit, although the ovarium of both these genera evidently appears to be composed of two carpella, and that of *Scybalium* to be actually bilocular.

The nakedness of the apex of the ovaria, connected with the papillose appearance of the apex of the fruit, seems to me to indicate that the appearances which have caused the ovaria of *Helosis*, and especially of *Scybalium*, to be described as inferior, may originate in an early development of the papillæ.

To endeavour to make this account of *Balanophora* and *Phæocordylis* more complete, I subjoin distinctive characters of the genera to which I would at present limit the natural family *Balanophoreæ*.

A. Monostyli.

Balanophora, *Forst. Nov. Gen.* 50. *Jussieu, Gen. Pl.* 445. *Richard, Mém. du Mus.* 8, 431. *Endl. Mel. Bot.* fasc. 1. 12; *Gen. Pl.* 74. no. 718. Cynopsole, *Endl. Gen. Pl.* 74. no. 719. Langsdorffia, *Arnott in Hook. Icon. Plant.* t. 205, 206.

Sexus diclines, rarissimè monoclines. *Flores masculi* bracteati. *Perianthium* 3–5-sepalum, æstivatione valvatum. *Stamina* 3–5, sepalis opposita, monadelpha (in *Bal. polyandrâ* indefinita). *Flores fœminei*: *Ovaria* stipitata, plura receptaculo communi ex axi spicæ oriundo apice incrassato-glanduloso affixa, nuda. *Stylus* setaceus, persistens. *Stigma* inconspicuum. *Fructus* pistilliformes, sicci.

Langsdorffia, *Mart. Nov. Gen. Sp. Plant. Bras.* 3. 181. t. 299, 298 *ex parte*. *Richard, Mém. du Mus.* 8. 412 *et* 430. t. 19. *Endl. Mel. Bot.* fasc. 1. 12. *Gen. Pl.* 74. no. 722.

Sexus diclines. *Flores masculi* bracteati. *Perianthium* 3-sepalum, æstivatione valvatum. *Stamina* 3, sepalis opposita, monadelpha. *Flores fœminei*: *Ovaria* stipitata, ex axi

* Nov. Gen. Sp. Plant. Bras. 3. 181. t. 298, 299. † In Hooker, Icones Plant. t. 205, 206.

spicæ ipsâ orta. *Stylus* filiformis, basi tubulo papilloso cum ovarii parietibus continuo circumcinctus. *Stigma* subclavatum, papillosum. *Fructus* —— ?

Phæocordylis, *Griff.*

Sexus diclines. *Mas*: ignot. *Flores fœminei: Ovaria* in axi ipsâ sessilia, nuda, pilis paraphysiformibus immixta. *Stylus* filiformis, exsertus, deciduus. *Stigma* subcapitatum. *Fructus* compressi (striati), apice subpapillosi.

B. Distyli.

Helosis, *Richard, Mém. du Mus.* 8. 416 *et* 430. t. 20. *Mart. Nov. Gen. Sp. Pl. Bras.* 3. 184. t. 300 *et* 298 *ex parte. Endl. Mel. Bot.* fasc. 1. 11; *Gen. Pl.* 74. no. 721.

Sexus monoclines. *Flores* pilis paraphysiformibus immixti: *masculi* ebracteati. *Perianthium* 3-sepalum. *Stamina* incompletè monadelpha. *Antheræ* connatæ, introrsæ!! *Flores fœminei: Ovaria* in axi ipsâ subsessilia, quasi calyculo coronata.—Caules *squamis nisi ad imam basin orbati!*

Scybalium, *Endlicher. Schott in Endl. Mel. Bot.* fasc. 1. 3. t. 2; *Gen. Pl.* 74. no. 720.

Sexus diclines. *Flores masculi* pilis paraphysiformibus et filis (*auct. Endl.*) immixti, ebracteati. *Perianthium* 3-sepalum. *Stamina* monadelpha; *antheræ* apices versus dehiscentes. *Pistilli* rudimentum intra tubum filamentorum! *Flores fœminei: Ovaria* pilis paraphysiformibus tantùm immixta, sessilia in ipsâ axi, limbulo subpapilloso coronata.

Adnot.—*Ombrophytum*, Schott et Endl., et *Lophophytum*, Poeppig, genera vix ritè cognita, vel hucusque dubia, et certè in posterum reinvestiganda, meliùs extra limites familiæ interim locanda. Genus *Cynopsole*, Endl., delendum.

EXPLANATION OF THE PLATES.

Tab. III.

Balanophora Burmannica.

Fig. 1. Male plant:—natural size.

Fig. 2. Alabastrum.

Fig. 3. The same, just expanding.

Fig. 4. Vertical view of apex of columna staminea in a pentamerous flower.

Fig. 5. Lateral view of a tetramerous flower.

Fig. 6. Endothecium.

Fig. 7. Pollen in its natural state. *a.* The same, in water (triplet $\frac{1}{33}$). *b.* The same, after long maceration in spirits ($\frac{1}{330}$ m.).

Fig. 8. Female plant:—natural size.

Fig. 9. Apex of spadix: squamæ reflexed, showing that abortive bracteæ do exist.

Fig. 10. Portion of spadix.

Fig. 11. Portion of the female inflorescence.

Fig. 12. Portion of transverse section of bulbiform mass (irregular base of axis).

Fig. 13. Portion of transverse section of stem.

Tab. IV.

Balanophora affinis.

Fig. 1. Male plant:—natural size.

Fig. 2. Flower just opening.

Fig. 3. Expanded flower.

Fig. 4. Endothecium, portion of.

Fig. 5. Pollen, moist.

Fig. 6. The same, immersed in water.

Fig. 7. Longitudinal half-section of stem.

Fig. 8. Portion of one of the vascular bundles.

Fig. 9. Attachment to the root of the stock.

Fig. 10. Young bud, and part of the base of the plant.

Fig. 11. Another, more advanced: enclosing superficial layer removed.

Fig. 12. Bud considerably more advanced: superficial layer ruptured.

Fig. 13. Female plant:—natural size.

Fig. 14. Longitudinal section of stem and inflorescence.

Fig. 15. Transverse section of a portion of the flower-bearing part.

Fig. 16. Portion of spadix; one series of corpora pistilliformia, with the corpus terminale.

Fig. 17. Corpus pistilliforme, unfecundated?—$\frac{1}{150}$ m.

Fig. 18. The same, fecundated:—$\frac{1}{150}$ m.

Tab. V.

Balanophora alveolata.

Fig. 1 & 1 *a*. Portions of male plants:—natural size.

Fig. 2. Portion of another plant, with a much less warty common axis.

Fig. 3. Alabastrum from fig. 1, just opening.

Fig. 4. Alabastrum, opened, of fig. 1.

Fig. 5. Columna staminea of fig. 2. This presents a variety in the structure of the front anther.

Fig. 6. Pollen:—magnified 550 times.

Fig. 7. Female of fig. 1.

Fig. 8. Portion of a female of fig. 2.

Fig. 9. Corpora pistilliformia and corpus terminale of fig. 7.

Fig. 10. The same, of fig. 8.

Fig. 11. Unfecundated? corpus pistilliforme of fig. 8:—magnified 200 times.

Fig. 12. The same, fecundated?—magnified 200 times.

Fig. 13. Portion of a very young flowering axis; the smaller more conical bodies are young pistilla.

Fig. 14. Another, more advanced.

Fig. 15. Apex of a styloid prolongation of a corpus pistilliforme, about the same period as fig. 14:—magnified 550 times.

Fig. 16. Apex of another, after sphacelation:—magnified 550 times.

Tab. VI.

Balanophora picta.

Fig. 1. Female plant:—natural size.

Fig. 2. Pericarpia and terminal body.

Fig. 3. Pericarpium.

Fig. 4. The same, with the chief part of the style removed, and the parietes laid open to expose the central body.

Fig. 5 & 6. Central body.

All but 1 & 2 measured, under an object-glass, $\frac{1}{4}$ of an inch focal distance.

Tab. VII.

Balanophora (*Polyplethia*) *polyandra.*

Fig. 1. Male plant:—natural size.

Fig. 2 & 3. Alabastra, seen vertically.

Fig. 4. Alabastrum, forcibly expanded.

Fig. 5. Columna staminea.

Fig. 6. A flower.

Fig. 7. The same, with the sepals reflexed forcibly, viewed laterally.

Fig. 8. Transverse double section of columna staminea.

Fig. 9. Endothecium.

Fig. 10. Pollen; measured under object-glass $\frac{1}{16}$.

Fig. 11. A female plant:—natural size.

Fig. 12. Pistilla and glandular-headed axes.

Fig. 13. Pistillum, separate. *a, a.* The nucleary appearance, seen externally, due to the cavity in the pistillum. *b.* The young embryo: this is supplied from fig. 15.

Fig. 14. Apex of a style of a young and apparently abortive pistillum:—$\frac{1}{350}$ m.

Fig. 15. Pistillum, upper half torn open; the opake circular line represents the boundary of its cavity, in the upper part of which is the young embryo.

Fig. 15*a*. Embryo detached; the apex is torn a little. I could make nothing out of the filament by which it is attached, even under $\frac{1}{350}$.

Fig. 16. Upper part of a pistillum, with its style similarly laid open, showing the embryo increased in size; a pollen-grain? adheres to the style a little below its apex:—magnified about 200 times.

Fig. 16*a*. Apex of the style:—$\frac{1}{350}$ m.

From specimens preserved in spirits.

Tab. VIII.

Phæocordylis areolata.

Fig. 1. Plant, reduced one-third, from a drawing from recent specimens by one of the native draftsmen of the Calcutta Garden.

Fig. 2. Another view, partially altered from a pencil sketch by the same draftsman.

Fig. 3. Portion of the head of the spadix.

Fig. 4. Two of the paraphysiform hairs.

Fig. 5. Abortive pistillum.

Fig. 6. Stigma of the same.

Fig. 7. Another abortive pistillum.

Fig. 8. Somewhat immature fruit.

Fig. 9. Mature? fruit.

Fig. 10. Longitudinal section parallel to broadest diameter.

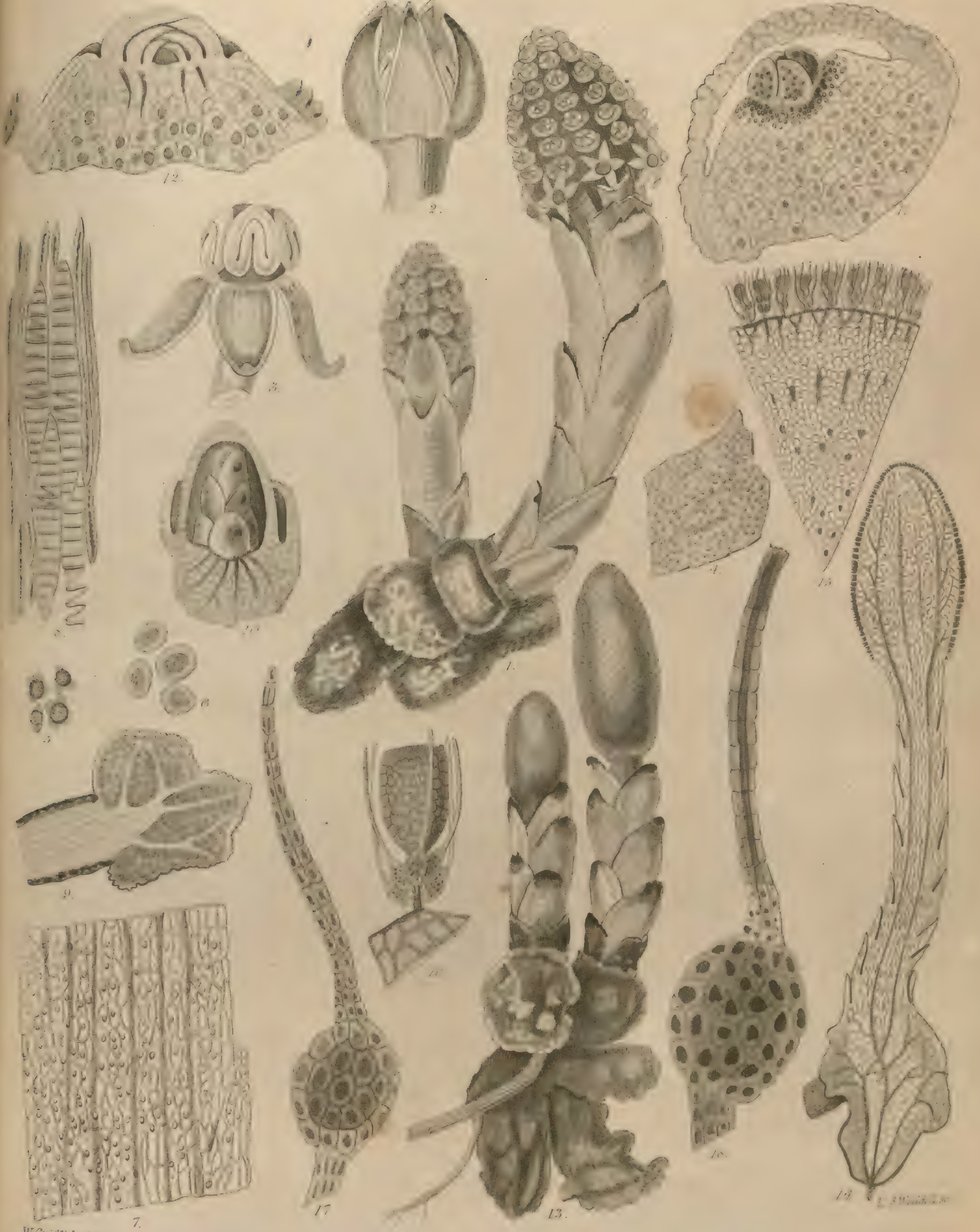
Fig. 11. The same, parallel to narrowest diameter.

Fig. 12. Nucleus detached: longitudinal section.

Fig. 13. Nucleus of another entire, resembling in some measure certain young dicotyledonous embryos.

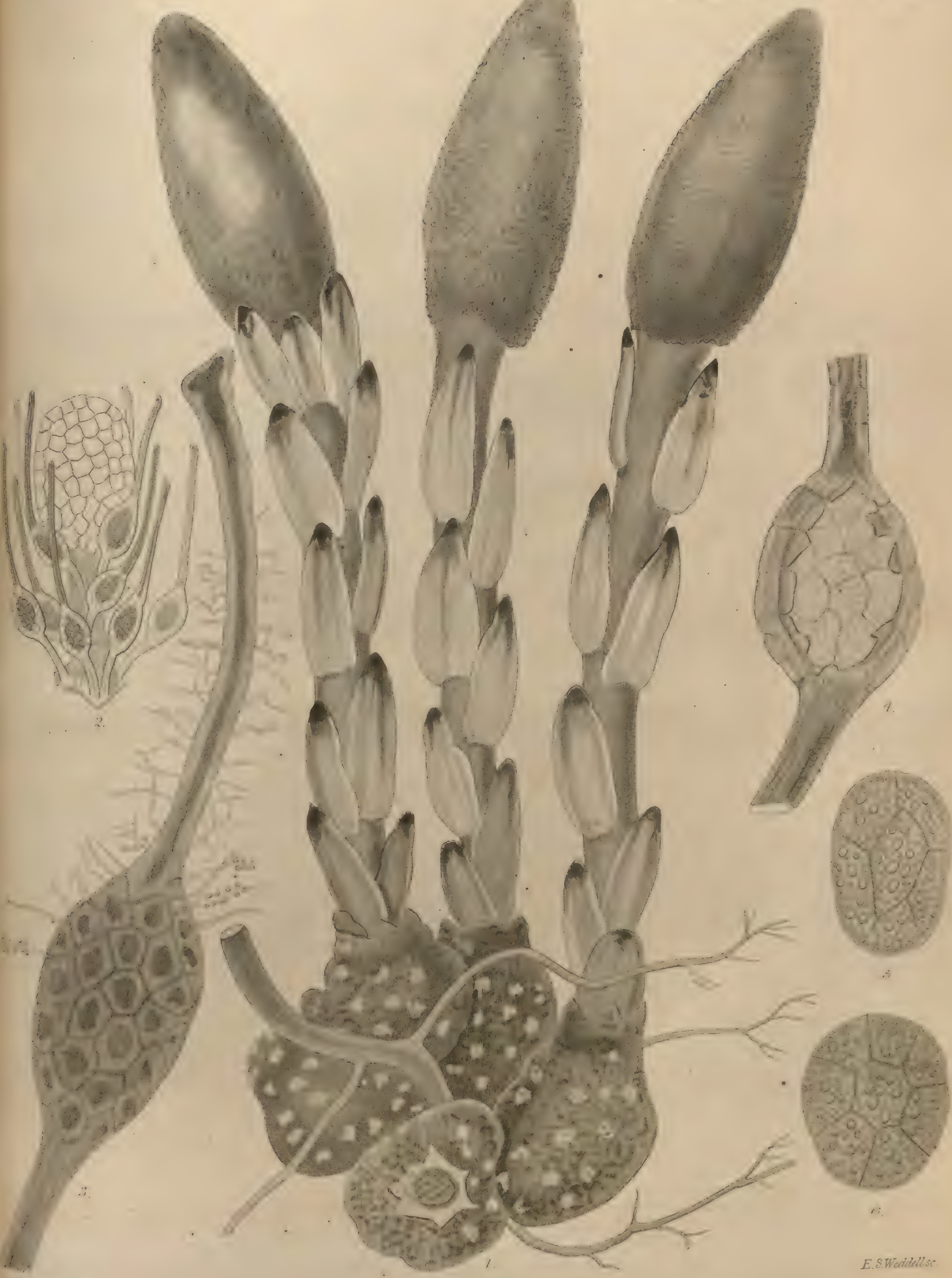
Fig. 14. Portion of the nucleus, showing its composition.

W. Griffith delin. 12. E. S. Weddell sc.



W. Griffith delin.

W. Griffith delin

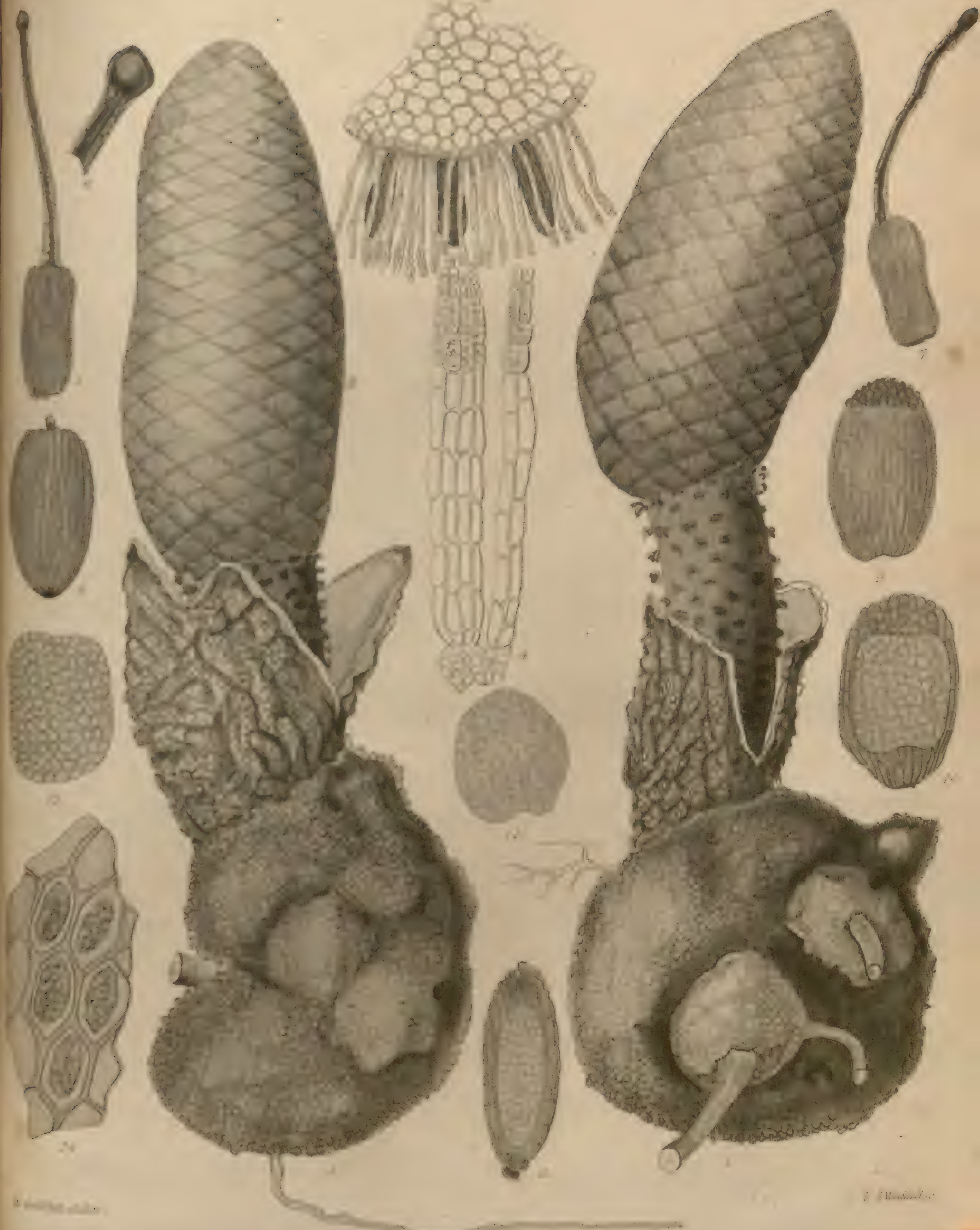


S. Griffith delin.

E. S. Weddell sc.

W. Griffith delin.

E. S. Weddell sc.



V. *On* Agaricus crinitus, *Linn., and some allied Species. By the Rev.* M. J. Berkeley, *M.A., F.L.S. &c. &c.*

Read February 18th, 1845.

THE number of *Fungi* preserved in the Linnean herbarium is small, but they are in good condition, and comprise a few very interesting forms. Amongst them, not the least interesting is *Agaricus crinitus*, a species which, though correctly described, has been much misunderstood. The object therefore of the present memoir is to illustrate this and a few allied species, which there is the greater necessity for doing, as, by some mischance, the species described by Dr. Klotzsch in the 'Linnæa' were communicated to Fries under transposed names, in consequence of which, without reference to the original specimens, the confusion is almost inextricable, especially as the same species are marked by other names by Dr. Klotzsch in Sir W. J. Hooker's herbarium. It is hoped that the present observations may help to place them on a surer footing, especially as they are accompanied by accurate drawings, of which it is sufficient to say, that they are from the pencil of Mr. J. De Carle Sowerby.

1. Lentinus crinitus; pileo latè infundibuliformi repando badio-rufo fibris innatis apice liberis vix fasciculatis regulariter striato margine reflexo, stipite æquali pallido sericeo-farinoso, lamellis acutis integris rigidiusculis subdistantibus glandulosis decurrentibus posticè anastomosantibus. (Tab. IX. fig. 1.)

Agaricus crinitus, L. Sp. Plant. ed. 2. p. 1644.

Hab. On wood, South America. *Rolander* in the Linnean herbarium.

Pileus $1\frac{3}{4}$ of an inch across, broadly infundibuliform, with the border arched, of a dark red-brown, closely and regularly striate with silky fibres, the ends of which are free, flat and ascending, and very slightly if at all fasciculate; margin inflected. Stem about $\frac{3}{4}$ of an inch high, $1\frac{1}{2}$ line thick, firm, hard, nearly equal except towards the base, where it is slightly incrassated, dark, and expands over the wood on which it grows, paler than the pileus and clothed with a little white silky meal, with a few very minute dark scales towards the base. Gills narrow, rather rigid, subochraceous, nearly entire, rather distant, slightly forked, glandular, decurrent and anastomosing behind.

The fungus described by Fries as *Ag. crinitus,* Swartz, is a very distinct species, of which I have given a figure and description in the 'Annals of Natural History,' from an authentic specimen in the British Museum. It was supposed at the time that Swartz's name was correct, but on consulting the Linnean herbarium it appeared to be very different. I possess specimens from Brazil, and there is one in the herbarium of Mr. Edward Forster. It is distinguished at once by its very pale colour, fasciculate hairs and other peculiarities. This was stated in the second volume of Sir W. J. Hooker's 'London Journal of Botany,' p. 632, and the name of *Lentinus Swartzii* proposed for it.

Of the synonyms cited by Linnæus, that in Brown's 'History of Jamaica,' tab. 15. fig. 1, is a fair representation of the species. The plant of Plumier, tab. 168. fig. B, is clearly something of a totally different character.

2. Lentinus tener; pileo tenui regulari latè infundibuliformi repando cervino fibris fasciculatis subcrispis vestito subtùs sericeo-striato margine subsulcato, stipite gracili æquali pallido granulato-furfuraceo, lamellis subdistantibus pallido-ligneis opacis lato-denticulatis glandulosis decurrentibus posticè vix anastomosantibus. (Tab. IX. fig. 2.)

Lentinus tener, Klotzsch. Fries, Syn. Lent. p. 6; Epicrisis, p. 389. Berk. in Hook. Lond. Journ. of Bot. vol. ii. p. 632.

Hab. On wood. Organ Mountains, *Gardner*; and according to *Klotzsch*, New Orleans. (*Hook. Herb.*)

Pileus 2¼ inches across, regularly infundibuliform, with the border spreading, thin and flexible, not at all rigid, fawn-coloured, darker in the centre, clothed with scattered fascicles of fibres, which are paler towards the margin; these gradually fall off and expose the surface of the pileus, which is striate with innate fibres; margin sulcate, not involute. Stem nearly 1½ inch high, more than a line thick, pale, smooth, with the exception of a few minute granular branny scales. Gills rather distant, decurrent, scarcely at all anastomosing at the base, broadly toothed, or rather incised, glandular, of a pallid wood colour, with a peculiar opake appearance.

The plant still remaining in Sir W. J. Hooker's herbarium, though somewhat injured by insects, is marked by Dr. Klotzsch *Lentinus villosus*, but it is neither the species described under that name in his MSS. nor that so sent to Fries. Whether or not there has been any mistake as to locality I cannot say, but there are no specimens marked as coming from New Orleans in Sir W. J. Hooker's collection. It will be observed, that my description does not accord with that of Fries as regards the colour of the pileus and stem, but Mr. Gardner's plant is in a more perfect condition, and the under colour of the pileus and stem varies according to circumstances. Specimens which have been much exposed to the weather acquire a dark tinge; and their condition before being submitted to pressure, whether more or less saturated with moisture, makes some difference. The accompanying figure will indicate in a great measure the differences, which are stated at length under the following species.

3. Lentinus Schomburgkii; pileo tenui latè infundibuliformi repando cervino floccis mollibus fasciculatis leviter crispatis pallidis vestito demùm medio subglabrescente sericeo-striato, stipite æquali sublurido parcè furfuraceo apice sericeo, lamellis confertis tenuibus decurrentibus posticè anastomosantibus pallidè cervinis eglandulosis acie denticulatis. (Tab. IX. fig. 3.)

Hab. On dry wood. British Guiana, *Schomburgk in Hook. Herb.*

Pileus $1\frac{1}{2}$ inch across, thin, rigid and coriaceous when dry, broadly infundibuliform, with the border arched and the extreme edge slightly incurved, fawn-coloured, clothed with pale, fasciculate, slightly-curled flocci, at length comparatively smooth in the centre and sericeo-striate. Stem $\frac{3}{4}$ of an inch high, $1\frac{1}{2}$ line thick, fawn-coloured like the pileus, but with a dingy hue, slightly furfuraceous below, sericeo-striate above. Gills crowded, narrow, thin, of a pale fawn-colour, decurrent, slightly anastomosing behind; edge thin, denticulate; surface quite free from glands.

This species is nearly allied to *L. tener*, but it is smaller, more rigid, the hairs on the pileus are less coarse, the gills are thinner, more closely set, and they have no glands upon them. There is besides a peculiar dull appearance about those of *L. tener*, which at once distinguishes them.

4. *Lentinus nigripes*, Fries, Syn. Lent. p. 4; Epicrisis, p. 387. Klotzsch in Linn. vol. viii. p. 479. 1833. (Tab. IX. fig. 4.)

This species is well described in the 'Synopsis Lentinorum,' but no figure has hitherto been published. The pileus is far more densely clothed with fibres, the margin distinctly involute, the stem black, covered with a dull branny coat; the gills crowded and very distinctly glandular. This is *L. villosus*, Klotzsch, in Sir W. J. Hooker's herbarium, where he regards the two foregoing species as varieties. *L. villosus*, Fries, is quite a different species, and known generally under the name of *L. Berterii*. The species of Fries however, so named, is quite different. What the original plant of Sprengel is upon which that species is founded, I have no means at present of ascertaining.

5. Lentinus Leveillei; pileo tenui latè infundibuliformi repando explanato rigidiusculo floccis crispatis subfasciculatis rarioribus vestito, stipite æquali nigro furfuraceo, lamellis confertis furcatis decurrentibus glandulosis ochraceis acie granulato-dentatis posticè vix anastomosantibus. (Tab. IX. fig. 5.)

Hab. Surinam. Communicated by M. Miquel (marked No. 17) to M. Léveillé, who kindly lent me the specimen.

Pileus about $1\frac{1}{2}$ inch across, thin, rather rigid when dry, broadly infundibuliform, with the border arched, and the margin somewhat lobed, minutely denticulated, and not in the least inflected or involute, of a pale bay, fibrilloso-striate, and clothed with sparing fascicles of paler, slightly crisped, flat filaments. Stem about 1 inch high, 1 line thick, flexuous, nearly black, sparingly furfuraceous. Gills rather distant, forked, ochraceous; edge rough with minute granular processes, sprinkled with glandular processes.

This species approaches nearest to *L. nigripes*, but is smaller, the pileus less densely clothed, and the margin not in the least involute. M. Léveillé has lately given the characters of several new species, but none of them apparently closely allied to any of those just described. The species in the herbarium at the Jardin des Plantes which belong to this group are from Gaudichaud, collected from 1831 to 1833, and numbered from 38 to 41. M. Léveillé does not seem to have noticed them.

EXPLANATION OF THE PLATE.

Tab. IX.

Fig. 1 *a* and 1 *b*. *Lentinus crinitus*, L. 1 *c*. A portion of the stem and under surface of the pileus, magnified. 1 *d*. Lateral view of a portion of the gills, magnified.

Fig. 2 *a*. *Lentinus tener*, Klotzsch. 2 *b*. Portion of stem and gills, magnified. 2 *c*. Gills seen laterally, magnified.

Fig. 3 *a*. *Lentinus Schomburgkii*, Berkel. 3 *b*. Portion of stem and gills, magnified. 3 *c*. Gills seen laterally, magnified.

Fig. 4 *a* and 4 *b*. *Lentinus nigripes*, Fries. 4 *c*. Portion of stem and gills, magnified. 4 *d*. Gills seen laterally, magnified.

Fig. 5 *a*. *Lentinus Leveillei*, Berkel., upper surface. 5 *b*. Lower surface. 5 *c*. Gills seen laterally, magnified. 5 *d*. A small portion of a gill, more highly magnified.

J. De C. Sowerby del.

G. Jarman

VI. *Caricis Species novæ, vel minùs cognitæ. Auctore* FRANCISCO BOOTT, *M.D., S.L.S. &c. &c.*

Read June 3rd and 17th, 1845; and February 17th, 1846.

1. C. TUCKERMANI; spicis 5–4 rariùs 6; masculis 2 rariùs 3 v. 1; fœmineis 3 v. 2 oblongis cylindraceisque crassis subapproximatis pedunculatis longissimè bracteatis infimâ sæpè demùm nutante, stigmatibus 3, perigyniis tenuibus pellucidis oblongo-ovatis acuminatis longè cylindrico-rostratis bifurcatis glabris turgidè inflatis pallidis obliquè adscendentibus 10–14 nerviis squamâ ovatâ acutâ vel hispido-mucronatâ multùm latioribus longioribusque.

C. bullata, Tuckerman (non Schk.).

Hab. In Americâ Septentrionali, "nondum in Novâ Angliâ visa." *Tuckerman, Enum. Method. Car.* p. 20.

Culmus 2–2½ pedalis, firmus, scaber, infra foliis vestientibus tectus, apice filiformis; pars spicas gerens 6–10 poll. longa. Folia 1–2½ lin. lata, culmo longiora, scabra. Bracteæ culmo longiores, infima interdum vaginata. Vagina 1–10 lin. longa. Spicæ masculæ plerumque 2, rarius 3 vel 1, rarissimè apice fœmineæ, ½–1½ poll. longæ, lineam latæ; infima (si tres adsint) bracteata. Squamæ lanceolatæ, obtusæ v. acutæ, rariùs hispido-mucronatæ, pallidæ, margine albo-hyalinæ. Spicæ fœmineæ 3 v. 2, rariùs 1, oblongæ et cylindraceæ, 8 lin. ad vix 2 poll. longæ, 8 lin. latæ, suprema subsessilis, infima pedunculata, nutans, intervallo 1–2, rariùs 4 poll. remotæ. Squamæ ovatæ, acutæ, v. hispido-mucronatæ, pallidæ, nervo viridi, ad latera ferrugineo-nebulosæ, margine albo-hyalinæ, glabræ vel dorso scabræ. Pedunculi 2 lin. ad 1 poll. longi, scabri. Perigynium 5 lin. longum, 2 lin. latum, tenue, pellucidum, glabrum, pallidè viridans vel fusco-stramineum, turgidum, inflatum. Achenium 1⅔ lin. longum, lineam latum, triquetrum, pallidum, papilloso-asperulum, basi styli incrassatâ apiculatum.

Affinis *C. bullatæ*, Schk. Differt perigyniis tenuioribus, pellucidis, majoribus, obliquè adscendentibus, rostro glabro, squamis sæpè mucronatis, spicis fœmineis pluribus, longioribus, longiùs pedunculatis, nutantibus, foliis latioribus, culmo scabriori, pedunculis scabris.

2. C. Sullivantii; spicis 4–6 cylindricis gracilibus; masculâ 1; fœmineis 4 rariùs 3–5 laxifloris erectis pedunculatis superioribus approximatis infimâ remotâ exsertè pedunculatâ basi attenuatâ sæpè compositâ, stigmatibus 3, perigyniis ellipticis brevi-rostratis ore integro vel emarginato viridibus pellucidè punctatis pilosis enerviis squamâ ovatâ ciliatâ hispido-mucronatâ albidâ nervo viridi paululum longioribus.

C. Sullivantii, B. Bot. Exc. to the Mountains of North Carolina; Gray in Silliman's Journ. 42. p. 29.

Hab. In sylvaticis, prope Columbum, Ohionis, Americæ Sept., *W. S. Sullivant*, 1840.

Pilosa. Culmus bipedalis, gracilis, firmus, acutangulus, pilis albis, longis, sparsis vestitus, basi vaginis atro-purpureis foliisque vestientibus tectus; pars spicas gerens 2–9, rariùs 12 poll. longa. Folia 2–3½ lin. lata, culmo breviora, pilosa. Bracteæ pilosæ; infima vaginata, foliacea, culmum æquans vel multùm brevior; superiores setaceæ. Vagina 3 lin. ad 1½ poll. longa, albida, sæpè punctis minimis ferrugineis maculata. Spica mascula semper solitaria, 7–15 lin. longa, vix lineam lata, sessilis vel brevi-pedunculata; squamæ obtusæ, muticæ, apice ciliolatæ, pallidè castaneæ, margine hyalinæ, nervo scabro. Spicæ fœmineæ sæpiùs 4, rariùs 3–5 vel 2, laxifloræ, 1–1½ poll. longæ, 1–1½ lin. latæ; superiores approximato-contiguæ, infima aliquando intervallo 6–12 poll. longo remota, sæpè basi spiculâ alterâ minori composita, suprema rariùs geminata; squamæ albidæ, nervo viridi scabro, ciliolatæ, hispido-mucronatæ. Pedunculi scaberrimi, infimus aliquando 3 poll. longus. Perigynium $1\frac{5}{9}$–$1\frac{7}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, viride, demùm ferrugineum, enervium, pilosum, brevi-stipitatum, squamam subæquans vel longius. Achenium abortivum.

Affinis *C. arctatæ*, Boott, satis herbâ pilosâ, spicis erectis, perigyniis enerviis distincta.

3. C. juncea; spicis 2–4 gracilibus erectis ferrugineo-purpureis; terminali masculâ filiformi; reliquis fœmineis laxifloris subremotis infimâ pedunculatâ evaginatâ, stigmatibus 3, perigyniis triquetro-fusiformibus ore integro apice scabris squamâ ovatâ obtusâ longioribus vel lanceolatam mucronatam subæquantibus.

C. juncea, Willd.; Kunth, Cyper. p. 468.

C. miser, Buckley in Silliman's Journ. 45. 173.

C. Rugeliana, Kunze in Herb. Hooker (ex parte).

Hab. In montibus Carolinæ Sept., *Buckley, Rugel.*

Subpedalis. Culmus filiformis, triqueter, apice scaber, basi foliatus, vaginisque purpureis tectus. Folia plana, $\frac{1}{2}$–1 lin. lata, culmo breviora, vaginæque pilis albidis sparsis vestita, apice triquetra, scabra. Bracteæ setaceæ, evaginatæ, spicis suis, culmo rariùs longiores. Spica mascula 8 lin. longa, $\frac{1}{2}$ lin. lata, pedunculata; squamæ lanceolatæ, acutæ, imbricatæ. Spicæ fœmineæ 2–3, rariùs 1, laxifloræ, 6–10 lin. longæ, lineam latæ, inferiores pedunculatæ, basi attenuatæ, intervallis 9 lin. ad 2 poll. remotæ; squamæ ferrugineo-purpureæ, nervo pallido, margine hyalinæ, ovatæ, obtusæ vel mucronulatæ, vel lanceolatæ, acutæ vel mucronatæ, glabræ vel dorso scabræ. Perigynium $1\frac{6}{9}$–$1\frac{7}{9}$ lin. longum, $\frac{4}{9}$ lin. latum, triquetro-fusiforme, utrinque attenuatum, ore obliquo vel truncato integro, apice præcipuè ad margines scabrum, binervium, rariùs basi striatum, pallidum, purpureo-tinctum. Achenium 1 lin. longum, $\frac{3}{9}$ lin. latum, triquetro-oblongum, stipitatum, stramineum, basi styli æquali apiculatum.

Affinis *C. brachystachys*, Schrank, quæ perigyniis, foliis vaginisque glabris, etc. differt.

4. C. COMOSA; spicis 4–6 cylindricis densifloris; masculâ 1 erectâ gracili bracteatâ; fœmineis 3–5 crassis demùm nutantibus vel pendulis longissimè bracteatis superioribus contiguis infimâ remotâ longiùs pedunculatâ interdum plus minus vaginatâ, stigmatibus 3, perigyniis stipitatis glabris nervosis demùm divergentibus retroflexisque squamâ lanceolatâ hirsutâ ciliatâ nervosâ longè hispido-aristatâ longioribus triquetro-lanceolatis longè rostratis altè bicuspidatis: laciniis elongatis patentissimis subrecurvis.

C. furcata, Elliott (non Lapeyr.).

C. pseudo-cyperus, Torr., Dewey (non Linn.).

Hab. In Georgiâ et Carolinâ, *Elliott*; Ohio, *Sullivant*; Philadelphiâ et Uticâ, *Torrey*; Boston, *Boott.*

Culmus $2\frac{1}{2}$ pedalis, validus, acutè triqueter, scaber. Folia 3–5 lin. lata, culmo longiora, nodosa, scabra. Bractea infima latior, longissima, interdum vaginata, sursum breviores, angustiores, evaginatæ. Spica mascula 1–3 poll. longa, 3 lin. lata; squamis lanceolatis, hirsutis, superioribus longiùs aristatis. Spicæ fœmineæ 3–5, crassæ, $1\frac{3}{4}$–$2\frac{3}{4}$ poll. longæ, 6–7 lin. latæ; infima interdum ultra modum remota, longissimè pedunculata; omnes e rostro, laciniisque perigynii elongatis (perigyniis hinc magis apertis vel minùs arcte imbricatis) quasi comosæ! Squamæ fœmineæ lanceolatæ, ad medium virides, nervosæ, ad latera ferrugineæ, hirsutæ, ciliatæ, longè ligulatim hispido-aristatæ. Perigynium triquetro-lanceolatum, sensim stipitatum, longèque rostratum, altè bicuspidatum, laciniis elongatis, patentissimis, subrecurvis, nervosum (nervis, nisi marginalibus, infra rostrum cylindricum evanescentibus), glabrum, divergens, demùm retroflexum; $2\frac{7}{9}$–$3\frac{4}{9}$ lin. longum (stipite $\frac{4}{9}$ lin., rostro $\frac{6}{9}$–$\frac{7}{9}$ lin., laciniisque $\frac{7}{9}$ ad lineam longis), $\frac{6}{9}$ lin. latum. Achenium $\frac{7}{9}$–$\frac{8}{9}$ lin. longum, $\frac{4}{9}$ lin. latum, elliptico-triquetrum, pallidè castaneum, basi styli æquali apiculatum.

Habitus *C. pseudo-cyperi*, Linn. quæ etiam Americæ Septentrionalis incola, ab amicissimo *Sartwellio* (*Penn-Yan, Nov. Ebor.*) et a cel. *Drummondio* (*Cumberland House*) inventa est. Satis, cel. *Elliottio* (Sketch of the Bot. of S. Car. &c. 2. p. 553), et nuper peritissimo *Nuttallio* in litt. monentibus, distincta! præcipuè e spicis fœmineis crassioribus, perigyniis longiùs rostratis, laciniisque oris semper glabris elongatis, patentissimis, subrecurvis, adspectum spicis quasi comosum (verbis Nuttallianis uti) præbentibus, perigyniisque squamâ longioribus.

Nomen *Elliottianum* ob antiquius *Lapeyrousianum* mutatum.

5. C. Geyeri; spicâ simplici androgynâ apice masculâ basi flosculis fœmineis 1 vel 2 alternis instructâ, stigmatibus 3, perigyniis triquetro-obovatis stipitatis rostratis ore integro glabris pallidis squamâ latâ basi amplectente brevi-cuspidatâ dorso trinervi pallidâ ad latera ferrugineâ brevioribus angustioribusque.

Hab. In declivitatibus aridis Montium Saxosorum, Americæ Septentrionalis, *C. A. Geyer*, 332. (*Herb. Hooker.*)

Densè cæspitosa. Radix repens, fibris lignosis ramosissimis. Culmus filiformis, scaber, triqueter, basi vaginis ferrugineis striatis foliisque vestientibus tectus, supernè nudus. Folia (*sempervirentia*, Geyer) $1\frac{1}{2}$–1 lin. lata, carinata, rigida, marginibus carinâque scaberrima, plana et involuta, culmo longiora. Spica 10–15 lin. longa, apice lineari mascula, 5–10 lin. longa, $\frac{1}{2}$ lin. lata, basi flosculis fœmineis 2–1, a masculis et inter se intervallis 3 lin. longis remotæ; rachis recta. Squamæ masculæ elongatæ, obtusæ, arctè imbricatæ, ferrugineæ; fœmineæ latæ, basi amplectentes, cuspidatæ, vel infima brevi hispido-aristata, arista 2 lin. longa. Perigynium vix 3 lin. longum, lineam latum, brevi-rostratum, ore integro vel emarginato, tenuissimum. Achenium cavitatem totam perigynii implens, $2\frac{1}{9}$ lin. longum, obovatum, basi styli incrassatâ apiculatum.

Affinis *C. phyllostachys*, Meyer, quæ flosculis fœmineis sæpè 3, squamis masculis brevioribus apice hyalinis, fœmineis foliaceis longissimis, rachi flexuosâ differt.

6. C. Mertensii; spicis 4–10 cylindricis androgynis basi masculis pedunculatis nutantibus approximatis inferioribus remotis, stigmatibus 3, perigyniis ovatis acutis rostellatis ore integro tenuissimis compressis binerviis squamâ oblongâ muticâ vel mucronulatâ longioribus latioribusque.

C. Mertensii, Prescott, Hook. Fl. Bor. Amer. t. 217.

Hab. Ad Americæ Borealis Oram Occidentali-Borealem, *A. Menzies*; ad flumen Columbia, *Dr. Scouler* (*C. Columbiana*, Dewey); in Ins. Sitcha, *Bongard in Mém. Acad. St. Pétersb.* vi. *sér.* 2. 168.

Culmus bipedalis et ultrà, acutè triqueter, angulis scabris. Folia 3 lin. lata, culmum subæquantia, lætè virentia, laxa, nervis margineque scabra; vaginis longis ferrugineis. Bracteæ evaginatæ; inferiores foliaceæ, culmum superantes, superiores setaceæ, brevissimæ. Spicæ 4–10, nutantes, $1\frac{1}{2}$ poll. longæ, 3 lin. latæ, omnes basi flosculis masculis paucis instructæ; superiores congestæ, brevi-pedunculatæ, inferiores subremotæ, longè pedunculatæ. Squamæ oblongæ, obtusæ vel acutiusculæ, muticæ vel mucronulatæ, ferrugineæ. Perigynium 2 lin. longum, $1\frac{1}{2}$ lin. latum, ovatum, brevissimè rostellatum, ore integro, compressum, hyalino-tenuissimum, viride, basi pallidè ferrugineum, maculis ferrugineis notatum, binervium. Achenium longè stipitatum, 7 lin. longum (cum stipite 1 lin. longum) $3\frac{1}{2}$ lin. latum, elliptico-triquetrum, pallidè stramineum, basi styli terminatum. Stigmata 3! (*Prescott* 2!)

7. C. Banksii; spicis 3–7 oblongis ovatisque crassis atro-purpureis exsertè pedunculatis nutantibus; supremâ basi masculâ; reliquis fœmineis infimâ remotâ, stigmatibus 3 longis, perigyniis hyalino-tenuissimis latè ovatis compressis leviter nervosis cylindrico-rostratis glabris ore obliquo bifido squamâ oblongo-spathulatâ emarginatâ aristatâ brevioribus latioribusque.

Hab. In Terra del Fuego, *Banks & Solander in Herb. Banks. sub nominibus* C. atratæ *et* C. magellanicæ; *Darwin*, no. 300, 301, *Herbb. Henslow & Hooker.*

Culmus sesquipedalis, acutè triqueter, glaber, basi foliatus. Folia 2–3 lin. lata, carinata, culmo breviora, apice triquetro-acuminata, nervo marginibusque scabra. Bracteæ foliaceæ, vaginatæ, infima culmum subæquans, superior obsoleta, fissa, squamæformis. Ligula elongata. Spicæ 7–14 lin. longæ, 4–5 lin. latæ, superiores approximatæ, infima 4 poll. remota. Squamæ atro-purpureæ, nervo pallidiori, perigynio angustiores et paulò longiores. Perigynium brevissimè stipitatum $1\frac{7}{9}$ lin. latum, $3\frac{4}{9}$ lin. longum, album, obsoletè nervosum, rostro angusto cylindrico fusco obliquè bifido. Achenium $\frac{8}{9}$ lin. longum, stipitatum (cum stipite $1\frac{8}{9}$ lin. longum), $\frac{1}{2}$ lin. latum, castaneum, acutè triquetrum, lateribus concavis.

Affinis *C. Mertensii*, Prescott.

8. C. decidua; spicis 4–7 erectis; supremâ masculâ vel androgynâ basi vel apice et basi masculâ; reliquis fœmineis superioribus sessilibus contiguis

oblongis inferioribus cylindricis pedunculatis bracteatis evaginatis rariùs geminatis vel compositis infimâ interdum subremotâ, stigmatibus 2, perigyniis oblongo-ovatis rostellatis ore integro utrinque nervosis stipitatis pallidis deciduis squamâ oblongâ obtusâ atro-purpureâ nervo pallido deciduâ longioribus latioribusque.

Hab. In Terra del Fuego, *Banks & Solander, Herb. Banks.*; in Ins. Falkland, *Dr. J. D. Hooker, Herb. Hooker.*

Radix stolonifera. Culmus 1–1½ pedalis, triqueter, glaber; pars spicas gerens 2–3 poll. longa. Folia 1–1½ lin. lata, culmo longiora, flaccida, marginibus scabra. Bracteæ foliaceæ, evaginatæ, inferiores culmum superantes, auriculis 2 subrotundis ferrugineis. Spica terminalis subpollicaris, sæpiùs androgyna, basi, vel apice et basi mascula, 3 lin. lata, nunc omninò mascula 1–1½ lin. lata. Spicæ fœmineæ 8–15 lin. longæ, 3–4 lin. latæ, inferiores interdum geminatæ, vel basi spiculâ minori composita; infima rariùs 1–2 poll. remota. Perigynium (cum stipite) $1\frac{4}{9}$–$1\frac{7}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, rariùs sub lente supernè ad margines denticulato-serratum. Achenium $\frac{8}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, orbiculatum, lenticulare, fuscum, impresso-punctulatum, basi styli æquali apiculatum.

Habitu *C. Goodenovii*, Gay, affinis. Differt spicâ supremâ sæpiùs androgynâ, fœmineis geminatis vel compositis, perigyniis denticulato-serratis, squamisque deciduis.

9. C. Darwinii; spicâ masculâ pedunculatâ solitariâ? fœmineis 6–10 cylindricis elongatis nutantibus remotis foliaceo-bracteatis evaginatis inæqualiter pedunculatis geminatis ternatisque inferioribus solitariis, stigmatibus 2, perigyniis ellipticis stipitatis nervosis brevi-rostratis ore integro papilloso-asperatis squamâ lanceolatâ acuminatâ ferrugineâ latioribus brevioribusque.

Hab. In Archipelago Chonas, Americæ Australis, *Darwin*, no. 304, *Herb. Henslow.*

Culmus tripedalis, acutè triqueter, glaber, sulcatus, basi foliatus; pars spicas gerens pedalis. Folia bipedalia et ultra, 3–4 lin. lata, crebrè nervosa, margine, carinâ apiceque triquetro serrato-scabra. Bracteæ foliaceæ, evaginatæ, inferiores culmum longè superantes. Pedunculi triquetri, scabri, longitudine inæquales, ½–3 poll. longæ, rariùs desunt. Spica mascula caret. Spicæ fœmineæ ½ ad 3 poll. longæ, 3 lin. latæ, cylindricæ, basi laxifloræ, remotæ, intervallis 2–4-pollicaribus; inferiores geminatæ, superiores ternatæ (spicâ unicâ interdum abbreviatâ sessili). Uno exemplo spica inferior solitaria; nonnullis apice masculis. Squamæ ferrugineæ, nervo pallido interdum extra apicem producto. Perigynium $1\frac{2}{3}$ lin. longum, $\frac{8}{9}$ lin. latum, ellipticum, acuminatum, brevi-rostratum, stipitatum, ore integro, utrinque 4–5 nervium, papilloso-punctatum, stramineo-pallidum. Achenium $\frac{7}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, orbiculato-obovatum, lenticulare, castaneum, basi styli æquali.

Affinis *C. acutæ*, Good.

10. C. DURA; spicâ decompositâ e spiculis 7–20 oblongo-ellipticis ferrugineo-purpureis androgynis apice masculis; superioribus simplicibus confertis sessilibus; inferioribus subremotis pedunculatis bracteatis evaginatis basi compositis, stigmatibus 2, perigyniis obovatis rostellatis bidentatis atro-purpureis lucidis enerviis estipitatis squamâ lanceolatâ acutâ apice ciliatâ vel hispido-mucronatâ nervo pallido brevioribus.

Hab. In monte Pillylum, Columbiæ, ad alt. 13,000 ped., *Dr. Jameson, in Herb. Hooker.*

Culmus 9–12 pollicaris, firmus, gracilis, triqueter, scaberrimus, serraturis deorsum spectantibus, basi foliatus; pars spicas gerens $2\frac{1}{2}$–3 poll. longas. Folia glauca, stricta, rigida, erecta, convoluta (marginibus asperrimis recurvis), $1\frac{1}{2}$ lin. lata, culmo breviora vel æquantia; vaginis purpureis in filis reticulatis rumpentibus. Bracteæ evaginatæ, infima subfoliacea, rarius culmum æquans, reliquæ setaceæ. Ligula elongata, ferruginea. Spica decomposita. Spicæ partiales 5–6; supremæ 2–5 congestæ, sessiles, inæquales, terminales majores; mediæ interdum simplices; inferiores subremotæ, pedunculatæ, basi spiculis 1–5 compositæ. Spiculæ ovales vel ellipticæ, 2–13 lin. longæ, 1–3 lin. latæ, omnes androgynæ apice masculæ. Pedunculi filiformes, scaberrimi, infimus 7–15 lin. longus. Squamæ lanceolatæ, nigro-purpureæ, marginibus pallidis, nervo apice scabro pallido, acutæ, apice ciliatæ, quandoque brevi-hispido-cuspidatæ. Stylus exsertus. Stigmata 2, brevia. Perigynium $1\frac{3}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, obovatum, rostellatum, bidentatum, lucidum, estipitatum, nervis 2 marginalibus. Achenium $\frac{7}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, lenticulare, ovale, basi productum, apice basi styli æquali abruptè terminatum, pallidum.

Aspectus *C. atratæ*, L.: a *C. Pichinchensi* et *C. Lemannianâ* differt staturâ minori, culmo graciliori, foliis glaucis convolutis rigidis, spicis paucioribus, perigyniis obovatis glabris atro-purpureis estipitatis.

11. C. LEMANNIANA; spicâ decompositâ e spiculis 20–40 cylindricis inæqualibus ferrugineo-purpureis androgynis apice extremo masculis; supremis 6–12 congestis sessilibus; reliquis in spicas 4–5 alternas pedunculatas erectas plùs minùs compositas foliaceo-bracteatas insidentibus, stigmatibus 2, perigyniis ovalibus brevi-cylindrico-rostratis subbifurcatis sti-

pitatis nervosis viridibus supernè ferrugineo-tinctis ad margines aculeatis squamâ lanceolatâ longè acuminatâ acutâ vel rariùs hispido-mucronatâ purpureo-ferrugineâ nervo pallido subduplò brevioribus.

Hab. In locis humidis montis ignivomi Cotopaxi, Columbiæ, Amer. Merid., *Hartweg*, no. 1446, *Herb. C. M. Lemann*; Columbia, *Dr. Jameson*, 220, *Herb. Lemann.*

Culmus bipedalis, validus, acutè triqueter, scaber, serraturis sursùm spectantibus; pars spicas gerens 5–7 poll. longas. Folia plana, 3–4½ lin. lata, culmo longiora, ad carinam marginesque scabra. Bracteæ inferiores foliaceæ, 3–4 lin. latæ, culmo longiores, sursùm decrescentes. Ligula amplectens, purpureo-ferruginea. Spica e spiculis 20–42 decomposita. Spicæ partiales plùs minùs compositæ, erectæ, inferiores 4–5 approximatæ pedunculatæ, bracteatæ, e spiculis 2–7 inæqualibus, sessilibus pedunculatisque, alternis compositæ, inferiores duæ longiùs pedunculatæ, infima rariùs simplex. Spiculæ ½–1½ poll. longæ, 1–4 lin. latæ, terminales majores, basi laxifloræ, omnes androgynæ apice extremo masculæ; supremæ 6–12 arctè congestæ, ebracteatæ. Pedunculi scabri; infimus nunc 2½ poll. longus. Antheræ $\frac{7}{9}$ lin. longæ, apiculatæ, ferrugineo-maculatæ. Stigmata 2, longa. Squamæ lanceolatæ, longè acuminatæ, acutæ, vel inferiores interdum hispido-mucronatæ, ferrugineo-purpureæ, nervo pallido, marginibus incurvis. Perigynium (*floriferum*) 1$\frac{5}{9}$ lin. longum, $\frac{5}{9}$–$\frac{6}{9}$ lin. latum, subbifurcatum, nervosum, dentibus marginibusque plùs minùs aculeato-serratis.

Affinis *C. Pichinchensi*, Kunth; tamen perigyniis subbifurcatis aculeatis satis distincta.

12. C. Pichinchensis; spicâ decompositâ e spiculis 20–35 ovatis vel oblongo-cylindraceis inæqualibus fuligineo-purpureis androgynis apice extremo masculis; supremis 8–12 congestis sessilibus simplicibus; reliquis in spicas primùm simplices deinde deorsùm magis compositas pedunculatas inferiores brevi-bracteatas subnutantes? insidentibus, stigmatibus 2, perigyniis (floriferis) glabris enerviis ovalibus cylindrico-rostratis bidentatis stipitatis basi pallidis squamâ lanceolatâ acuminatâ acutâ muticâ fuligineo-purpureâ concolori brevioribus.

C. Pichinchensis, *Kunth*, *Nov. Gen. Pl. Amer.* i. p. 233.

Hab. In regno Quitensi, in monte Rucu-Pichincha, *Humboldt*; in montibus Quito, *Dr. Jameson*, 143, *Herbb. Hooker & Lemann.*

Culmus 1–1½ pedalis, acutè triqueter, scaber; pars spicas gerens 3 poll. longas. Folia plana 1½–3 lin. lata, ad carinam marginesque scabra, culmo breviora, vel longiora? Bractea infima subfoliacea, 1–1½ lin. lata, spicâ suâ vix longior, reliquæ setaceæ, vel squamæformes. Ligula amplectens, ferrugineo-purpurea. Spica decomposita e spiculis 20–37, inæqualibus, supremis 6–12 simplicibus sessilibus. Spicæ partiales 3 inferiores pedunculatæ, remotiores, deorsùm (e spiculis 5–12) magis compositæ; terminales majores; omnes apice masculæ, infima nutans? Spiculæ 3–10 lin. longæ, 1–4 lin. latæ. Pedunculi scabri; inferiores vix pollicares. Squamæ lanceolatæ, acuminatæ, acutæ, muticæ, fuligineo-purpureæ concolores. Perigynium (floriferum) cum stipite ($\frac{2}{9}$ lin. longo) rostroque cylindrico (3 lin. longo) $1\frac{7}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, basi pallidum, supernè ferrugineum, enervium, bidentatum, glabrum. (*Descr. sec. specim. Jameson.*)

Affinis *C. Lemannianæ*; tamen perigyniis glabris bidentatis, enerviis, squamis muticis differt.

13. C. crinalis; spicis 3–5 oblongis congestis sessilibus erectis olivaceo-ferrugineis; terminali majori androgynâ basi masculâ; reliquis fœmineis bracteatis evaginatis, stigmatibus 3, perigyniis ellipticis triquetris conico-rostratis bifidis glabris striato-nervosis ferrugineis squamâ æquilatâ ovatâ obtusâ vel acutâ rariùs mucronulatâ longioribus.

Hab. Prope Antisana, *Hartweg*, no. 1461, *Herb. Bentham*; Pillylum, Columbiæ, Amer. Meridional., *Dr. Jameson, in Herb. Hooker.*

Rhizoma lignosum, fibris validis lignosis. Culmus abbreviatus, subbipollicaris, basi foliosus, inter folia vestientia omninò clausus; vel 5-pollicaris, triqueter, glaber vel hirsutus; pars spicas gerens 9 lin. ad pollicem longas. Folia 1–2 lin. lata, culmo longiora, rigida, erecta, plana, vel marginibus recurvis scabris, apice triquetrâ attenuatâ pilis albidis sparsis hirsuta, vel juniora tantùm subtùs ad carinam marginesque pilosa. Bracteæ evaginatæ, spicis suis longiores, inferiora culmo longiores. Spica terminalis 7–9 lin. longa, $1\frac{1}{2}$–3 lin. lata. Squamæ masculæ ad basin spicæ latiores, pallidè ferrugineæ, margine albido, obtusæ. Spicæ fœmineæ 2–4, congestæ, 5–8 lin. longæ, 1–2 lin. latæ. Squamæ margine albido angustiori. Perigynium $1\frac{5}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, triquetrum, basi productum, longè conico-rostratum, ore membranaceo bifido, punctis minimis ferrugineis sub lente notatum, striato-nervosum, nervis infra rostrum pallidius evanidis. Achenium vix lineam longum, $\frac{1}{2}$ lin. latum, triquetrum, utrinque acutum, punctulatum.

Specimen unicum Jamesonianum, spicas 3, culmum 5-pollicarem exhibet, folio infra spicas remotiusculo, culmum superante, hirsuto; forsan in aliis speciminibus spica altera infima subremota adest. Specimina Hartwegiana spicas 5, culmum subbipollicarem, omninò inter folia duplò longiora clausum.

Affinis *C. hirsutæ*, Willd., quæ culmo altiori, perigyniis obovatis obtusis squamâ hyalino-albidâ latioribus, satis differt.

14. C. Jamesoni; spicis sub-20 fusco-nigris cylindricis androgynis apice

masculis inæqualiter longè pedunculatis bracteatis evaginatis pendulis simplicibus compositisque extremis solitariis reliquis geminatis ternatisve, stigmatibus 3, perigyniis lanceolatis utrinque nervosis in rostrum breve attenuatis bidentatis glabris atro-purpureis squamâ lanceolatâ hispido-cuspidatâ fusco-nigrâ margine albo-membranaceâ brevioribus angustioribusque.

Hab. In montibus Columbiæ, Amer. Australis, ad altitudinem 13,000 ped., *Dr. Jameson, in Herb. Hooker.*

Culmus acutè triqueter, scaber. Folia desunt. Bracteæ evaginatæ, infima culmum superans, 4 lin. lata, scaberrima, superiores squamæformes. Spicæ $1\frac{1}{2}$–$2\frac{1}{2}$ poll. longæ, 4 lin. latæ, omnes apice masculæ (pars staminifera 2–5 lin. longa) simplices, vel basi spiculis parvis compositæ, extremæ solitariæ, suprema spiculis 4, infima spiculis 2 basi auctæ; reliquæ interdum compositæ, geminatæ, ternatæque, basi laxifloræ. Pedunculi hispidi, inæquales, superiores breves, reliqui 1–3 poll. longi. Squamæ masculæ pallidiores; fœmineæ nervo pallido. Perigynium $2\frac{1}{9}$ lin. longum, $\frac{4}{9}$ lin. latum, atro-purpureum, basi pallidum, lanceolatum, acuminatum, brevi-rostratum, bidentatum, utrinque leviter nervosum. Achenium $1\frac{2}{9}$ lin. longum, $\frac{3}{9}$ lin. latum, trigono-lineare, castaneum, basi styli æquali terminatum.

Proxima *C. Boryana*, Schk.

15. C. ACUTATA; spicis 5–6 erectis cylindraceis fuscis; masculis 1–2 sessilibus; reliquis 4 fœmineis sæpè apice subulato-acutatis masculis densifloris sessilibus vel pedunculatis longè foliaceo-bracteatis alternatim contiguis, stigmatibus 3, perigyniis elliptico-lanceolatis rostratis bifurcatis subinflatis nervosis glabris nitidis squamâ purpureo-ferrugineâ concolori vel apice hyalinâ ciliatâ hispido-aristatâ longioribus.

C. physocarpa, Nees, MSS. in Herb. Hooker (non Presl).

Hab. In Americæ Meridionalis Ins. Chiloe, *Cuming*, no. 43; in monte Pillylum, Columbiæ, ad alt. 12,000 ped., *Jameson, in Herb. Hooker.*

Culmus acutangulus, validus, scabriusculus; pars spicas gerens 3–6 poll. longas. Folia 4 lin. lata, culmo longiora. Bracteæ foliaceæ; infima 3 lin. lata, culmum longè superans, nunc brevissimè vaginata. Spicæ masculæ 1–2 sessiles, 1–$1\frac{1}{2}$ poll. longæ, $1\frac{1}{2}$ lin. latæ; squamæ ferrugineæ, concolores vel apice hyalino-albidæ, ciliatæ, brevi hispido-mucronatæ. Spicæ fœmineæ vel androgynæ, 4 (pars suprema plerumque tertia omnium sæpiùs subulato-acutata mascula vel sterilis), $1\frac{3}{4}$ poll. longæ, 4 lin. latæ, densifloræ; superiores sessiles approximatæ; inferiores plùs minùs longè pedunculatæ, intervallis

$1\frac{1}{2}$–2 poll. longis remotæ, tamen omnes ob longitudinem pedunculorum contiguæ. Squamæ purpureæ, concolores vel apice hyalino-albidæ, ciliatæ, nervo lato viridi in aristam latam hispidam producto. Pedunculi validi, erecti, infimus $\frac{1}{2}$–2 poll. longus, evaginatus vel e vaginâ 4 lin. longâ exsertus. Perigynium $1\frac{8}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, nitidum, crebrè nervosum, pallido-viride, basi purpureo-tinctum, pellucido-punctatum. Achenium (vix maturum) $\frac{8}{9}$ lin. longum, oblongo-triquetrum, pallidè stramineum, basi styli incrassatâ terminatum.

Affinis *C. paludosæ*, Good.

16. C. globosa; spicis 4–6; masculâ 1 cylindricâ; fœmineis 3–5 ovatis oblongisve erectis evaginatis laxè paucifloris superioribus 1–2 subsessilibus masculæ approximatis inferioribus remotis subradicalibus longè pedunculatis, stigmatibus 3, perigyniis globosis conico-rostratis ore membranaceo obliquo longè stipitatis hirsuto-scabris nervosis squamam lanceolatam mucronatam subæquantibus.

Hab. In Californiâ, *Nuttall.*

Radix stolonifera, fibris validis lignosis. Culmus 5–9-pollicaris, gracilis, erectus, triqueter, scaber, basi foliatus, vaginisque laceratis ferrugineis tectus. Folia $\frac{1}{2}$–$1\frac{1}{4}$ lin. lata, culmum subæquantia, vel eo longiora, vel breviora, carinata, firma, ad faciem, margines, apicemque triquetrum attenuatum scaberrima. Spica mascula 7–12 lin. longa, lineam lata, utrinque acuta, plus minus longè pedunculata. Spicæ fœmineæ 3–5, evaginatæ, 3–6 lin. longæ, 2 lin. latæ, laxè paucifloræ, 2–9-floræ; superiores 1 vel 2 ovatæ, suprema sessilis, ebracteata, masculæ approximata, vel intervallo 10 lin. longo remota, altera pedunculata setaceo-bracteata; inferiores 1–3, oblongæ, subradicales, foliaceo-bracteatæ, pedunculis 1–$4\frac{1}{2}$ pollices longis suffultæ, sibi approximatæ, infima rariùs basi composita. Bractea suprema squamæformis vel setacea; infimæ foliaceæ spicas duas subæquantes. Pedunculi scabri, inæquales, extremi breviores, erecti. Squamæ masculæ imbricatæ, purpureæ, ad margines apicemque albo-hyalinæ, nervo viridi infra apicem evanescente; fœmineæ laxæ, angustiores, mucronatæ, medio virides, nervosæ, lateribus angustè purpureæ. Perigynium 2–$2\frac{3}{9}$ lin. longum, vix lineam latum, globosum, longè stipitatum (stipite $\frac{7}{9}$ lin. longo) rostro conico $\frac{5}{9}$ lin. longo apiculatum, ore obliquo membranaceo, hirsuto-scabrum, punctulatum, supernè fusco-purpureum basi pallidum, nervis 2–3 majoribus, reliquis minùs prominentibus. Achenium $1\frac{2}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, globoso-triquetrum, argenteum, eximiè punctulatum, brevissimè stipitatum, basi styli æquali apiculatum.

Affinis *C. bispicata*, Hooker (*C. longerostrata*, Meyer, *C. camschatcense*, Kunth), quæ squamis masculis mucronatis, spicis fœmineis vaginatis, perigyniis enervibus, rostro elongato margine hispido profundè bifido, abundè diversa.

17. C. TRIQUETRA; spicis 3–4; masculâ 1 elliptico-cylindricâ; fœmineis 2–3 approximatis laxis apice masculis supremâ ovatâ sessili inferiore cylindricâ basi attenuatâ longè vaginatâ inclusè pedunculatâ, stigmatibus 3, perigyniis ellipticis acutè triquetris pubescentibus bidentatis sub-4-nerviis, squamâ ovatâ mucronatâ ferrugineâ margine scariosâ longioribus.

Hab. In Californiâ, *Nuttall.*

Radix fibris lignosis validis. Culmus 5 pollices ad pedem altus, triqueter, scabriusculus, basi foliatus, reliquiisque foliorum marcidis tectus; pars spicas gerens 2–3-pollicaris. Folia 1–$2\frac{1}{4}$ lin. lata, culmo longiora vel breviora. Bractea infima (vaginâ 5–12 lin. longâ) foliacea, suprema squamæformis. Spica mascula 8 lin. longa, lineam lata, subsessilis vel brevi-pedunculata. Spicæ fœmineæ 2–3, apice flosculis masculis 3–4 imbricatis apiculatæ, basi fœmineis 6–12 laxis instructæ, 5–9 poll. longæ, 2–3 lin. latæ. Squamæ omnes ovatæ, obtusæ vel acutatæ, mucronatæ, ferrugineæ, nervo viridi, glabro vel scabro; fœmineæ latiores, margine albo-hyalinæ. Perigynium 2–$2\frac{4}{9}$ lin. longum, $1\frac{1}{9}$ lin. latum, ellipticum, utrinque acutum, bidentatum, acutè triquetrum, pubescens, viride, faciebus subplanis; ad medium facierum duarum, et ad angulos duos nervo unico vel ad faciem unam nervis 2, hinc nervis 4–5, præditum. Achenium $1\frac{6}{9}$–2 lin. longum, $1\frac{1}{9}$ lin. latum, ellipticum, acutè triquetrum, fusco-castaneum, insigniter punctatum.

Proxima *C. gynobasis,* Vill. (*C. alpestris,* All.); quæ tamen spicis evaginatis, abbreviatis, paucifloris, infimis radicalibus; perigyniis pyriformibus, crebrè nervosis, glabrioribus; foliis angustioribus, satis distincta.

18. C. TWEEDIANA; spicis 8 cylindricis erectis; terminali masculâ simplici; reliquis 7 androgynis apice masculis compositis: superioribus approximatis sessilibus: inferioribus pedunculatis evaginatis infimâ remotâ longissimè exsertè pedunculatâ, stigmatibus 3, perigyniis ovatis acuminatis brevi-rostratis bifurcatis basi abruptè productis quasi stipitatis scabris nervosis stramineis purpureo-maculatis vel olivaceis squamam ovatam pallidam hispido-aristatam trinervem subæquantibus.

C. Tweediana, Nees, Hook. Journ. Bot. ii. 398.

Hab. Ad Buenos Ayres, *Tweedie, in Herb. Fielding.*

Culmus validus, triqueter, scaber. Folia desunt. Bracteæ 6 lin. latæ, culmo multùm longiores, carinatæ, scabræ; infima vaginata. Spica mascula 2 poll. longa, $2\frac{1}{2}$ lin. lata, sessilis; squamæ lanceolatæ, hispido-aristatæ, nervosæ, nervis scabris, margine membranaceæ. Spicæ androgynæ 16 lin. ad $2\frac{1}{2}$ poll. longæ, 5 lin. latæ; suprema simplex, basi flosculis fœmineis 2–3 instructa; reliquæ compositæ; binæ superiores magis masculæ spiculâ alterâ subæquali basi compositæ, quasi geminatæ; inferiores elongatæ, spiculis 2–4 minoribus, basi acutæ; infima remota, longissimè exserta, pedunculata. Spiculæ, ad basin spicarum, e perigynio sterili progredientes, squamasque binas, inferiores basi tumidas, more perigynii scabras, ferentes! Squamæ fœmineæ ovatæ, hispido-aristatæ, nervosæ, margine membranaceæ, perigynio longiores vel breviores. Pedunculus infimus 8 poll. longus, anceps, lævis. Perigynium $2\frac{6}{9}$ lin. longum, $1\frac{2}{9}$ lin. latum, ovatum, acuminato-brevi-rostratum, bifurcatum, basi productum, spongiosum, undique scabrum, nervosum, stramineum, purpureo-maculatum, vel denique olivaceum vel ferrugineum. Achenium $1\frac{3}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, trigono-ellipticum, olivaceum, punctatum.

Affines *C. hirta*, L., et *C. Houghtonii*, Tor.

19. C. PALEATA; spicis 7–10 cylindricis pallidis; masculis 2–4 sessilibus contiguis infimâ bracteatâ; fœmineis 3–7 remotis exsertè ligulato-pedunculatis longissimè bracteatis densifloris basi attenuatis inferioribus nutantibus, stigmatibus 2–3, perigyniis obovatis rostellatis bifidis nervatis nervisque 2 marginalibus pallidis supernè scabris cinctis olivaceis purpureo-maculatis squamâ ovatâ paleaceâ trinervi latè hispido-cuspidatâ brevioribus longioribusque.

Hab. In Ins. Juan Fernandez, *Scouler, in Herbb. Hooker & Fielding*; *Cuming*, no. 1341, *in Herb. Boott.*

Culmi pars superior, triquetra, lævis, inter spicas scabriuscula, solùm adest; pars spicas gerens 10 poll. usque ad 2 ped. longa. Folia desunt. Bracteæ omnes culmum superantes, infima 2 lin. lata. Spicæ masculæ 2–4 sessiles, contiguæ, 7–20 lin. longæ, $1–1\frac{1}{2}$ lin. latæ, castaneæ, extremæ longiores, infima longè filiformi-bracteata. Spicæ fœmineæ 5–7, intervallis $2\frac{1}{2}–3\frac{1}{2}$ poll. longis remotæ, $1\frac{1}{2}–2\frac{1}{2}$ poll. longæ, 2 lin. latæ, cylindricæ, densifloræ, basi attenuatæ, duæ superiores nunc apice masculæ, supremaque inclusè pedunculata. Squamæ omnes ovatæ, acutæ vel obtusæ, trinerves, latè hispido-cuspidatæ; masculæ castaneæ; fœmineæ membranaceo-pallidæ. Pedunculi ligulato-compressi; inferiores $2–2\frac{1}{2}$ poll. longi, glabri, exserti, squamis alternis sterilibus longè cuspidatis versus apicem instructi, supremus interdum abbreviatus, insertus. Vaginæ 3 lin. usque ad 2 poll. longæ, glabræ. Perigynium $1\frac{3}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, obovatum, rostellatum, bifidum, laciniis serratis, nervatum, nervisque 2 marginalibus pallidis prominentibus supernè scabris cinctum, pallidè olivaceum, purpureo-maculatum, plano-convexum vel triquetrum, coriaceum. Achenium $\frac{8}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, obovatum, plano-triquetrum, atro-olivaceum.

Affinis *C. lucidæ*, Boott.

20. C. socia; spicis 8–9 cylindricis solitariis geminatisque ferrugineis concoloribus; terminali masculâ breviori erectâ; fœmineis 7–8 apice masculis pendulis superioribus approximatis geminatis inferioribus remotis solitariis omnibus evaginatis bracteatis, stigmatibus 2, perigyniis orbiculatis abruptè brevi-cylindrico-rostratis ore integro enerviis squamâ lanceolatâ acuminato-cuspidatâ lævi brevioribus.

Hab. In Ins. Ceylon, *Chiliarch. Walker, in Herb. Hooker.*

Culmus sesquipedalis, triqueter, validus, lævissimus, inter spicas scaber. Folia 3 lin. lata, culmo longiora, supra marginibus scabra. Bracteæ inferiores 2 lin. latæ, culmo longiores, evaginatæ, sursùm decrescentes, demùm obsoletæ, basi culmum circumvolventes. Spica mascula 9–10 lin. longa, lineam lata. Spicæ fœmineæ 1–2 poll. longæ, 3 lin. latæ, apice masculæ, superiores geminatæ sessiles vel brevi-pedunculatæ approximatæ, inferiores remotæ pendulæ solitariæ. Squamæ omnes lanceolatæ, ferrugineæ, nervo pallido, acuminatæ, acumine cuspidato lævi. Perigynium $1\frac{1}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, orbiculatum, rostro cylindrico brevi, ore integro, enervium, ferrugineum, compressum. Achenium $\frac{5}{9}$ lin. longum, $\frac{1}{2}$ lin. latum, orbiculatum, basi styli æquali apiculatum.

Affinis *C. geminatæ*, Schk., quæ tamen spicis masculis 3, bracteis vaginatis, squamis hispido-mucronatis gaudet.

21. C. maculata; spicis 4–5 cylindricis, erectis; terminali masculâ sessili; reliquis fœmineis longè bracteatis superioribus masculæ contiguis sessilibus vel inclusis infimâ remotâ longè exsertè pedunculatâ, stigmatibus 3 et 2, perigyniis ovatis plano-triquetris rostellatis bidentatis demùm ore integro nervatis atro-purpureis granulatis squamâ ovatâ acutâ vel mucronulatâ ferrugineâ basi nervatâ latioribus longioribusque.

Hab. In Ins. Ceylon, *Chiliarch. Walker.*

Subpedalis vel altior. Culmus gracilis, firmus, lævis, obtusangulus, sæpè, ut et folia vaginæque (sub lente), maculis minimis purpureis crebris ornatus; pars spicas gerens 3–5 poll. longas. Folia glaucescentia, 1–2 lin. lata, culmo longiora, marginibus recurvis, firma, (sub lente) granulata, apice serrato-scabra. Ligula elongata, membranacea, ferruginea. Bracteæ firmæ, erectæ, inferiores vaginatæ, culmum longè superantes; suprema sæpè spicâ suâ brevior, vaginæ 1–14 lin. longæ. Spicæ 4–5, rariùs 3, strictæ, erectæ. Spica mascula sessilis, 4–14 lin. longa, lineam lata, ferruginea. Spicæ fœmineæ 6–22 lin. longæ, 1–2 lin. latæ, fusco-purpureæ, 3–4 rariùs 2, suprema sessilis, cum masculâ quasi geminata, vel superiores 2–3 masculæ contiguæ, sessiles vel inclusè brevi-pedunculatæ, nunc abbreviatæ, rariùs apice masculæ vel steriles, infima $1\frac{1}{2}$–3 poll. remota, longior, exsertè pedunculata. Squamæ omnes viridè ferrugineæ, acutæ, fœmineæ sæpè minimè mucronulatæ, basi ad medium nervis 3–4 distinctis sursùm coalescentibus. Pedunculus infimus 10 lin. ad 2 poll. longus, granulato-exasperatus. Perigynium $1\frac{2}{9}$ lin. long. $\frac{6}{9}$ lin. latum, ovatum, plano-triquetrum, rostellatum, bidentatum, demùm ore integro, utrinque 3–5-nervatum, fusco-purpureum, concolor, granulato-exasperatum. Achenium $\frac{6}{9}$ lin. long. $\frac{1}{2}$ lin. latum, triquetrum, ellipticum, impresso-punctulatum, pallidum.

Habitus *C. granularis*, Muhl., abundè formâ perigynii quæ, primo aspectu, *C. Goodenovii*, Gay, similis, diversa.

22. C. Walkeri; spicâ compositâ e spiculis pluribus androgynis apice masculis fasciculatis cylindricis laxifloris inæqualibus exsertè setaceo-pedunculatis, stigmatibus 3, perigyniis angustis triquetro-lanceolatis longe-rostratis bicuspidatis stipitatis nervosis marginibus supernè serrato-scabris squamâ lanceolatâ aristatâ longioribus.

C. Walkeri, Arnott in Herb.

Hab. In Ins. Ceylon (*Herb. Arnott*).

Culmus lævis, supernè setaceo-attenuatus, scaber; pars spicularum fasciculos gerens sesquipedalis. (Folia desunt.) Bracteæ vaginatæ; inferiores foliaceæ, scaberrimæ, culmo breviores, sursùm demùm setaceæ; vagina inferior biuncialis; superiores 3–5 lin. longæ, purpureæ. Spiculæ 1–$1\frac{1}{2}$ poll. longæ, 1–2 lin. latæ, in fasciculos axillares laxè congestæ, androgynæ, plùs minùs apice masculæ; superiores basi solùm flosculis fœmineis 1–2, apice masculis pluribus instructæ, vel aliæ apice extremo masculæ basi flosculis fœmineis sub 12 gaudentes. Flosculi fœminei laxi, aperti, masculi arctè imbricati. Pedunculi inæquales; inferiores longiores, setacei, scaberrimi. Squamæ omnes lanceolatæ, hispido-aristatæ, purpureæ, margine pallidæ. Perigynium $3\frac{6}{9}$ lin. longum, $\frac{1}{2}$ lin. latum, triquetro-fusiforme, longè rostratum, nervosum, glabrum, margine scabrum, brevi-stipitatum, basi pallidum, supernè purpureum. Achenium triquetro-lineare, longè stipitatum, sine stipite $1\frac{6}{9}$ lin. longum (stipes 2 lin. longa), $\frac{3}{9}$ lin. latum, pallidè ferrugineum, basi styli æquali apiculatum.

C. valida, Nees, fructibus ovatis, glabris, culmo crasso gaudet, aliter proxima.

23. C. Arnottiana; spicis 5 cylindricis erectis contiguis; terminali masculâ; reliquis 4 fœmineis inferioribus vaginatis insertè pedunculatis superioribus sessilibus ebracteatis, stigmatibus 3, perigyniis subinflatis ellipticis

acuminatis cylindrico-rostratis bidentatis nervosis glabris olivaceo-viridibus squamâ lanceolatâ aristatâ longioribus.

C. Neesiana, Arnott, MSS. (non Endlicher) Herb. Arnott.

Hab. In Ins. Ceylon, *Dr. Wight,* "1836, no. 1295."

Rhizoma lignosum. Culmus foliosus, tripedalis, lævis, basi foliis longis vaginantibus tectus; pars spicas gerens 4-uncialis. Folia 5–6 lin. lata, culmo longiora, suprà marginibus scabra. Bracteæ 2 inferiores vaginatæ, foliaceæ, culmo longiores; vagina inferior uncialis; superior 3 lin. longa. Spicæ omnes congestæ, erectæ; mascula 15 lin. longa, 2 lin. lata; fœmineæ 2 poll. longæ, 4 lin. latæ, confertifloræ, concolores, olivaceo-virides. Squamæ omnes lanceolatæ, acuminatæ, hispido-aristatæ; masculæ ferrugineæ, nervo marginibusque pallidæ; fœmineæ purpureæ, nervo pallido; inferiores longiùs aristatæ, perigynium æquantes vel eo longiores. Perigynium $2\frac{2}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, subinflatum, oblongo-ovale, acuminatum, cylindrico-rostratum, emarginato-bidentatum, patens, æqualiter nervosum, olivaceum, ad apicem rostri purpureo-tinctum. Achenium $\frac{8}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, oblongo-trigonum, pallidum, basi styli æquali apiculatum. Stylus insertus. Stig. 3, brevia.

Affinitas cum *C. paludosâ,* Good.

24. C. ALTA; spicâ compositâ elongatâ e spiculis basi masculis pluribus oblongis simplicibus superioribus contiguis alternatis inferioribus remotiusculis bracteatis, stigmatibus 2, perigyniis parvis ellipticis marginatis ciliato-serratis utrinque nervosis breviter rostratis bidentatis squamam pallidam ovato-acuminatam subæquantibus.

Hab. In Java, *Dr. Horsfield.*

Radix cæspitosa, fibris validis, lignosis. Culmus 3–4-pedalis, lævis, vel apice inter spiculas scabriusculus, supernè nudus, basi rudimentis foliorum laceratis tectus; pars spicam gerens 4–5 uncialis. Folia $1–1\frac{1}{2}$ lin. lata, plana, margine scabra, culmum subæquantia. Bracteæ inferiores foliaceæ, infima culmum longè superans; quæque spiculas 2–4 inferiores suffulciunt plùs minùs elongatæ; reliquæ setaceæ, sursùm evanescentes. Spica 4–5 uncialis, 4 lin. lata, e spiculis 16–20 composita. Spiculæ 5–7 lin. longæ, 2 lin. latæ, simplices, supremæ contiguæ, inferiores remotiusculæ. Squamæ ovato-acuminatæ vel mucronulatæ, pallidæ, perigynium æquantes vel eo breviores. Perigynium $1\frac{3}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, elliptico-lanceolatum, ciliato-serratum, marginatum, nervosum, breviter rostratum, bidentatum. Achenium $\frac{7}{9}$ lin. longum, $\frac{4}{9}$ lin. latum, ellipticum, utrinque acutum, pallidè stramineum, pellucidè punctatum.

Affinis *C. remotæ,* L.

25. C. pruinosa; spicâ masculâ 1 subclavatâ; fœmineis 4 cylindricis pedunculatis evaginatis erectis contiguis superioribus apice masculis inferioribus longissimè bracteatis, stigmatibus 2, perigyniis ovatis rostellatis emarginatis obsoletè nervosis albo-tuberculatis squamâ lanceolatâ mucronatâ longioribus latioribusque.

Hab. In Java, *Dr. Horsfield.*

Culmus tripedalis, glaber; pars spicas gerens biuncialis, scabra. Folia glauca, $1\frac{1}{2}$–2 lin. lata, culmo breviora, supernè serrato-scabra; ligula obtusa brunnea. Bracteæ binæ inferiores foliaceæ, 8–10 poll. longæ; reliquæ setaceæ spicis suis breviores, evaginatæ. Spica mascula 1 poll. longa, $1\frac{1}{2}$ lin. lata, basi attenuata, subsessilis, squamis ferrugineis. Spicæ fœmineæ 4, superiores plùs minùs apice masculæ, contiguæ, 8–14 lin. longæ, 2–3 lin. latæ; superior sessilis; inferiores brevi-hispido-pedunculatæ, erectæ, squamis ferrugineis, inferioribus brevi-hispido-mucronatis. Perigynium $1\frac{6}{9}$ lin. longum, $1\frac{1}{9}$ lin. latum, ovatum, rostellatum, emarginatum, obsoletè 3–4 nervosum, tuberculis albis minimis conspersum, quasi pruinosum. Achenium orbiculatum, compressum, basi styli æquali terminatum.

C. glaucescenti, Elliott (quæ tamen stigmatibus 3 gaudet), habitu et aspectu similis.

26. C. Horsfieldii; glaucescens concolor, spicis 4–5 decompositis erectis strictis alternis; inferioribus longè exsertè pedunculatis remotis; terminali majori evaginata; spiculis apice masculis oblongis alternis patentibus, stigmatibus 3, perigyniis triquetro-ellipticis acuminato-rostratis bidentatis obliquè fissis arcuatim recurvis nervosis supernè parcim serrato-denticulatis squamâ ovatâ albo-membranaceâ hispido-aristatâ nervo viridi scabriusculo longioribus.

Hab. In Java, *Dr. Horsfield.*

Radix fibris validis lignosis. Culmus bipedalis, obtusangulus, glaber. Folia pallidè viridia vel glauca, 6–7 lin. lata, culmo longiora, ad margines nervosque scabra. Bracteæ longissimæ, inferiores vaginatæ 3–4 lin. latæ, suprema evaginata 1 lin. lata spicâ suâ longior; vaginæ 1–2 poll. longæ, truncatæ. Spicæ (ambitu oblongo-ovato) 2–3 poll. longæ, $1\frac{1}{2}$ poll. latæ. Pedunculi inferiores 7–5 poll. longi, stricti, scabri. Rachis supra scaberrima. Spiculæ 3–5 lin. longæ, 2–3 lin. latæ, apice extremo flosculis 3–4 masculis, basi flosculis sub 10 fœmineis instructæ, bracteolâ setiformi suffultæ. Squamæ masculæ lanceolatæ; fœmineæ ovatæ, hispido-aristatæ, inferiores longiores, basi trinerves, nervo scabro; omnes albo-membranaceæ. Perigynium 2 lin. longum, $\frac{6}{9}$ lin. latum, crebrè nervosum, supernè marginibus serraturis paucis asperatum, basi subfuscum, rostro arcuato viridi bidentato, ore obliquè fisso. Achenium $1\frac{2}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, oblongo-triquetrum, fuscum. Stylus insertus, basi incrassatus, deciduus.

Obs.—Ad basin spicularum lateralium adest squama sterilis tumida nervosa, etc. ut in *C. polystachyâ*, Willd., et *C. Hartwegii*, Boott.

Affinis *C. polystachya*, Willd.

27. C. Rafflesiana; spicâ ferrugineâ concolori subsesquipedali paniculatâ e spiculis permultis congestis sessilibus oblongis androgynis apice masculis supradecompositâ, paniculis terminalibus axillaribusque multifloris; superioribus sessilibus approximatis simplicibus solitariis; inferioribus remotis longè pedunculatis decompositis geminatis vaginato-bracteatis, stigmatibus 3, perigyniis trigono-ellipticis acuminatis longè rostratis obliquè recurvis bidentatis nervosis supernè plùs minùs scabriusculis ad margines serrato-scaberrimis lineolis purpureis notatis squamâ ovatâ uninervi ferrugineâ mucronatâ longioribus.

Hab. In Java, *Dr. Horsfield.*

Culmus lævissimus, versus apicem scabriusculus. Bractea $3\frac{1}{2}$ lin. lata, vaginata, culmo brevior; superiores setaceæ. Spiculæ 3–4 lin. longæ, basi 2 lin. latæ, densæ, apice flosculis masculis 4–6, basi fœmineis 6–10 instructæ. Squamæ fœmineæ ovatæ, ferrugineæ, mucronatæ; masculæ lanceolatæ. Pedunculi scabri. Rachis scaberrima. Perigynium $1\frac{5}{9}$–$1\frac{7}{9}$ lin. longum, $\frac{1}{2}$ lin. latum, trigono-ellipticum, longè rostratum, supernè ad nervos plùs minùs scabriusculum, marginibus serrato-scaberrimum, rostro obliquè recurvo. Achenium $\frac{7}{9}$ lin. longum, $\frac{4}{9}$ lin. latum, trigono-ellipticum, pallidum, basi styli æquali terminatum.

Affinis *C. raphidocarpæ*, Nees, quæ perigynio glabro subciliato, squamâ subulato-acuminatâ, foliis subtùs vaginisque hirtis, differt. A *C. ramosâ*, Schk., *C. filicinâ*, Nees, *C. meiogynâ*, Nees, inflorescentiâ densiori, aliisque notis differt.

28. C. Jackiana; spicâ masculâ 1 oblongo-cylindricâ; fœmineis 4–5 superioribus oblongis contiguis sessilibus inferioribus vaginatis longè exsertè pedunculatis infimâ remotissimâ elongatâ laxiflorâ interdùm compositâ, stigmatibus 3, perigyniis triquetro-lanceolatis acuminatis striato-nervosis emarginatis squamâ ovato-acuminatâ aristatâ longioribus.

Hab. In Ins. Java, *Dr. Horsfield.*

Culmus bipedalis, acutangulus, glaber, debilis; pars spicas superiores gerens, $1\frac{1}{2}$–6 poll.

longa; spica infima 5 ad 12 poll. remota. Folia laxa, 4 lin. lata, culmo breviora, apice scabra. Bracteæ inferiores longè foliaceæ, vaginatæ, superiores evaginatæ, culmum superantes. Spica mascula 7–12 lin. longa, 1 lin. lata, squamis pallidis, inferioribus aristatis, superioribus obtusis, carinâ scabris. Spicæ fœmineæ 4–5, sublaxifloræ; superiores 6–11 lin. longæ, 2–3 lin. latæ, contiguæ, sessiles, inferiores vaginatæ, exsertæ, infima elongata, laxiflora, longè exsertè pedunculata, remotissima, uno exemplo basi spiculâ minori composita, squamis oblongo-ovatis, inferioribus hispido-aristatis, superioribus acuminatis vix mucronatis perigynio latioribus. Perigynium 3 lin. longum, $\frac{8}{9}$ lin. latum, triquetrum, elliptico-lanceolatum, longè acuminatum, emarginatum, crebro-nervosum, stramineum. Achenium 1 lin. longum, $\frac{8}{9}$ lin. latum, obtusum, triquetrum, pallidè aurantiacum, partem inferiorem perigynii implens; stylus permanens.

Habitu aspectuque *C. pubescenti*, Muhl., affinis.

29. C. ESENBECKII; spicâ cylindricâ dioicâ? vel androgynâ apice masculâ multiflorâ basi laxiflorâ fœmineis paucioribus alternis instructâ, stigmatibus 2, perigyniis (*floriferis*) linearibus ore membranaceo truncato obliquè fisso ciliato-serratis squamâ lanceolatâ hispido-mucronatâ angustioribus longioribusque.

C. Esenbeckii, Kunth, Cyp. p. 522.

C. trinervis, Nees in Wight, Contr. Ind. Bot. 120. (non Degland.)

Hab. In Ind. Orient., *Royle*; in Monte Choor, ad altitudinem 12,000 ped., *Edgeworth.*

Culmus compressus, lævissimus, 8–9 pollicaris. Folia angusta, conduplicata, margine scabra, culmo breviora. Spica 2 poll. longa, 2 lin. lata, basi flosculis fœmineis 2–9 alternis, apice masculis pluribus imbricatis, instructa. Squamæ magnæ, lanceolatæ, nervo viridi, ad latera pallidè ferrugineæ, marginibus membranaceis; superiores muticæ, obtusæ, inferiores hispido-mucronatæ, infima nunc foliaceo-bracteata. Antheræ 3, elongatæ, 2 lin. longæ, ferrugineo-purpureæ. Stigmata 2; stylus insertus. Perigynium (*floriferum*) lineare, ad apicem scabrum, ad margines supernè ciliato-serratum, viride, ore albo membranaceo truncato obliquè fisso.

Spec. Royleanum vix 3 poll. altum, spicâ ex toto masculâ, squamis obtusis, infimis vacuis; omnia ab amiciss. Edgeworth lecta androgyna, culmo altiori.

30. C. COACTA; spicâ castaneâ basi setaceo-bracteatâ e spiculis pluribus androgynis apice masculis parvis ovatis sessilibus ebracteatis in capitulum longiusculum arctè congestis compositâ, stigmatibus 2, perigyniis ovatis

acuminato-brevi-rostratis bifidis stipitatis utrinque sub 9-nerviis supernè ad margines inalatas serrato-scabris stramineis squamâ ovatâ hispido-mucronatâ brevioribus.

Hab. In Affghanistan, *Griffith*, no. 79, *Herb. Hooker.*

Culmus obtusangulus, supernè gracilis, nudus, scabriusculus, subsesquipedalis. Folia $1\frac{1}{2}$ lin. lata, culmum æquantia, apice longè attenuata, scabriuscula, flavescentia; vagina pallida, apice truncata. Bractea ad basin spicæ, filiformis, spicâ brevior. Spica $1\frac{1}{2}$ poll. longa, 6 lin. lata, castanea, circumscriptione cylindracea. Squamæ ovatæ, acutæ, vel fœmineæ hispido-mucronatæ, nervo pallido, margine scariosæ, ad latera castaneæ. Perigynium $1\frac{8}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, plano-convexum, utrinque sub 9-nervium. Achenium $\frac{8}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, orbiculatum, basi productum, abruptè basi styli apiculatum, lenticulare, stramineum.

Affinis *C. vulpinæ*, L. Differt culmo obtusangulo, supernè gracili, nec in axim angustiorem abruptè coarctato. A *C. vulpinari*, Nees, spicâ longâ cylindraceâ basi minùs compositâ (nec ovatâ), perigyniis scabris, distincta; a *C. glomeratâ*, Thunberg, culmo graciliori obtusangulo, perigyniis sub 9-nerviis, spicâ congestâ (nec basi sublobatâ), bracteâ solùm ad basin spicæ setaceâ, foliis angustioribus (nec glaucescentibus), differt.

31. C. ORBICULARIS; spicis 4 parvis congestis sessilibus ebracteatis; terminali masculâ oblongâ fusco-ferrugineâ; reliquis fœmineis apice masculis ovatis atro-purpureis, stigmatibus 2, perigyniis compressis orbiculatis abruptè rostellatis ore integris enerviis atro-purpureis basi pallidis squamâ lanceolatâ obtusâ nigro-purpureâ concolori vix longioribus triplòque latioribus.

Hab. In Indiâ Orientali, *Royle.*

Rhizoma repens, fibris longis validis lanuginosis, rudimentis foliorum striatis foliisque marcidis laceratis tectus. Culmus 5-pollicaris, gracilis, triqueter, striatus, scaber, nudus, basi foliatus; pars spicas gerens 7 lin. longa. Folia lineam lata, culmum subæquantia, carinata, striata, margine carinâ apiceque triquetro attenuato scabra. Spicæ arctè congestæ, ambitu ovato-capitatæ, ebracteatæ; mascula 5 lin. longa, $1\frac{1}{2}$ lin. lata; squamæ lanceolatæ, obtusæ, fusco-ferrugineæ, concolores vel margine hyalino-albidæ; spicæ fœmineæ 3, suprema rotundata, reliquæ 4 lin. longæ, 2 lin. latæ, apice masculæ. Squamæ lanceolatæ, obtusæ, perigynium subæquantes. Perigynium $1\frac{1}{9}$ lin. longum, lineam latum, pars tertia suprema atro-purpurea, punctatum, quasi granulatum, infra (et ad rostrum) pallidum, ferrugineo-tinctum. Achenium immaturum. Stig. 2, longa, lanuginosa.

Affinis *C. saxatili*, L. (*C. pullæ*, Good.)

32. C. Prescottiana; spicis 6 elongatis cylindricis approximatis stramineis concoloribus; terminali 1–2 masculâ; reliquis fœmineis sessilibus nutantibus evaginatis inferioribus longè foliaceo-bracteatis basi laxifloris, stigmatibus 2, perigyniis latè ellipticis brevi-rostratis bidentatis compressis nervosis divergentibus stramineis squamâ hispido-mucronatâ dorso trinervi pallidâ ad latera ferrugineâ latioribus longioribusque.

Hab. In Napaliâ? *Herb. Wallich,* no. 3386.

Culmus sesquipedalis, validus, acutè triqueter, basi lævis, foliatus, foliisque vestientibus tectus, supernè scabriusculus; pars spicas gerens 6-pollicaris. Folia 4 lin. lata, culmum æquantia, rigida, carinata, nervis 2 prominentibus notata, carinâ marginibusque scabra; vaginæ membranaceæ, punctis minimis ferrugineis maculatæ. Bracteæ inferiores culmo longiores, evaginatæ. Spicæ masculæ 2–2½ poll. longæ, lineam latæ, sessiles. Spicæ fœmineæ 2½–4 pollices longæ, 2½ lin. latæ, superiores approximatæ, inferiores inter se intervallis 8 lin. ad 1½ poll. remotæ. Squamæ omnes hispido-mucronatæ, dorso pallidæ, trinerves, ad latera ferrugineæ. Perigynium 1$\frac{5}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, glabrum, 2–4-nervium. Achenium $\frac{7}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, obovatum, compressum, castaneum, punctulatum, basi styli æquali apiculatum, vix cavitatem dimidiam perigynii implens.

Affinis *C. crinitæ,* Lam.

33. C. leucantha; spicâ decompositâ e spiculis parvis androgynis apice masculis terminalibus et infra ad apicem pedunculorum congesto-sessilibus axillaribus; spicis partialibus 4–6 alternis plùs minùs compositis inferioribus remotis elongatis exsertè pedunculatis superioribus approximatis abbreviatis sessilibus, stigmatibus 3, perigyniis trigono-ellipticis acuminatis rostratis altè obliquè fissis striato-nervosis scabris squamâ ovatâ hispido-mucronatâ pallidâ nervosâ duplò longioribus.

C. leucantha, Arnott in Herb.

Hab. Courtallum, Penins. Ind. Orient., *Wight, Herb. Wight,* "2379 *a,* July 1838, no. 993" (*juvenilis*); "2379 *b, var. composita,* August 1835, no. 992, 998" (*senilis*).

Radix fibris lignosis. Culmus 2–3 pedalis, gracilis, basi foliis vestientibus tectus; pars spicam gerens 6–20 poll. longa. Folia 1–2 lin. lata, culmo breviora vel longiora, supernè scabra, firma. Bracteæ vaginantes, inferiores longè foliaceæ, sursùm decrescentes, setaceæ, evaginatæ; vaginæ 2 lin. ad 1½ poll. longæ. Spica in var. *a.* e spiculis 4–5 composita; inferioribus compositis, remotis, insertè pedunculatis; superioribus approximatis, sessilibus, setaceo-bracteatis: in var. *b.* magis composita; spicæ partiales elongatæ; inferiores remotissimæ, compositæ, exsertè pedunculatæ; superiores simpliciores, abbreviatæ, approximatæ, demùm sessiles. Spiculæ 3–5 lin. longæ, 2 lin. latæ, pallidæ, stramineæ. Pedunculi scabri, sulcati. Squamæ masculæ lanceolatæ, mucronatæ, imbricatæ; fœmineæ ovatæ, latiores, longiùs hispido-mucronatæ, striato-nervosæ. Perigynium 3 lin. longum, lineam latum, trigonum, ellipticum, acuminatum, longè cylindrico-rostratum, striato-nervosum, scabrum, altè obliquè fissum, stramineum. Achenium $1\frac{5}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, trigono-ellipticum, brevi-stipitatum, punctulatum, fuscum; basi styli incrassatâ deciduâ.

34. C. CINNAMOMEA; spicis 5 cylindricis nutantibus basi attenuatis ferrugineis concoloribus; terminali androgynâ basi masculâ; reliquis fœmineis superioribus contiguis sessilibus inferioribus pedunculatis infimâ remotâ longè exsertè vaginato-bracteatâ basi compositâ, stigmatibus 3, perigyniis ovalibus bidentatis enerviis compressis ferrugineis basi albidis supernè marginibus pallidis scabriusculis squamâ oblongâ acutâ vel cuspidatâ ferrugineâ longioribus latioribusque.

Hab. In Indiâ Orientali, *Royle.*

Culmus pedalis, triqueter, acutangulus, undique tuberculato-scabriusculus, basi foliosus, foliisque marcidis reliquiisque foliorum laceratis tectus. Folia $1–2\frac{1}{2}$ lin. lata, culmo breviora, apice acuminato scabra, tuberculato-scabriuscula. Bractea infima brevis, setacea, longè vaginata, reliquæ demùm squamæformes; vagina pollicaris. Pedunculus 3 poll. longus, scaber. Spicæ 5, cylindricæ, basi attenuatæ, nutantes, contiguæ, 10–15 lin. longæ, 3 lin. latæ; suprema basi mascula; proxima flosculis masculis paucis ad basin et ad mediam cum fœmineis admixtis; reliquæ fœmineæ, binæ inferiores pedunculatæ, infima remota, vaginata, longè exsertè pedunculata, basi spiculâ alterâ minori aucta. Squamæ oblongæ, cuspidatæ, ferrugineæ, nervo pallido. Perigynium $1\frac{5}{9}$ lin. longum, lineam latum, tenuissimum, tuberculato-scabriusculum, enervium, vix vel brevissimè rostratum, bidentatum, cinnamomeum, basi albidum, compressum, supernè ad margines parcè ciliato-scabrum. Achenium longè stipitatum, $\frac{6}{9}$ lin. longum (cum stipite lineam longum), 3–4 lin. latum, trigonum, stramineum, basi styli æquali apiculatum.

C. coriophoræ, Fischer, affinis!

35. C. NIVALIS; spicis 4 atro-purpureis cuneatis vel ellipticis contiguis; superioribus androgynis basi masculis; infimâ fœmineâ exsertè pedunculatâ subremotâ brevi-setaceo-bracteatâ, stigmatibus 3, perigyniis ellipticis

ero stratis bidentatis supernè ad margines scabriusculis enerviis compressis atro-purpureis basi albidis tenuissimis squamâ atro-purpureâ lanceolatâ mucronatâ longioribus latioribusque.

Hab. In Indiâ Orientali, supra Dhunrao, versus fauces Montium Mana dictas, ad altitudinem 16,000 ped.! *M. P. Edgeworth.*

Culmus subpedalis, triqueter angulis acutissimis, lævissimus, tuberculatus, erectus, apice nutans; pars spicas gerens 2 poll. longa. Folia 3 lin. lata, culmo breviora. Bracteæ inferiores setaceo-cuspidatæ; infima vaginata. Ligula purpurea. Spicæ 4, atro-purpureæ, 7–10 lin. longæ, 3–4 lin. latæ; terminalis brevi-pedunculata, basi conspicuè mascula; spicæ 2 proximæ flosculis masculis paucis basi instructæ, superior duarum abbreviata sessilis, altera pedunculata; infima ex toto fœminea, exsertè pedunculata, remotiuscula. Pedunculus infimus pollicaris, tuberculato-asperatus. Squamæ lanceolatæ, mucronatæ, purpureæ, nervo viridi, perigynio duplò breviores. Stigmata 3, brevia. Perigynium $2\frac{6}{9}$ lin. longum, $1\frac{6}{9}$ lin. latum, atro-purpureum, basi et ad medium interdùm albidum, brevi-stipitatum, supernè ad margines pallidas ciliato-scabriusculum, erostratum, bidentatum, compressum, tenuissimum. Achenium $\frac{7}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, trigonum, pallidum, longè stipitatum (stipite 4 lin. longo), basi styli æquali terminatum.

Facies *C. atratæ*, L., *C. coriophoræ*, Fischer, affinior, quæ spicâ terminali interdùm basi masculâ (*C. caucasica*, Stev.?) gaudet. (fide *Herb. Fielding.*) Ab eâ, *C. nivalis*, perigynio erostrato, squamis mucronatis brevioribus, spicis atro-purpureis, culmo acutangulo satis differt.

36. C. sanguinea; spicâ decompositâ duplicato-racemosâ, racemis terminalibus axillaribusque remotis solitariis geminatisque longè exsertè pedunculatis vaginatis; spiculis 3–8 ovatis sessilibus atro-purpureis androgynis apice masculis ad apicem pedunculorum spicatim vel duplicato-spicatim dispositis, stigmatibus 3, perigyniis trigono-ovatis rostratis bifidis nervosis stipitatis scabris subrecurvis squamâ latâ ovatâ acutâ vel mucronulatâ purpureâ longioribus.

Hab. In Affghanistan, *Griffith*, no. 96, *Herb. Hooker.* β. magis composita (junior, 91).

Culmus subsesquipedalis, obtusangulus, lævis, supernè gracillimus, basi foliatus. Folia 2 lin. lata, rigida, carinata, apice attenuata scabra. Bracteæ inferiores vaginatæ, culmo breviores, sursùm decrescentes, demùm setaceæ. Vagina infima pollicaris. Spiculæ 3–4 lin. longæ, basi 2 lin. latæ, ibi flosculis fœmineis 4–6 laxis, apice masculis pluribus imbricatis, instructæ, sessiles. Pedunculi inæquales, scabri, superiores simplices breves, inferiores ramosi; medii geminati; infimus subradicalis, 5 poll. longus. Perigynium $1\frac{7}{9}$ lin. longum, $\frac{1}{2}$ lin. latum, triquetrum, ovatum, rostratum, bifidum ore membranaceo, pallidum, purpureo-tinctum, scabrum, ad margines serratum. Achenium lin. longum, trigono-ellipticum, stipitatum, pallidum. Antheræ flavescentes, appendice purpureâ apiculatæ.

Ad gregem *C. polystachyæ*, Willd. etc. pertinet.

37. C. Griffithii; spicis 4–5 purpureis; terminali masculâ obovatâ; reliquis fœmineis oblongo-cylindraceis inferioribus exsertè pedunculatis basi attenuatis erectis, stigmatibus 3, perigyniis ovalibus tenuissimis abruptè brevi-cylindrico-rostratis ore integro vel emarginato membranaceo enerviis margine supernè scabriusculis purpureis basi albidis compressis squamâ lanceolatâ acuminatâ longè cuspidatâ purpureâ nervo albo angustioribus brevioribusque.

Hab. In Affghanistan, *Griffith*, no. 78, *Herb. Hooker.*

Culmus subbipedalis, triqueter, validus, basi foliatus lævis, inter spicas scaber; pars spicas gerens 4–5 pollicaris. Folia 1–$1\frac{1}{2}$ lin. lata, longè acuminata, carinata, culmo breviora, glauco-viridia. Bracteæ inferiores vaginatæ, spicis suis breviores. Vagina infima 1–2 poll. longa. Pedunculi erecti, scabri, infimus $2\frac{1}{2}$–3 poll. longus. Spica mascula 6 lin. longa, $2\frac{1}{2}$ lin. lata, obovata, sessilis. Spicæ fœmineæ 4–14 lin. longæ, 2–3 lin. latæ, superiores abbreviatæ, sessiles, ad basin masculæ contiguæ; reliquæ remotæ exsertè pedunculatæ, basi attenuato-laxifloræ, longè vaginatæ. Squamæ omnes lanceolatæ, acutæ, purpureæ, rigidæ, nervo albo longè excurrente. Perigynium (*floriferum*) 2 lin. longum, lineam latum, abruptè rostratum rostro albido, glabrum, vel supernè ad margines sparsim denticulatum. Achenium (*immaturum*) intra perigynium longè stipitatum visum.

Affinis *C. lucida*, Boott.

38. C. olivacea; spicis 6–8 elongatis cylindricis alternis remotis; masculis 2 ferrugineis; fœmineis 4–5 rariùs 6 apice masculis fusco-olivaceis longissimè bracteatis infimâ remotâ rariùs inclusè pedunculatâ, stigmatibus 3, perigyniis ellipticis acuminato-rostratis bidentatis ventricosis nervosis rugosis divaricatis squamâ lanceolatâ hispido-aristatâ brevioribus latioribusque.

Hab. In Assam, Ind. Orient., *Major Jenkins* (*v. s. in Herb. Hooker*).

Culmus bipedalis vel altior, triqueter, infernè validus, lævis, supernè gracilis, scaber; pars spicas gerens 7–12 poll. longa. Bracteæ 3–5 lin. latæ, supremæ angustiores, rariùs spiculâ breviores, inferiores culmum longè superantes; infima interdum tripedalis. Ligula purpurea, infima elongata, pollicaris. Spicæ masculæ sæpiùs 2, pedunculatæ, brevi-bracteatæ, suprema elongata $2\frac{1}{2}$–6 poll. longa, altera vix pollicaris sessilis: squamæ ferrugineæ; supremæ lanceolatæ, obtusæ, nervo infra apicem evanescente; infimæ elongatæ, hispido-aristatæ, vel acutæ ciliatæ; eæ spiculæ minoris semper muticæ. Spicæ fœmineæ 4–5, rariùs 6, erectæ, $1\frac{1}{2}$–6 poll. longæ, 3 lin. latæ, densifloræ, alternæ, a se 1–2 (infima 3–4) poll. remotæ, sessiles, infima rariùs inclusè pedunculata, supremæ 1–3, rariùs omnes, apice masculæ (pars staminifera 4–10 lin. longa) longissimè bracteatæ: squamæ lanceolatæ, inferiores longè hispido-aristatæ; supremæ acutæ. Perigynium 2 lin. longum, lineam latum, ellipticum, acuminatum, rostratum, bidentatum, nervosum, fusco-olivaceum, rugosum, ventricosum, divaricatum vel retroflexum, rariùs (*abortivum*) lanceolatum. Achenium lin. longum, $\frac{6}{9}$ lin. latum, triquetro-ellipticum, stramineum, papillosum, basi styli æquali apiculatum.

Habitus *C. pendulæ*, Huds.

39. C. rara; spicâ simplici oblongâ fuscâ androgynâ apice masculâ, stigmatibus 3, perigyniis ovatis acuminatis rostratis ore emarginatis crebrè et validè nervosis divergentibus squamâ ovatâ obtusâ vel acutiusculâ ferrugineâ longioribus.

Hab. In montibus Khasiya, Indiæ Orientalis. *Griffith* (*Herb. Lemann*).

Culmus 12–14-pollicaris, filiformis, lævis. Folia triquetra, filiformia, apice scabra, culmo breviora. Spica 8–11 lin. longa, basi 2 lin., apice staminifero $\frac{1}{2}$ lin. lata, flosculis fœmineis 8–20, masculis paucioribus instructa. Squamæ ferrugineæ, nervo pallido, obtusæ vel acutæ, nunc apice ciliatæ; infima mutica, vel plùs minùs longè hispido-aristatæ; una vel plures masculinæ rariùs carinâ scabrâ. Perigynium $1\frac{2}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, ovatum, rostratum vel lanceolatum, ore emarginatum, undique crebrè nervosum, olivaceum, squamâ vix duplò longius. Achenium $\frac{6}{9}$ lin. longum, $\frac{5}{9}$ lin. latum, triquetrum, pallidè stramineum, impresso-punctatum. Stigmata 3, longa.

C. polytrichoides, Muhl.? affinis.

40. C. spiculata; spicis 4–5 cylindraceis pallidis erectis androgynis apice masculis superioribus approximatis sessilibus infimâ subremotâ exsertè pedunculatâ, stigmatibus 3, perigyniis triquetro-ellipticis cylindrico-rostratis bifidis stipitatis supernè ad margines scabris nervosis squamâ lanceolatâ acuminatâ vel hispido-cuspidatâ longioribus.

Hab. In montibus Khasiya, Indiæ Orientalis. *Griffith* (*Herb. Lemann*).

Culmus bipedalis, gracilis, firmus, lævis, versus apicem inter spicas superiores scabriusculus; pars spicas gerens 6-pollicaris; basi vaginis foliorum ferrugineis laceratis tectus. Folia radicalia et culmum vaginantia, 1–2 lin. lata, culmum æquantia. Bracteæ foliaceæ, inferiores vaginatæ, culmo longiores, supremæ setaceæ; vaginæ foliorum culmi longæ; ligula ferruginea truncata. Spicæ 1–$1\frac{1}{2}$ poll. longæ, 2–3 lin. latæ, densifloræ, basi attenuatæ, steriles; omnes ad apicem masculæ, superiores approximatæ sessiles, inferiores remotiusculæ, exsertè pedunculatæ. Squamæ lanceolatæ, acuminatæ vel cuspidatæ; masculinæ ferrugineæ; fœmineæ nervo viridi, ad latera pallidè castaneæ; infimæ vacuæ. Perigynium $1\frac{8}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, triquetro-ellipticum, cylindrico-rostratum, bifidum, utrinque nervosum, pallidum, stipitatum, supernè ad margines scabrum. Achenium stipitatum, $1\frac{2}{9}$ lin. longum, $\frac{1}{2}$ lin. latum, triquetro-oblongum, ferrugineum, basi styli apiculatum.

Affinis *C. setigera*, Don (*C. hymenolepis*, Nees), quæ perigyniis scabris, squamis testaceis, spicis supremis masculis differt.

41. C. Moorcroftii; spicis 3–4 ovalibus congestis; terminali masculâ; reliquis fœmineis vel apice masculis infimâ pedunculatâ lanceolato-bracteatâ, stigmatibus 3, perigyniis ovali-globosis rostratis bifidis enerviis nitidis glabris vel supernè ad margines hispidulis pellucidè punctulatis stramineis rostro purpurascente longè stipitatis squamâ lanceolatâ acutâ fusco-purpureâ apice marginibusque albo-membranaceâ brevioribus.

C. Moorcroftii, Falconer, MSS.

Hab. In Indiâ Orientali, ad ripas fluv. Indi in planitie elatâ Tibetanâ, "Tibet Grass of Moorcroft," *Falconer in litt. ad Prof. Royle.*

Spithamea, cæspitosa, glaberrima. Culmus gracilis, sulcatus, apice scabriusculus; pars spicas gerens 15–18 lin. longa. Folia $1\frac{1}{2}$–2 lin. lata, firma, rigida, glauco-viridia, demum flava, apice glaberrima vel scabra, culmum subæquantia. Spicæ 3–4, ovales vel oblongæ, 6–9 lin. longæ, 3–4 lin. latæ, congestæ, sessiles, vel infima pedunculata, evaginata, mascula longior, reliquæ fœmineæ, vel superiores apice masculæ. Squamæ fusco-purpureæ, apice et ad margines albo-membranaceæ, lanceolatæ, acutæ. Bractea lanceolata, spicâ suâ brevior. Perigynium (cum stipite $\frac{3}{9}$–$\frac{4}{9}$ lin. longo) $1\frac{4}{9}$–$1\frac{5}{9}$ lin. longum, $\frac{6}{9}$–$\frac{7}{9}$ lin. latum, ovali-globosum, ventricosum, enervium, nisi nervis 2 marginalibus, glabrum vel supernè ad margines hispidulum, glauco-stramineum. Achenium $\frac{8}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, trigono-obovatum, pallidè castaneum.

Affinis *C. verna*, Schk., *C. conglobata*, Kit. Differt spicis congestis, nunc apice masculis, evaginatis, bracteâ abbreviatâ, perigyniis enerviis, bifidis, pellucidè punctatis, foliis glauco-viridibus, demùm flavis.

42. C. GEBLERI; spicâ masculâ 1 vel 2 cylindricâ; fœmineis 2 vel 1 oblongis vel cylindricis remotis pedunculatis erectis evaginato-bracteatis, stigmatibus 3, perigyniis ovatis brevi-latiusculèque rostratis bicuspidatis lucidis nervosis purpureis squamâ ovatâ mucronatâ vel hispido-aristatâ purpureâ margine membranaceâ longioribus.

C. Gebleri, Prescott in Herb.

Hab. In mont. Altai? *Gebler* (*Herb. Fielding*).

Culmus pedalis et ultra, gracilis, apice scabriusculus, triqueter, basi foliatus. Folia lineam lata, plana, culmo breviora; vaginis purpureis, ligulâ truncatâ. Bracteæ evaginatæ, culmum æquantes; suprema setacea. Spica mascula 1 vel 2; terminalis 9 lin. longa, lineam lata; altera minor, sessilis, e fœmineâ supremâ $1\frac{1}{2}$ poll. remota; squamæ ferrugineæ marginibus albo-membranaceis ciliatis, nervo scabro, in mucronem brevem scabrum producto. Spicæ fœmineæ 1 vel 2, remotæ, 7–15 lin. longæ, 3 lin. latæ, pedunculatæ; squamæ inferiores longiùs hispido-aristatæ. Pedunculus 3–10 lin. longus, scaber. Perigynium $1\frac{7}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, nitidum, nervosum, ovatum, rostro brevi, latiusculo, bicuspidato. Achenium trigonum, pallidum, pellucidè punctatum, basi styli æquali apiculatum.

C. rotundatæ, Wahl., similis; differt squamis mucronatis vel aristatis, rostro breviori latiorique, vaginis nullis, foliis planis.

"*C. vesicaria*? Bunge, MSS., e Chinâ Boreali," differt solùm perigyniis ellipticis, squamis masculis muticis, *v. s. in Herb. Fielding.*

Patria ignota! Forsan e montibus Altaicis. "*C. tristem*, no. 26," ex Alpibus Altaicis Geblero missum, in Herb. Fielding invenio.

43. C. ABBREVIATA; hirsuta, spicis 3–4 oblongis approximatis sessilibus; terminali masculâ reliquis fœmineis; inferioribus brevi-bracteatis evaginatis, stigmatibus 3, perigyniis trigono-obovatis abruptè brevi-rostratis ore integro nervosis squamâ ovatâ mucronatâ ferrugineâ margine membranaceâ longioribus.

C. abbreviata, Prescott in Herb.

Hab. In mont. Altai? (*Herb. Fielding, olim Prescott.*)

Culmus sesquipedalis, gracilis, hirsutus, triqueter, apice scabriusculus, basi foliatus; pars spicas gerens $1–1\frac{1}{2}$ poll. longa. Folia hirsuta, 3–6 poll. longa, lineam lata, apice triquetra, scabra, carinata. Bractea infima culmo brevior, margine scabra, hirsuta; reliquæ obsoletæ. Spica mascula 8 lin. longa, lineam lata, sessilis; squamæ pallidæ lanceolatæ, margine albo-membranaceæ, nervo scabriusculo; superiores acuminatæ, acutæ. Spicæ fœmineæ 3–5 lin. longæ, 2 lin. latæ, contiguæ, sessiles; infima remotiuscula. Squamæ subrotundo-ovatæ, pallidè ferrugineæ, margine latè albo-membranaceæ, inferiores hispido-mucronatæ. Perigynium $1\frac{6}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, obovatum, abruptè brevi-rostratum, crebrè nervosum, glabrum, ferrugineum, ore integro. Achenium $1\frac{2}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, trigono-obovatum, punctatum, olivaceum, basi styli æquali apiculatum.

Proxima *C. striatæ*, R. Br., quæ perigynio bidentato, squamis omnibus hispido-aristatis, foliis glabris gaudet. Nomen patriæ a Prescott omissum.

44. C. SUBDOLA; spicis 5–7 cylindricis erectis ferrugineo-purpureis solitariis vel geminatis; masculis 1–3 terminali longiori longè pedunculatâ infimâ cum spicâ supremâ fœmineâ vel androgynâ apice masculâ geminatâ; fœmineis 3–4 strictè erectis solitariis vel supremis geminatis longissimè bracteatis superioribus approximatis sessilibus infimâ plùs minùs remotâ vaginatâ vel radicali basi attenuatâ laxiflorâ longè exsertè pedunculatâ, stigmatibus 2, perigyniis ovalibus rostellatis ore integro stipitatis nervosis stramineis squamâ oblongâ emarginatâ hispido-aristatâ vel muticâ obtusâ ferrugineo-purpureâ nervo lato viridi longioribus latioribusque vel eam subæquantibus.

Hab. In Novâ Zealandiâ. *Dr. J. D. Hooker.*

Culmus subbipedalis, acutè triqueter, firmus, strictus, striatus, glaber, vel supernè scabriusculus, inter spicas serraturis sursum spectantibus scaber, basi foliatus; pars spicas gerens 4–8 pollices longa vel longior. Folia $1–1\frac{1}{2}$ lin. lata, culmo longiora, rigidiuscula, facie, carinâ, marginibusque scabra. Bracteæ foliaceæ, culmo ter quaterve longiores, infima quandoque brevi-vaginata; in uno specimine vagina radicalis $2\frac{1}{2}$ poll. longa; in aliis vix 2–3 lin. longa. Spicæ masculæ 1–3; suprema $1–1\frac{3}{4}$ poll. longa, $1–1\frac{1}{4}$ lin. lata, longè pedunculata; media sæpe abortiva, bracteata; infima quandoque cum fœmineâ vel androgynâ supremâ geminata, sessilis vel pedunculata. Spicæ fœmineæ 3–4 erectæ, $\frac{1}{2}$–2 poll. longæ, 2 lin. latæ, acutæ, apice sæpe masculæ vel steriles; superiores contiguæ, supremæ geminatæ, una spicula sessilis, altera longior pedunculata; inferiores longiores, solitariæ, approximatæ vel remotæ, pedunculatæ, basi attenuatæ laxifloræ; infima quandoque brevi-vaginata (in uno specimine radicalis longè exsertè pedunculata). Pedunculi triquetri scabri, 3–9 lin. longi (infimus radicalis 3 poll. longus). Squamæ fœmineæ ferrugineo-purpureæ; dorso ad medium trinervi lato-viridi; in eâdem spicâ ovatæ, obtusæ, integræ, muticæ, vel sæpiùs emarginatæ, hispido-aristatæ; masculæ omnes nisi inferiores muticæ, integræ, nervo infra apicem evanescente. Perigynium $1\frac{5}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, ovale, rostellatum, ore integro, obconico-stipitatum, utrinque nervosum, nervis pallidioribus, pallidè ferrugineo-stramineum, glabrum, apice quasi albo-granulosum.

Primo aspectu *C. Goodenovii*, Gay, similis! *C. Gaudichaudiana*, Kunth, culmo octopollicari, spicâ masculâ unicâ, fœmineis 3 (nec geminatis), squamis masculis lanceolatis acuto-mucronatis, perigyniis punctis nigro-fuscis conspersis, gaudet.

45. C. GUNNIANA; spicis 4–5 oblongis vel cylindricis erectis; terminali masculâ sessili; fœmineis 3–4 superioribus sessilibus contiguis inferioribus remotis foliaceo-bracteatis exsertè pedunculatis, stigmatibus 3, perigyniis trigono-ellipticis subinflatis acuminato-rostratis bidentatis ad margines supernè scabriusculis stramineis æqualiter utrinque nervosis squamâ latè ovatâ mucronatâ vel hispido-cuspidatâ longioribus.

Hab. In Ins. Van Diemen. *Gunn*, 578. (*Herbb. Lindley & Hooker.*)

Culmus sesquipedalis, triqueter, lævis; pars spicas gerens 4–15 poll. longa. Folia 4 lin. lata, culmo longiora, subglauca, marginibus supernè scabra. Bracteæ foliaceæ, culmum superantes, inferiores vaginatæ, vaginis $\frac{1}{2}$–2 poll. longis; suprema evaginata. Spica mascula 5–15 lin. longa, 1–2 lin. lata, sessilis; squamis lanceolatis, hispido-cuspidatis, pallidè ferrugineis, nervo scabro. Spicæ fœmineæ 3–4, oblongæ vel cylindricæ, 5–18 lin. longæ, 3–4 lin. latæ, erectæ, inferiores longiores; suprema vel binæ superiores ad masculam contiguæ; inferiores intervallis 2–10 poll. longis remotæ, plùs minùs exsertè pedunculatæ; squamis latè ovatis, pallidis, vel lucidè ferrugineis, nervo scabro in cuspidem plùs minùs longam producto, perigyniis vix duplò brevioribus. Pedunculi graciles, scabri. Perigynium 2–$2\frac{7}{9}$ lin. longum, 1 lin. latum, trigono-ellipticum, acuminato-plùs minùs longè rostratum, ad margines supernè scabriusculum, bidentatum, utrinque nervosum, subinflatum, stramineum, pellucidè punctatum, punctis minimis nigrescentibus notatum. Achenium $1\frac{3}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, obovato-trigonum, brevi-stipitatum, fusco-castaneum, punctatum, basi styli æquali abruptè terminatum.

Affines *C. laxiflora*, Lam., et *C. lævigata*, Sm.

46. C. THECATA; spicis 4–6 erectis pallidis vel castaneis; terminali masculâ cylindraceâ; reliquis fœmineis oblongis remotis inferioribus exsertè pedunculatis longè bracteatis vaginatis, stigmatibus 3, perigyniis (*floriferis*) ovatis bidentatis utrinque nervosis ad margines denticulatis squamâ ovatâ acuminatâ vel cuspidatâ dorso nervosâ brevioribus.

Hab. In Australiâ Occidentali, in arenosis Insulæ Rottnest, prope Prest. *Preiss,* 1839 (*Herb. Ward*); ad fluvium Cygnorum. *Drummond,* 921. (*Herb. Hooker.*)

Glauca. Culmus subpedalis, triqueter, scaber; pars spicas gerens 7–10 poll. longa. Folia 1–1½ lin. lata, culmo longiora, marginibus supernè scaberrima. Bracteæ vaginatæ, inferiores culmo longiores. Vaginæ 2 lin. ad 1½ poll. longæ, superiores lineis 2, e marginibus bractearum decurrentibus, scabris. Spica mascula 8–12 lin. longa. 1–1½ lin. lata, obtusa, 1 vel altera minor contigua, flosculo fœmineo unico ad basin instructa. Antheræ 3, apiculatæ. Spicæ fœmineæ 3–5, strictè erectæ, 5–9 lin. longæ, lineam latæ, binæ superiores approximatæ, sessiles vel inclusè pedunculatæ; inferiores intervallis 2–3 pollicaribus remotæ, exsertè pedunculatæ, basi attenuatæ laxifloræ. Squamæ omnes ovatæ, acuminatæ vel hispido-cuspidatæ, dorso nervosæ, scabræ, pallidæ vel castaneæ. Pedunculi stricti, scaberrimi; inferiores 1–2½ poll. longi. Perigynium (*floriferum*) 1⅔ lin. longum, $\frac{4}{9}$ lin. latum, in rostrum latiusculum, sensim attenuatum, bidentatum, utrinque validè nervosum, ad margines denticulato-scabrum. Achenium immaturum.

Affinis *C. alveata,* Boott; differt perigyniis bidentatis margine denticulatis.

47. C. Langsdorffii; spicis 3-4 oblongis; masculâ 1; fœmineis 2–3 laxifloris superioribus contiguis infimâ subremotâ bracteatis exsertè pedunculatis, stigmatibus 3, perigyniis triquetro-fusiformibus bidentatis nervosis hirto-scabris squamâ lanceolatâ hispido-cuspidatâ brevioribus.

C. Japonica, Fischer in Herb. Boott.

Hab. Ad Nangasaki, Japoniæ. *Langsdorff.*

Culmus 8-pollicaris, gracilis. Folia lineam lata, culmo breviora. Bracteæ spicas superantes, vaginatæ; vagina infima 4 lin. longa. Spica mascula 7 lin. longa, 1 lin. lata; squamis albis, nervo viridi, lanceolatis, plùs minùs longè hispido-cuspidatis. Spicæ fœmineæ 2–3, subquindecemfloræ, 6 lin. longæ, vix 2 lin. latæ, inferiores brevi-exsertè pedunculatæ; squamis longè hispido-cuspidatis, viridibus, margine albis. Perigynium 1¼ lin. longum, ½ lin. latum, crebrè nervosum, viride, pilis albis scabrum. Achenium triquetrum, stramineo-pallidum, basi styli plano-incrassato terminatum.

A *C. Japonicâ,* Thunb., Schk., t. W.W., perigyniis scabris, spicis gracilibus distincta.

48. C. Bongardi; spicis 4 cylindricis erectis alternis stramineo-pallidis concoloribus; masculâ 1 pedunculatâ; fœmineis 3 apice masculis basi attenuatis laxè imbricatis inferioribus exsertè pedunculatis bracteatis, stigmatibus 3, perigyniis ellipticis stipitatis latè rostratis bicuspidatis supernè

serrato-hispidis striato-nervosis squamâ oblongâ emarginatâ hispido-aristatâ brevioribus angustioribusque.

Hab. Ad Bonin, Ins. Loo-Choo, *Bongard*, 70, *Herb. Hooker.*

Radix valida. Culmus gracilis, triqueter, versus apicem inter spicas scabriusculus, bipedalis, basi foliosus, reliquiis foliorum laceratis undique tectus; pars spicas gerens 9 poll. longa. Folia 1–3 lin. lata, culmo longiora, crebra, carinata, supernè scabra. Bracteæ vaginatæ, culmo breviores, vaginis 8–10 lin. longis. Spica mascula 2 poll. longa, 2 lin. lata; squamis oblongis, emarginatis, hispido-aristatis, arctè imbricatis. Spicæ fœmineæ 2 poll. longæ, 3 lin. latæ, omnes apice masculæ, suprema insertè pedunculata, alternæ, intervallis 2–3 poll. remotæ, squamis laxè imbricatis. Pedunculi 8 lin. ad 2 poll. longi, scabriusculi. Perigynium $2\frac{6}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, ellipticum, stipitatum, latè rostratum, altè bicuspidatum, laciniis extùs serrato-hispidis, intùs hyalino-membranaceis, striato-nervosum, pallidum. Achenium 1 lin. longum, $\frac{4}{9}$ lin. latum, stipitatum, atro-purpureum, trigonum (immaturum, vacuum, vesicam referens), basi styli deciduâ incrassatâ.

C. trichocarpæ, Muhl., et affinibus proxima!

49. C. TENUISSIMA; spicis 2–3 erectis pedunculatis; terminali masculâ cylindricâ; reliquis fœmineis oblongis laxè paucifloris exsertè pedunculatis vaginatis remotis, stigmatibus 3, perigyniis trigono-obovatis brevissimè conico-rostratis rostro recto ore emarginato leviter nervosis squamam æquilatam mucronatam ferrugineam æquantibus.

C. panicea? Bunge in Herb. Fielding.

Hab. In Chinâ Boreali, *Bunge.*

Culmus subpedalis, erectus, setaceo-gracillimus, basi foliatus, vaginis foliorum striatis ferrugineis tectus; pars spicas gerens $1\frac{1}{2}$–3 poll. longa, inter spicas scabriuscula. Folia $\frac{2}{9}$ lin. lata, culmo breviora, sulcata, apice triquetra scabra. Bracteæ vaginatæ, e basi involutæ, marginibus serrato-scabræ; infima spicam suam subæquans, suprema brevior; vaginæ 3 lin. longæ; ligula ferruginea. Spica mascula 6–9 lin. longa, lineam lata; squamæ oblongæ, ferrugineæ, infima (more bracteæ) plùs minùs longè hispido-cuspidata, reliquæ obtusæ, vel mucronulatæ. Spicæ fœmineæ 1 vel 2 erectæ, 4–7-floræ, 3–5 lin. longæ, 2 lin. latæ, laxifloræ, exsertè pedunculatæ; squamæ oblongæ, acutæ, mucronatæ, ferrugineæ, nervo pallido. Perigynium $1\frac{4}{9}$ lin. longum, $\frac{7}{9}$ lin. latum, pallido-viride, ferrugineo-tinctum. Achenium lineam longum, $\frac{6}{9}$ lin. latum, trigono-obovatum, stramineum, basi styli æquali apiculatum.

Affinis *C. paniceæ*, L.; satis foliis filiformibus, squamis fœmineis mucronatis, perigynii rostro recto, distincta.

50. C. Æthiopica; spicis 4–5 cylindricis erectis castaneis concoloribus; masculâ 1; fœmineis 3–4 superioribus approximatis inclusè reliquis exsertè pedunculatis infimâ remotâ, stigmatibus 3, perigyniis ovatis triquetris rostratis bifurcatis nervosis sanguineo-maculatis squamâ ovato-lanceolatâ emarginatâ hispido-aristatâ brevioribus angustioribusque vel longioribus.

C. Æthiopica, Schkuhr, Car. t. Z. f. 83.

Hab. "In Caffer-land, Cap. Bonæ Spei," *Dr. Gill, Herb. Hooker!* "Uitenhage, Cap. Bonæ Spei, *Zeyher,* 684," *Herb. Hook.*

Culmus bipedalis et ultra, basi foliosus, glaber, apice scabriusculus; pars spicas gerens 3–14 poll. longa. Folia 3–5 lin. lata, culmo longiora. Bracteæ foliaceæ vaginatæ, superior setacea, infima longissima 4 lin. lata, culmum superans, supernè carinâ marginibusque scabra. Vaginæ 4 lin. ad 2 poll. longæ. Spicæ concolores, lucidè castaneæ; mascula 1–2 poll. longa, 2 lin. lata, squamis arctè imbricatis, hispido-aristatis, inferioribus emarginatis apice ciliatis, nervo pallido. Spicæ fœmineæ, erectæ, $1\frac{1}{2}$–$2\frac{1}{2}$ poll. longæ, 4 lin. latæ, duæ superiores spicæ masculæ approximatæ, sessiles vel inclusè pedunculatæ; reliquæ exsertæ, infima remota; omnes sublaxifloræ; squamis laxis obliquè divergentibus, carinâ pallidâ latiori nervosâ scabrâ, apice emarginatis vel acutis in aristam lanceolatam hispidam productis. Perigynium $2\frac{1}{2}$ lin. longum, 1 lin. latum, nervosum, maculis sanguineis notatum, pellucidè punctatum, nitidum. Achenium $1\frac{1}{9}$ lin. longum, $\frac{8}{9}$ lin. latum, trigonum, obtusum, fuscum, subtilissimè punctulatum.

Schkuhrius hanc speciem, e specimine Thunbergiano, primùm quasi incolam Insulæ Borbonicæ descripsit, deinde in ejus *Nachtr.* quamvis a cel. Smithio et Willdenovio infaustè eam ad *C. lævigatam,* Sm., referre seductus, ritè ad Cap. Bonæ Spei relegit. Nemo post Thunbergium ante Gillium et Zeyherium prospexit. A *C. lævigatâ,* Sm., spicis fœmineis (superioribus masculæ approximatis) lucidè castaneis sublaxifloris et squamis emarginatis abundè differt.

51. C. Sinai; glauca, spicis cylindricis gracilibus erectis; masculâ 1; fœmineis 4 inferioribus remotis exsertè pedunculatis, stigmatibus 3, perigyniis elliptico-lanceolatis triquetris nervosis brevi-rostratis bifidis apice hispidis squamâ ferrugineâ emarginatâ obtusâ mucronatâ longioribus.

"*C. distans,* L., *var.* Unio Itin. 176, 1835."

Hab. "In fontanis ad radices Montis Sinai, *Schimper.*"

Radix fibris lignosis aurantiacis longis. Culmus subsesquipedalis, erectus, lævis vel apice scabriusculus, sulcatus, angulis obtusis, basi foliatus, rudimentis foliorum foliisque vaginantibus tectus. Folia glauca, nervosa, basi involuta, apice triquetro scabra, culmo breviora. Bracteæ foliaceæ, vaginantes, spicis suis longiores, suprema setacea vix vaginans; vaginæ 3–15 lin. longæ, ligulâ membranaceâ ferrugineâ apice instructæ. Spica mascula $1\frac{1}{2}$ poll. longa, $1\frac{1}{2}$ lin. lata, squamis obtusis, ferrugineis, margine membranaceo pallidis, nervo viridi, infra apicem evanescente. Spicæ fœmineæ graciles, cylindricæ, 5–17 lin. longæ, 1–2 lin. latæ, inferiores remotæ, exsertè pedunculatæ, basi attenuatæ. Pedunculi scabriusculi; squamæ fœmineæ emarginatæ, obtusæ, nervo viridi, hispido-mucronatæ, ferrugineæ. Perigynium $1\frac{7}{9}$ lin. longum, $\frac{6}{9}$ lin. latum, brevi-stipitatum, pallidum, apice hispidum, squamâ duplò longius. Achenium (vix maturum) $1\frac{1}{3}$ lin. longum, $\frac{5}{9}$ lin. latum, oblongo-triquetrum, brevi-stipitatum, basi styli apiculatum, pallidum.

C. diluta, Bieb. affinis, quæ tamen spicis fœmineis brevioribus crassioribus, perigyniis glabris, recedit.

VII. *Remarks on the Examination of some Fossil Woods, which tend to elucidate the Structure of certain Tissues in the recent Plant.* By Edwin John Quekett, *Esq., F.L.S. &c.*

Read March 18, 1845.

Among the many disputed points in vegetable anatomy, few have excited more controversy than the structure of spiral vessels, and the markings on the woody fibres of plants belonging to the order *Coniferæ*. Having found instances of these structures in the fossil state which appear satisfactorily to explain their nature, the following observations are offered to the notice of the Society. In doing so, it is not intended to enter into any detailed account of the minute anatomy of these parts, as it is generally known and already described in most botanical works.

From the period of the discovery of spiral vessels in plants by Henshaw, in 1661, up to the last quarter of a century, numerous have been the theories respecting their structure; the older vegetable anatomists, from the imperfection of their microscopes, were led to form various opinions on these minute organs, which have been recorded in works on vegetable anatomy. The true structure, by the aid of delicate manipulation and improved means of observation, had however, to most recent observers, appeared to be determined; as it can be shown that these organs are composed of a cylinder of membrane closed at each end, in the interior of which are one or more fibres coiled spirally. This is a fact often to be seen in favourable dissections, and is decidedly manifest when the development of the fibre is watched in the manner I have described in vol. i. of the 'Transactions of the Microscopical Society;' but another opinion has been entertained, that the fibres are coiled spirally on the *exterior* of the cylinder of membrane, instead of in its interior.

On examining lately a specimen of fossil wood, exhibiting the structure of a palm, I discovered a portion which, instead of being compact like the general mass, broke down on the slightest pressure into minute fragments: on submitting these to the microscope, it was found that they were composed of cylinders more or less elongated and minute rounded granules. On the cylinders there could readily be observed a perfect screw, the helix being either single or compound, and undoubtedly fashioned from the interior of the recent spiral vessels, which fact gives the most satisfactory proof that the fibre is in the interior of the cylinder, as these siliceous casts could not have been so moulded if the spiral fibre had been external. The intervals between the helix show the shape of the fibre, and also show that it was of a solid nature.

The other point that has occasionally been the subject of controversy, is the nature of the discoid bodies on the woody tissue of coniferous plants. These have been supposed by some persons to be glands; by others to be thicker, and by others again to be thinner places in the membrane forming the walls of the woody fibres. Others have asserted that there is a pore in the centre of each disc, which allows of a communication between adjoining fibres. Later observers however have shown that none of the above theories is altogether correct, as the discs are not proper to one woody fibre, but are formed between two contiguous fibres, each contributing to the formation of the disc by having a minute depression, shaped like a saucer, on its exterior, which corresponds exactly to a similar depression on the contiguous fibre, whereby a small cavity is left between them. These markings or cavities very rarely exist on the sides of the fibres opposed to the pith or bark, but are very numerous on the sides parallel to the medullary rays. Wherever the markings occur, the saucer-shaped depression is thick at the circumference and for some distance towards the centre; but in the centre itself there is a spot so extremely thin and minute, that the light, which has to pass through it, becomes decomposed, and the spot looks either green or red, according to the adjustment of the focus.

Having received from Professor Bailey a specimen of fossil wood which was found at Fredericsberg in Virginia, I perceived, on submitting it to the microscope, that it would easily break into minute fragments in the direction of the woody fibres, which, when carefully viewed, presented a most beautiful example of casts of woody tissue, with numerous spirals traversing the interior. At various points were arranged the ordinary coniferous dots, and to the outside there adhered small bodies of the same size, which projected beyond the outline of the fibre when seen obliquely, each bearing the precise representation of the coniferous disc. In other parts of the field of view were some of the same bodies detached from the sides of the fibres, which left no doubt that they were casts of the cavities existing in the original plant, and proved the correctness of the view above stated respecting the nature of these minute circular markings. Besides these siliceous bodies in the fragments of the fossil, there were others of such a shape as to leave no doubt that they were casts of the interspaces between the cells or woody fibres.

There is very little doubt now, from the use of chemical tests, that fossil woods for the most part, or perhaps in all cases, still possess portions of the vegetable tissues, which are cemented together into a compact mass by silica, derived from the water to which the specimen had been subjected. It is difficult to account for the lodgement of silica in the tissues of plants ; but it is possible that the molecules of silica, which exist as one of their organic constituents, form the first attractive points, to which others are added by the water, until the whole of the portion of the plant, the woody fibres, the vessels and cells, and the interspaces between these organs, is filled, (in fact all places which in the recent plant are filled with sap and air,) after the manner that the spicules of silica in a sponge form nuclei for the subsequent deposits of flinty matter, until the whole is converted into a shapeless mass like the original sponge.

It follows from these observations, as every fibre, cell and spiral vessel is a closed sac or tube, that when any vegetable tissue becomes fossilized, the silica occupying their interior and their interspaces is, in fact, in detached pieces, each being separated from the adjoining cell or vessel by the intervening walls of the tissue. If fossilization went no further, and there is reason to believe that in some cases it does not, the mass could easily be broken down by slight force, and each original fibre detached from its neighbour on account of the vegetable matter, after long maceration in the silicifying fluid, being almost decomposed. But frequently the process goes further ; and as we know how readily vegetable membrane transmits liquids through its substance, it can be easily imagined how silica held in solution in the water would pervade it, and the intercellular spaces and the interior of the woody fibres would be cemented together into one mass of silica.

The reason why some woods break down more easily than others after being fossilized, I have not yet been able to determine; but it is certain that coniferous woods are found to be the most frequent examples in which the tissue is not cemented, and I imagine that in those woods there is great power of resisting decomposition when immersed in water, or there exists little or no silica as an organized part of their skeleton, so that no points in the membrane for the commencement of deposits are offered; whereas, where silica does exist, the molecules form the first centres, and the whole become cemented together.

It is thus, I am induced to believe, that silicification in the above instances proceeded so far as to fill the fibres, vessels and cells, and the spaces on their exterior; but as the vegetable membrane was interposed, the complete cohesion of the parts was prevented, and consequently they are now capable of being separated, and the frustules of silica when examined prove to be casts of the interior of the tissues and of the interspaces external to them, thus appearing to offer the most satisfactory evidence respecting the nature of the organs in question.

VIII. *Descriptions of* Chalcidites. *By* Francis Walker, *Esq., F.L.S. &c. &c.*

Read June 17th, 1845.

THE following communication contains a description of species not included in my previous publications on *Chalcidites* in the 'Entomological Magazine,' the 'Annals of Natural History,' the 'Entomologist,' and the 'Monographia Chalciditum.' In these works further information will be found respecting the genera and species mentioned as being related to those here described.

Pteromalus, *Swederus.*

This genus comprises a great number of species, somewhat similar in structure, and having, comparatively speaking, one unvarying form, while its outskirts, or the subgenera whereby it passes into other families, are diverse in appearance, and contain but few species. In the 'Entomological Magazine' (vols. ii. and iii.), and in the 'Monographia Chalciditum' (vol. i.), I have attempted to describe the characters of the British species of this genus, and to indicate their divisions into groups. In the second volume of the last-mentioned work, and in some numbers of the 'Annals of Natural History,' I have mentioned several exotic species. The characters that I have given are defective, owing to the omission of the structure of the metathorax or propodeon. The antennæ in the following species are nearly similar in structure; the first joint is long and slender; the second is cyathiform; the third and fourth are very minute; the following joints to the tenth successively decrease in length. The head and thorax are finely squameous; the abdomen is smooth.

Pteromalus Acrotatus, fem. Viridis, abdomine cupreo, antennis piceis, pedibus fulvis, coxis femoribusque basi viridibus, alis fuscis.

Corp. long. lin. 1; alar. lin. $1\frac{1}{2}$.

Body shining, rather short: head and thorax green: head broader than the thorax: antennæ clavate, dark piceous, a little longer than the thorax; first joint fulvous; club conical, not broader than the tenth joint but twice its length: thorax elliptical: prothorax short: scutum of the mesothorax rather long; sutures of the parapsides indistinct; scutellum having no trace of a transverse suture: propodeon obconic, declining: podeon very short: abdomen round, cupreous, depressed above, keeled beneath, hardly more than half the length of the thorax; octoon and following segments shorter than the metapodeon: legs fulvous; coxæ and thighs green; tips of the latter fulvous: wings fuscous; nervures fuscous; ulna hardly half the length of the humerus; radius as long as the ulna; cubitus shorter than the radius; stigma very small.

Found in July near Lanark, Scotland.

It belongs to the second division of the genus (Ent. Mag. ii. 479), and is allied to *Pt. Catillus* and to *Pt. Discus*, from which species it may be distinguished by its more slender structure.

Pteromalus Bubaris, fem. Æneo-viridis, abdomine cupreo, antennis nigris, pedibus fulvis, femoribus fusco-cinctis, alis limpidis.

Corp. long. lin. $\frac{2}{3}$; alar. lin. $1\frac{1}{4}$.

Body linear: head green, broader than the thorax: antennæ black, subclavate, as long as the thorax; first joint fulvous; club fusiform, more than twice the length of the tenth joint: thorax oval, æneous-green: prothorax very short: sutures of the parapsides indistinct; scutellum obconic, having an indistinct transverse suture near its tip: propodeon obconic, declining: podeon very short: abdomen oval, cupreous, smooth, depressed above, keeled beneath, green towards the base, a little shorter than the thorax; metapodeon of moderate size; octoon and following segments short: legs fulvous; coxæ green; a broad fuscous band across each thigh; tips of the tarsi fuscous: wings limpid, rather short; nervures fulvous; ulna more than half the length of the humerus; radius shorter than the ulna; cubitus a little shorter than the radius; stigma extremely small.

Found near Edinburgh by Dr. Greville.

Allied to *Pt. Lucilla* (Monographia Chalciditum, i. 231), but differing from it in structure and in colour.

Pteromalus Ection, mas. Viridis, scutello æneo-viridi, abdomine nigro-cupreo basi fulvo maculato, pedibus fulvis, femoribus piceis, alis fuscis.

Corp. long. lin. 1; alar. lin. $1\frac{1}{2}$.

Body slender: head and thorax dark green: head a little broader than the thorax: antennæ black, slender, filiform, a little longer than the thorax; club fusiform, twice the length of the tenth joint: thorax elliptical: prothorax transverse, short: scutum of the mesothorax broad; sutures of the parapsides indistinct; axillæ triangular, large, not complete; scutellum conical, æneous-green, having a slight trace of a transverse suture near its tip: propodeon obconical, declining, rather large: podeon very short, but distinct: abdomen cupreous-black, shining, depressed, increasing in breadth from its base till near its tip, having an obscure fulvous spot near its base, rather shorter and narrower than the thorax; metapodeon of moderate length; octoon and following segments shorter than the metapodeon: legs fulvous; coxæ green; thighs piceous, their tips fulvous: wings fuscous; nervures piceous; humerus much less than half the length of the wing; ulna more than half the length of the humerus; radius rather longer than the ulna; cubitus slightly curved, about half the length of the radius; stigma very small.

Found by Dr. Greville near Edinburgh.

In the structure of the prothorax, the scutellum and the podeon, it approaches the genus *Trigonoderus*, Westwood.

Pteromalus Xanthe, mas. Viridis, abdominis disco æneo, antennis piceis, pedibus fulvis, femoribus piceis, tarsis flavis, alis limpidis.

Corp. long. lin. $1\frac{1}{4}$; alar. lin. $1\frac{2}{3}$.

Body linear, bright green: head transverse, dark green, a little broader than the thorax: antennæ piceous, filiform, as long as the thorax; first joint fulvous, piceous towards the tip; fifth and following joints linear; club fusiform, twice the length of the tenth joint: thorax elliptical, inclining to æneous along the sutures: prothorax very short: scutum broad; sutures of the parapsides indistinct; axillæ large, triangular, not complete; scutellum obconical, having a cupreous band across it, but with no trace of a suture: propodeon obconical, declining: podeon very short: abdomen shining, depressed, increasing in breadth towards the tip, which is very minutely squameous, a little shorter and narrower than the thorax; disc æneous; metapodeon of moderate length; octoon and following segments shorter than the metapodeon, successively decreasing in length until the telum: legs fulvous; coxæ green; middle and hind legs with piceous thighs, yellow knees and tarsi, the tips of the latter fuscous: wings limpid; nervures piceous; humerus much less than half the length of the wing; ulna hardly more than half the length of the humerus; radius a little shorter than the ulna; cubitus much shorter than the radius; stigma small.

Found by Dr. Greville near Edinburgh.

Nearly allied to *Pt. Coryphe* (Monographia Chalciditum, i. 266).

PTEROMALUS AOLLIUS, mas. Viridis, scutello viridi-æneo, antennis fuscis, basi viridibus, pedibus fulvis, coxis femoribusque viridibus, tibiis fusco-cinctis, alis limpidis.

Corp. long. lin. $\frac{2}{3}$–$\frac{3}{4}$; alar. lin. 1–1$\frac{1}{4}$.

Body nearly linear: head and thorax bluish-green: head a little broader than the thorax: antennæ subclavate, slender, fuscous, as long as the thorax; first joint green; club elliptical, more than twice the length of the tenth joint: thorax oval: prothorax very short: sutures of the parapsides indistinct; scutellum obconic, æneous-green: propodeon obconic, æneous, declining: podeon very short: abdomen nearly linear, depressed, shining, dark æneous-green, rather shorter and narrower than the thorax; metapodeon of moderate size; octoon and following segments shorter: legs fulvous; coxæ and thighs green; a broad fuscous band across each tibia: wings limpid; nervures fuscous; humerus much less than half the length of the wing; ulna a little more than half the length of the humerus; radius shorter than the ulna; cubitus a little shorter than the radius; stigma very small.

September; North Wales.

Its structure approaches that of the first division of *Pteromalus* (Entomological Magazine, ii. 477).

PTEROMALUS ANTHO, mas. Viridis, abdomine purpureo, antennis nigris, pedibus piceis, femoribus viridibus, alis sublimpidis.

Corp. long. lin. 1; alar. lin. 1$\frac{3}{4}$.

Head and thorax dark green: head broader than the thorax: antennæ filiform, black, as long as the thorax; first joint green; club fusiform, twice the length of the tenth joint: thorax elliptical: prothorax very short: scutum broad; sutures of the parapsides very indistinct; scutellum obconical, having no traces of a transverse suture: propodeon obconical, declining, ridged lengthwise: podeon very short: abdomen linear, depressed, shining, dark purple, tinged with green towards the base, shorter and much narrower than the thorax: metapodeon larger than the following segments, which are rather short and nearly equal in size: legs piceous; coxæ and thighs green; knees fulvous: wings with a very slight fuscous tinge; nervures fuscous; ulna rather broad, hardly half the length of the humerus; radius a little shorter than the ulna; cubitus shorter than the radius; stigma of moderate size.

England. From the collection of the Rev. G. T. Rudd.

This species is allied to *Pt. Favorinus* (Monographia Chalciditum, i. 263), but differs in the antennæ, in the legs and in the stigma of the wing.

PTEROMALUS LEARCHUS, mas. Viridis, abdomine æneo-viridi, antennis fulvis basi flavis apice piceis, pedibus flavis, alis limpidis.

Corp. long. lin. $\frac{1}{2}$; alar. lin. $\frac{3}{4}$.

Body nearly linear: head and thorax bright green: head a little broader than the thorax: antennæ fulvous, subclavate, much longer than the thorax; joints from the first to the fourth yellow; the following joints from the fifth to the tenth short; club piceous, fusiform, more than twice the length of the tenth joint: thorax oval: prothorax very short; sutures of the parapsides indistinct; scutellum obconic, having no traces of a transverse suture: propodeon obconic, declining, rather short: podeon very short: abdomen nearly linear, depressed, shining, æneous-green, rather shorter than the thorax; metapodeon longer than the following segments, which are of moderate and nearly equal size: legs yellow; coxæ green: wings limpid or with a slight fulvous tinge; nervures yellow; ulna about half the length of the humerus; radius as long as the ulna; cubitus shorter than the radius; stigma fulvous, rather small.

Found near Edinburgh by Dr. Greville.

PTEROMALUS ANTORIDES, mas. Viridis, abdomine purpureo flavo-maculato, antennis fuscis, pedibus flavis, alis limpidis.

Corp. long. lin. $1\frac{1}{4}$; alar. lin. 2.

Head and thorax bright green, with an æneous tinge: head broader than the thorax: antennæ fuscous, filiform, rather longer than the thorax; first joint yellow; club fusiform, twice the length of the tenth joint: thorax elliptical: prothorax short: scutum broad; sutures of the parapsides indistinct; scutellum obconical, having no traces of a transverse suture: propodeon obconic, declining, ridged longitudinally: podeon very short: abdomen depressed, shining, short-oval, purple, green at the base, near which there is a large yellow spot, much shorter than the thorax; metapodeon of moderate size; octoon and following segments rather short: legs yellow; coxæ green: wings limpid; nervures yellow; ulna scarcely half the length of the humerus; radius as long as the ulna; cubitus much shorter than the radius; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

Nearly allied to *Pt. Ortalus* (Mon. Chal. i. 241), but it has a shorter and broader abdomen, and a smaller stigma.

PTEROMALUS JARAVUS, fem. Viridis, abdomine cyaneo-viridi disco cupreo, antennis piceis, pedibus flavis, femoribus viridibus, alis limpidis.

Corp. long. lin. $1\frac{1}{4}$; alar. lin. 2.

Head and thorax green, convex: head broader than the thorax: antennæ piceous, clavate, rather longer than the thorax; first joint fulvous; club conical, flat, more than twice the length of the tenth joint: thorax oval: prothorax very short: scutum of the mesothorax broad; sutures of the parapsides indistinct; scutellum subrhomboidal, having no traces of a transverse suture: propodeon rather large, furrowed, obconic, declining: podeon very short: abdomen elliptical, bluish-green, shining, depressed above, keeled and angular beneath, attenuated towards the tip, longer and rather narrower than the thorax; disc cupreous; metapodeon of moderate length; octoon and following segments short: legs yellow; coxæ and thighs green; tips of the tarsi fuscous: wings limpid; nervures fulvous; humerus twice the length of the ulna; radius rather longer than the ulna; cubitus much shorter than the ulna; stigma small.

England. From the collection of the Rev. G. T. Rudd.

Allied to *Pt. diversus* (Ent. Mag. iii. 483).

Pteromalus Anaxenor, fem. Viridis, abdominis disco cyaneo-viridi, antennis nigris, pedibus fulvis fusco-cinctis, tarsis flavis, alis limpidis.

Corp. long. lin. $1\frac{2}{3}$; alar. lin. 3.

Body green, rather broad: head as broad as the thorax: antennæ clavate, black, pubescent, shorter than the thorax; first joint fulvous towards the base; club conical, twice the length of the tenth joint: thorax elliptical: prothorax very short: scutum broad; sutures of the parapsides indistinct; axillæ large, not conniving; scutellum subrhomboidal, having a very slight trace of a transverse impression near its tip: propodeon large, obconic, declining, indistinctly furrowed lengthwise: podeon distinct, but very short: abdomen short-oval, shining, concave above, deeply keeled beneath, much broader and shorter than the thorax; disc bluish-green; metapodeon large; octoon and following segments transverse, short: legs fulvous; coxæ green; a broad fuscous band across each thigh and tibia, but very indistinct on the protibiæ; mesotarsi and metatarsi pale yellow, fuscous towards their tips: wings ample, slightly fuscous; nervures fuscous; humerus twice the length of the ulna; radius rather longer than the ulna; cubitus a little shorter than the ulna; stigma small.

England. From the collection of the Rev. G. T. Rudd.

This species has a slight trace of the transverse furrow on the scutellum of the mesothorax, which character is developed in the genera *Scladerma* and *Lamprotatus*.

Pteromalus Tedanius, fem. Viridis, abdomine basi fulvo, antennis piceis, pedibus flavis, alis subfulvis.

Corp. long. lin. 1; alar. lin. $1\frac{3}{4}$.

Head and thorax green: head a little broader than the thorax; front large: antennæ piceous, subclavate, a little longer than the thorax; first joint fulvous; club conical, flat, more than twice the length of the tenth joint: thorax oval: prothorax very short: scutum of the mesothorax broad; sutures of the parapsides indistinct; scutellum rhomboidal, having no traces of a transverse suture: propodeon obconical, declining, rather short: podeon very short: abdomen elliptical, smooth, depressed above, keeled beneath, fulvous towards the base, green towards the tip, longer but hardly narrower than the thorax; metapodeon of moderate size; octoon and following segments shorter: legs bright yellow; tips of the tarsi fulvous: wings slightly fulvous; nervures fulvous; ulna rather thick, about half the length of the humerus; radius as long as the ulna; cubitus shorter than the radius; stigma small.

England. From the collection of the Rev. G. T. Rudd.

Allied to *Pt. discolor* (Ent. Mag. iii. 473), but very different in colour.

PTEROMALUS NAUBOLUS, fem. Viridis, abdominis disco cupreo, antennis piceis, pedibus flavis, femoribus viridibus, alis limpidis.

Corp. long. lin. $1-1\frac{1}{4}$; alar. lin. $1\frac{3}{4}-2$.

Bright green: head and thorax convex, finely squameous: head as broad as the thorax: antennæ subclavate, piceous, as long as the thorax; first joint fulvous; club conical, twice the length of the tenth joint: thorax oval: prothorax very short: scutum of the mesothorax broad; sutures of the parapsides indistinct; scutellum subrhomboidal: propodeon short, transverse, declining, narrower towards its tip: podeon very short: abdomen elliptical, shining, depressed above, slightly keeled beneath for about two-thirds of its length from the base, much longer but hardly narrower than the thorax; disc cupreous; metapodeon of moderate length; octoon and following segments shorter: legs pale yellow; coxæ and thighs green: wings limpid; nervures fulvous; ulna rather thick, about half the length of the humerus; radius nearly as long as the ulna; cubitus shorter than the radius; stigma pale fuscous, of moderate size.

From the collection of the Rev. G. T. Rudd.

This species has a larger stigma than *Pt. Amyntor* (List of Chalcidites in the British Museum, p. 48) and *Pt. linearis* (Ent. Mag. iii. 189), to which it is allied. It much resembles *Pt. semifascia* (Ent. Mag. ii. 494), but wants the stripe on the upper wing which distinguishes the latter.

Pteromalus Aglaus, mas. Viridis, abdomine cupreo basi viridi, antennis piceis, pedibus fulvis, femoribus fusco-cinctis, alis limpidis.

Corp. long. lin. $\frac{2}{3}$; alar. lin. 1.

Body rather narrow: head and thorax green: head a little broader than the thorax: antennæ filiform, piceous, a little longer than the thorax; first joint fulvous towards the base; club fusiform, more than twice the length of the tenth joint: thorax elliptical: prothorax short: scutum of the mesothorax rather long; sutures of the parapsides indistinct; scutellum subrhomboidal: propodeon large, short-obconical, declining, having three longitudinal striæ: podeon very short: abdomen elliptical, depressed, cupreous, shining, narrower and much shorter than the thorax; metapodeon green, rather large; octoon and following segments short: legs fulvous; coxæ green; tips of the tarsi piceous; a broad fuscous band across each of the hind thighs: wings limpid, rather narrow; nervures fulvous; humerus nearly twice the length of the ulna; radius shorter than the ulna; cubitus shorter than the radius; stigma very small.

July, near London.

It has some resemblance to *Pt. Pronax* (Monographia Chalciditum, i. 224).

Pteromalus Urgo, fem. Cyaneo-viridis, abdominis segmentis basi purpureis, antennis piceis, pedibus flavis, femoribus viridibus, alis limpidis.

Corp. long. lin. $1\frac{1}{4}$; alar. lin. $1\frac{3}{4}$.

Head and thorax bluish-green: head not broader than the thorax: antennæ piceous, subclavate, rather shorter than the thorax; first joint fulvous; club conical, flat, twice the length of the tenth joint: thorax oval: prothorax very short: scutum of the mesothorax large; sutures of the parapsides very indistinct; scutellum subrhomboidal: propodeon rather short, declining, narrower behind: podeon very short: abdomen fusiform, shining, green, slightly compressed, concave above, keeled beneath, rather narrower and very much longer than the thorax; metapodeon of moderate size; octoon and following segments shorter, some of them purple on the disc, excepting the hind border: legs yellow; coxæ and thighs green; tips of the tarsi piceous: wings limpid; nervures yellow; humerus much more than twice the length of the ulna; radius longer than the ulna; cubitus rather shorter than the ulna; stigma very small.

From the collection of the Rev. G. T. Rudd.

Differs slightly from *Pt. Amyntor* (List of Chalcidites in the British Museum, p. 48).

Pteromalus Orinus, fem. Viridis, abdomine cupreo basi viridi, antennis fuscis pedibus fulvis, femoribus viridibus, alis limpidis.

Corp. long. lin. $\frac{3}{4}$; alar. lin. $1\frac{1}{4}$.

Head and thorax green: head a little broader than the thorax: antennæ slender, subclavate, fuscous, rather longer than the thorax; first joint fulvous; club conical, twice the length of the tenth joint: thorax oval: prothorax very short: scutum of the mesothorax almost flat; sutures of the parapsides indistinct; scutellum subrhomboidal, having a slight trace of a transverse suture: propodeon of moderate size, obconical, declining, finely squameous: podeon very short: abdomen elliptical, cupreous, shining, depressed above, slightly keeled beneath, green towards the base, narrower but not longer than the thorax; metapodeon of moderate length; octoon and following segments shorter: legs pale fulvous; coxæ and thighs green, tips of the latter fulvous; tips of the tarsi fuscous: wings limpid; nervures fulvous; humerus twice the length of the ulna; radius longer than the ulna; cubitus rather shorter than the radius; stigma very small.

Found near London.

Allied to *Pt. latifrons* (Ent. Mag. ii. 501).

Scladerma, *Walker.*

Scladerma Lalage, fem. Viridis, abdomine cyaneo, antennis nigris, pedibus fulvis, femoribus viridibus, tibiis tarsisque apice fuscis, alis sublimpidis.

Corp. long. lin. $1\frac{1}{4}$; alar. lin. $2\frac{1}{2}$.

Head and thorax bright green, convex, finely squameous: head a little broader than the thorax: antennæ subclavate, black, rather longer than the thorax; first joint long, slender, green; second long-cyathiform; third and fourth very minute; fifth and following joints to the tenth successively decreasing in length; club fusiform, much longer than the tenth joint: thorax elliptical: prothorax rather short, narrower in front: scutum of the mesothorax long; sutures of the parapsides very distinct; scutellum subrhomboidal, bluish-green, having a distinct transverse suture near its tip; axillæ large, nearly meeting between the scutum and the scutellum: propodeon large, obconical, declining, slightly ridged: podeon very short, but distinct: abdomen oval, blue, almost flat above, deeply keeled beneath, much shorter than the thorax; metapodeon rather large, conical, concave along the disc; octoon and following segments short, their hind borders cupreous: legs fulvous; coxæ and thighs green, tips of the latter fulvous; tips of the tibiæ and of the tarsi of the middle and of the hind legs piceous: wings nearly limpid; nervures piceous; humerus a little more than twice the length of the ulna; radius very much longer than the ulna; cubitus much shorter than the ulna; stigma of moderate size.

Found by Dr. Greville near Edinburgh.

It is nearly allied to *S. convexum* (Ent. Mag. ii. 290).

I add a few words in explanation of the terms, not in general use, which I have employed for describing the parts of insects in the preceding pages:

Propedes, or fore legs.
Mesopedes, or middle legs.
Metapedes, or hind legs.
Proalæ, or fore wings.
Metalæ, or hind wings.
Propodeon, or the segment between the metathorax and the petiole.
Podeon, or the petiole.
Metapodeon, or the first segment of the abdomen.
Octoon, or the second ditto.
Ennaton, or the third ditto.
Decaton, or the fourth ditto.
Protelum, or the fifth ditto.
Paratelum, or the sixth ditto.
Telum, or the seventh ditto.

—See the 'Entomological Magazine,' vol. i. p. 400, &c.

THE

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MDCCCXLVII.

CONTENTS.

IX. *An Enumeration of the Plants of the Galapagos Archipelago; with Descriptions of those which are new.* *By* JOSEPH DALTON HOOKER, *Esq., M.D., F.L.S. &c. &c.*

Read March 4th, May 6th, and December 16th, 1845.

FOR the materials upon which the following Flora of the Galapagos Islands has been constructed I am mainly indebted to Charles Darwin, Esq., who formed a collection of plants in that group during the voyage of H. M. Ship 'Beagle.' On my return from the Antarctic expedition, I expressed to that gentleman a wish to examine the botanical results of Captain Fitzroy's voyage, and to incorporate the plants with my own 'Flora Antarctica,' and through his kindness the collections in question were liberally given over to me by Professor Henslow of Cambridge, in whose charge they had been placed for the University. Mr. Darwin drew my attention to the striking peculiarities which mark the Flora of the Galapagos group, and to the fact that the plants composing it not only differ from those of any other country, but that each of these islands has some particular productions of its own, often representatives of the species which are found in the others of the group.

My first attempt to give any clear exposition of these features in the vegetation was frustrated by the novelty of the species themselves, forbidding any direct comparison of the Flora with that of adjacent countries. A clear determination of the plants themselves was indispensable; and I have now the honour of laying before the Society the names of the species, with descriptions of what have proved to be new, and some notices as to the ranges of others previously known. I must here beg to acknowledge the assistance I received from Professor Henslow, by whom the investigation of the species was commenced. These, together with some others collected by various voyagers, though perhaps composing but a small proportion of the Flora of the

Galapagos, afford materials for making some general remarks upon the botany of these islands and its relation to that of other countries.

FUNGI.

1. SCHIZOPHYLLUM COMMUNE, *Fries*.
Hab. Charles Island, *Charles Darwin, Esq.*

LICHENES.

2. USNEA PLICATA, *Ach. Syn. Meth.* p. 305.
Hab. James Island, "hanging from the boughs of the trees in the upper damp region, where it forms a considerable proportion of the food of the large tortoise." (*Charles Darwin, Esq.*)

Cladonia rangiferina is one of the few parallel instances of lichens constituting the main subsistence of any animal among the higher orders. This species is abundant in all temperate and tropical countries.

3. BORRERA LEUCOMELAS, *Ach. Lichenogr. Univ.* p. 499, *var. filiformis*.
Hab. James Island, *Charles Darwin, Esq.*

The same slender variety is common on the Peruvian coast. The species is a very rare English, though a common tropical plant.

4. STICTA AURATA, *Ach. Syn. Meth.* p. 231.
Hab. James Island, *Charles Darwin, Esq.*

Also an exceedingly scarce English lichen, much more common in the warmer latitudes.

HEPATICÆ*.

5. JUNGERMANNIA VAGINATA, *Sw.*
Hab. James Island and Charles Island, *Charles Darwin, Esq.* A West Indian plant.

6. J. TAMARISCI, *Hook.*
Hab. Charles Island, *Charles Darwin, Esq.* A British and very widely diffused species.

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* For the determination of the *Musci* and *Hepaticæ* I am indebted to the kindness of William Wilsón, Esq. of Warrington.—J. D. H.

7. J. FILIFORMIS, *var. β. laxa, Sw.*

Hab. Charles Island, *Charles Darwin, Esq.* Also found in several tropical localities.

8. J. FILICINA, *Hook.*; et *var. β. tenuis.*

Hab. James Island. *β.* James and Charles Islands, *Charles Darwin, Esq.* Also a native of the West Indies and South America.

9. J. ATRATA, *Sw.*?

Hab. Charles Island, *Charles Darwin, Esq.* Found also on the American continent.

10. J. PUNGENS, *Wils. MSS.*; caule bipinnato, ramis attenuatis, foliis patulis remotis e basi cordatâ longe acuminatis apicibus siccitate porrectis, stipulis oblongis profundè bifidis basi cordatis amplexicaulibus (dorso nec prominulo) cruribus attenuatis.—*Wils. MSS.*

Hab. Charles Island, *Charles Darwin, Esq.*

The *J. atrata* of Swartz, to which this is allied, has the stipules spurred at the back, and the apices of the leaves bent inwards and concealed when dry.

MUSCI.

11. MACROMITRIUM SCABRISETUM, *Wils. MSS.*; repens, surculis brevibus erectis, foliis subpatentibus lineari-lanceolatis acutis plicato-carinatis (nervo subexcurrente), setâ scabrâ, calyptrâ glabrâ (capsulâ sulcatâ?); operculo longirostro.—*Wils. MSS.*

Hab. Charles Island, *Charles Darwin, Esq.* Probably on trunks of trees in the higher regions of the island.

Very closely allied to an undescribed species from Columbia in Herb. Hook., as also to the *Schlotheimia longifolia,* Hook. The seta being rough, this moss should perhaps be referred to the genus *Trachypus,* R. and Hornsch.

12. NECKERA vel PILOTRICHUM sp.? (barren).

Hab. James Island, *Charles Darwin, Esq.*

FILICES.

13. POLYPODIUM PARADISEÆ, *Langsd. & Fischer.*

Hab. James Island, *Charles Darwin, Esq.* Abundant in all the warm parts of South America and the West Indies.

14. P. PLEIOSOROS, *Hook. fil.*; fronde ovatâ bipinnatâ, pinnis linearibus elongatis acuminatis; pinnulis lineari-oblongis approximatis apicibus rotundatis inferioribus grossè crenato-dentatis suprà pilis sparsis hirtis subtùs molliter pubescentibus, soris 10–14, rachibus costisque pubescentibus paleaceisque.

Hab. James Island, *Charles Darwin, Esq.*

Rachis paleacea pilisque brevibus albidis obsita, paleis elongatis brunneis. Pinnæ 6 unc. longæ, ad medium lineares deinde ad acumen gradatim attenuatæ, 1 unc. latæ. Pinnulæ sub-50, $\frac{1}{2}$–$\frac{2}{3}$ unc. longæ, $\frac{1}{4}$ latæ, sessiles, membranaceæ v. subcoriaceæ, supernè confluentes, suprà pubescentes, subtùs pilosæ, pilis sparsis elongatis, marginibus supernè crenatæ. Sori plurimi, medio venulæ inter costam marginemque siti.

Only the upper portion, about half a foot long, of an apparently very large frond exists in Mr. Darwin's collection, and it does not accord with any described species nor with any in the Hookerian herbarium. The veins are twice or thrice forked, and the sori are situated on the middle of the first superior branch.

15. P. PALEACEUM, *Hook. fil.*; fronde latè ovatâ bi- vel tripinnatâ, pinnis primariis alternis remotis elongato-ovatis curvatis secundariis profundè pinnatifidis linearibus suprà pilis rufis densè vestitis subtùs glabriusculis; segmentis oblongis obtusis infimis crenato-dentatis, soris 6–8 parvis, rachi densè subappressèque paleaceâ.

Hab. Charles and James Islands, *Charles Darwin, Esq.*

Rachis gracilis, pallida, paleis elongatis subulatis fuscis operta, pubescens, tuberculis minimis asperula. Pinnæ remotæ, 8–10 unc. longæ, 3–4 latæ, ultra medium in acumen elongatum gradatim attenuatæ. Pinnulæ 30–40, superiores decurrentes, inferiores 2–3 unc. longæ, $\frac{1}{2}$–$\frac{2}{3}$ latæ, profundè pinnatifidæ, basi subpinnatæ, membranaceæ. Sori parvi, ut in *P. pleiosoro* siti. Venæ bis furcatæ, ramo superiore apicem segmenti attingente.

Only a portion of a frond was collected, which is about two feet long.

16. MARGINARIA INCANA, *Presl* (Polypodium, *Sw.*), *var.* frondibus plerumque pinnatis, pinnis inferioribus 2–3 furcatis.

Hab. Charles Island, *Charles Darwin, Esq.* Albemarle Island, *Macrae.*

Though a most abundant plant in all the tropical and warm parts of America, and even found so far north as Boston, U.S., the only specimens which have come under my observation with the lower pinnæ forked, are the above, and Mr. Purdie's from Jamaica.

17. M. ENSIFOLIA, *Presl* (Polypodium, *Sw.*).

Hab. James Island. Common to all the warm regions of South America and the West Indies.

18. PLEOPELTIS LEPIDOTA, *Willd.*

Hab. Charles Island, *Charles Darwin, Esq.* Abundant throughout the tropics, and probably not distinct from the following species.

19. P. MACROCARPA, *Kaulf.*

Hab. James Island, *Charles Darwin, Esq.*

The fronds in these specimens are strictly lanceolate and attenuate at both ends; exactly according with individuals from Peru.

20. P. AUREA, *Presl* (Polypodium, *L.*).

Hab. James Island, *Charles Darwin, Esq.* Also a frequent plant in South America.

Fronds generally pinnatifid, but in one (probably monstrous) specimen, there are four digitate spreading pinnæ.

21. CAMPYLONEURUM PHYLLITIDIS, *Presl* (Polypodium, *Sw.*).

Hab. James Island, *Charles Darwin, Esq.* Common all over tropical South America.

22. OLFERSIA LANGSDORFFII, *Presl* (Acrostichum, *H. & G.*).

Hab. James Island, *Charles Darwin, Esq.*

23. O. VISCIDA, *Presl* (Acrostichum, *Auct.*).

Hab. James Island, *Charles Darwin, Esq.* West Indies, abundant.

24. HEMIONITIS PINNATA, *Hook. fil.*; frondibus biformibus (ex eadem radice) suprà nudis subtùs densè rufo-paleaceis, sterilibus sessilibus elongato-spathulatis obtusis, fertilibus sublongè stipitatis pinnatis, pinnis linearibus elongatis obtusis integerrimis subtùs undique soriferis, soris paleaceis.

Hab. Charles Island, *Charles Darwin, Esq.*

Radices cæspitosi, fibrosi; fibris atris repentibus. Frondes steriles 10–12, undique patentes.

sessiles, 4–5 unc. longæ, 1 latæ, firmæ sed teneræ, supernè glaberrimæ, medio obscurè sulcatæ, siccitate pallidè flavo-virides, subtùs paleis elongatis sericeis rufo-fulvis densè vestitæ, apicibus rotundatis, marginibus siccitate subundulatis lente recurvis, venis reticulatis obscuris, areolas elongatas efformantibus intra marginem anastomosantes. Frondes fertiles 2–3, 3 unc. longæ, suberectæ, supernè in laminam pinnatifidam expansæ, stipite rachique politis paleis elongatis obsitis. Pinnæ 5–7, superiores confluentes, omnes patentes, coriaceæ, obtusæ, $\frac{3}{4}$ unc. longæ, $\frac{1}{5}$ latæ, suprà nudæ, margine angustè revoluto subindusiiformi. Sori luridè rufo-brunnei, paginam inferiorem frondis omninò tegentes, paleis subsericeis operti.

The venation of the barren frond is that of a true *Pœcilopteris*, but in the (occasional) presence of a free venule it approaches *Acrostichum*. The fertile fronds resemble those of *Notochlæna*, though the sori are decidedly spread over the entire under-surface of the frond.

25. Pteris lutea, *Cav.*, *Spr. Sp. Pl.* vol. iv. p. 74.
Hab. James Island, *Dr. Scouler.* Galapagos, *Mr. Cuming.*

Our specimens agree with the very imperfect description of Sprengel, except that the pinnæ are nearly opposite. The same plant is also an inhabitant of Peru, in the specimens from which country the lower pinna is generally forked.

26. Gymnogramma chærophylla, *Desv.*
Hab. Charles Island, *Charles Darwin, Esq.* Brazil, Paraguay, Jamaica.

27. Litobrochia pedata, *Presl* (Pteris, *L.*).
Hab. Charles and James Islands, *Charles Darwin, Esq.*, *Douglas & Cuming.* Also found in the West Indies, Brazils, &c.

28. Adiantum cuneatum, *Willd.*
Hab. James Island, *Charles Darwin, Esq.*, & *Dr. Scouler.* A West Indian plant.

29. A. parvulum, *Hook. fil.*; glaberrimum, fronde tenerrimâ tripartitâ, ramis pinnatis, pinnis patentibus breviter petiolatis subrhombeo-oblongis apicibus rotundatis margine inferiore recto superiore denticulato ad soros emarginato basi truncato, stipite glaberrimo, rachi vix pilosâ.
Hab. Charles Island, *Charles Darwin, Esq.*

Stipes 3-uncialis, filiformis, glaberrima. Rami 3, laterales, horizontaliter patentes, breviusculi. Rachis supernè præsertim parcè pubescens. Pinnæ sub-10, membranaceæ, $\frac{1}{3}$ unc. longæ, $\frac{1}{5}$ latæ, breviter petiolatæ, lineis radiantibus subrugosæ, margine superiore siccitate subcrispato integro; basi truncatâ, rachi parallelâ. Sori pauci, parvuli, quâvis pinnulâ fundo sinûs solitarii.

A small species, most nearly allied to a native of New Zealand, in which the upper margins of the pinnæ are crenate.

30. A. Henslovianum, *Hook. fil.*; frondibus bi- v. rarius tripinnatis elongato-ovatis, pinnis primariis attenuatis; secundariis raris; pinnulis laxis divaricatis breviter petiolatis rhombeo-lunulatis membranaceis supernè crenato-lobatis, soris in fundo loborum majusculis, rachi puberulâ, stipite rufo-brunneo.

Hab. James and Charles Islands, *Charles Darwin, Esq.*

Species pulcherrima, elata, sub-3-pedalis. Stipes gracilis, nitida, canaliculata, fundo sulci pubescens, $\frac{1}{2}$ ped. longa. Pinnæ primariæ alternæ, remotæ, lineares, gradatim acuminatæ, 6 unc. longæ, $\frac{3}{4}$ latæ, scabridæ, ut et rachis pilis rigidis sparsæ. Pinnæ secundariæ (dum adsunt) irregulariter insertæ, cum pinnulâ sæpe alternantes, hinc rami quasi proliferi evadunt. Pinnulæ 30–40, alternæ, horizontales, margine inferiori lunatæ, ad apices rotundatæ, superiores basi truncatæ v. in auriculam productæ, 4-fidæ, segmentis quadratis emarginatis ad apices soriferis. Sori plurimi. Indusia majuscula.

31. Blechnum occidentale, *Sw.*

Hab. James Island, *Charles Darwin, Esq.*

32. Asplenium subulatum, *Hook. & Arn. in Bot. Beechey Voy.* p. 313. t. 72.

Hab. Charles Island, *Charles Darwin, Esq.* Also found in Jamaica, Mexico and Columbia.

33. A. furcatum, *L.*

Hab. James Island, *Charles Darwin, Esq.* Found in all warm latitudes, and as far north as in Madeira.

34. A. Macræi, *Hook. & Grev. Ic. Fil.* t. 217.

Hab. James Island, *Charles Darwin, Esq.*

Probably a very common West Indian species, of which, or its varieties, many others have been made.

35. A. marinum, *L.*, var. *auriculatum*; fronde ovato-lanceolatâ pinnatâ, pinnis petiolatis lineari-oblongis obtusis crenatis basi cuneatis sursùm auriculatis.

Hab. Charles and James Islands, *Charles Darwin, Esq.*

A very common South American plant, which I feel little hesitation in referring to *A. marinum.* The narrower pinnæ, auricled at the base, and the small size are the chief distinctions between this and the English form. One of Mr. Darwin's specimens cannot be distinguished from the *A. marinum* of New Brunswick in Canada; while some states of the plant from Staffa exhibit rhomboid or nearly orbicular pinnæ. In others, from the Galapagos, the pinnæ, instead of being auricled at the upper base, are there deeply divided down to the costa. In several of the fronds of the Guatemala, Columbian and Caraccas specimens, the pinnæ become longer and gradually attenuated, when the plant is hardly to be known from *A. auritum,* Sw.

36. A. nigrescens, *Hook. fil.*; fronde elongatâ pinnatâ, pinnis petiolatis ovato-v. lineari-lanceolatis acuminatis præsertim ad apices crenato-dentatis supernè obliquis basi cuneatis; terminali majusculâ basi sublobatâ, soris brevibus obliquis oblongo-ellipticis, stipite rachique glaberrimis.

Hab. James Island, *Charles Darwin, Esq.*

Frons bipedalis. Stipes rachisque glaberrimi, nitidi, validi, anticè canaliculati. Pinnæ remotæ, 3 unc. longæ, $\frac{1}{2}$–$\frac{3}{4}$ latæ, membranaceæ, siccitate nigrescentes, plus minusve serrato-dentatæ, dentibus angustis obtusis versus apices explanatis basi cuneatis. Sori 15–30 quâvis pinnâ, breves $\frac{1}{2}$ lin. longi, costæ subapproximati. Indusia membranacea, oblonga.

Near *A. salicifolium,* L., but the upper base of the pinna, though rather gibbous, is by no means lobed, and the sori are very unlike. It has also the aspect of *A. lucidum,* Forst., the sori being however much shorter, and the texture of the plant totally different. It is Mr. Gardner's n. 5942, from Rio, and is probably a frequent though overlooked South American fern.

37. Nephrodium pectinatum, *Presl* (Aspidium, *Willd.*).

Hab. James Island, *Charles Darwin, Esq.* Also found in all the warm districts of South America and the West Indies.

38. Nephrodium molle, *Schott.* (Aspidium, *Sw.*)

Hab. James Island, *Charles Darwin, Esq.* A species of South America and the West Indies.

39. Polystichum coriaceum, *Presl.* (Aspidium, *Sw.*)

Hab. James Island, *Charles Darwin, Esq.* Very common in all warm latitudes.

In Mr. Darwin's collections there is another fern, in a barren state, from Chatham Island, with a tripinnate frond; it is probably a species of *Polypodium.*

Monocotyledones.

Gramineæ.

40. Paspalum penicillatum, *Hook. fil.*; glaberrimum, spicis numerosis in paniculam subverticillatam dispositis ad axillas ciliatis, rachi latâ undulatâ, spiculis solitariis serialibus oblongis glaberrimis nitidis, culmis adscendentibus, foliis ovato- vel elongato-lanceolatis planis.

Hab. Charles Island, *Charles Darwin, Esq.*

Culmi $1\frac{1}{2}$–2 ped. alti, teretes, dichotomè ramosi, nodis tumidis nigrescentibus, internodiis 2–3-uncialibus fusco-lineatis politis. Vaginæ internodiis æquilongæ, laxè vaginantes, glaberrimæ, sulcatæ, ad basin usque fissæ, juniores ad margines ciliatæ, ad orem contractæ; ligula scariosa, lacera, semilunaris. Foliorum lamina 3 unc. longa, latiuscula, acuminata, plana, margine sub lente scabrido-ciliata, undulata, ad basin contracta, subcordata, membranacea, subtùs glabrescens, striata. Panicula erecta, sub 5 unc. longa. Rami (spicæ) 15–20, erecto-patentes, solitarii binive, ad axillas ciliato-barbati, 1 unc. longi, interdum unilaterales. Rachis latiuscula, concava, dorso carinata, 1 lin. lata, sub lente scabrida, margine undulata, inferior 15–30-flora, ultra flores in acumen producta. Spiculæ parvæ, in costam alternatim flexuosam dispositæ, breviter pedicellatæ, albidæ, glaberrimæ, $\frac{3}{4}$ lin. longæ, pedicello articulato cum flore ciliato. Gluma inferior membranacea, concava, vix trinervis, nervis lateralibus valdè inconspicuis, marginibus involutis; superior (seu palea floris inferioris) subsimilis, 3-nervis, nervis obscuris. Palea inferior coriaceo-chartacea, medio tenuissimè 1-nervis; superior enervis, cymbiformis, stamina ovariumque includens, marginibus incurvis supra medium in lobos 2 oppositos productis.

Very near the *P. Walterianum,* Schultz (Kunth, Agrost. p. 41) and to *P. fluitans,* Lam. It differs from those species and all their allies in having smooth leaves and bearded axils to the spikes, also in the smooth spiculæ which are placed in a single series, and faint nerves.

41. P. LONGEPEDUNCULATUM, *Leconte*; *fide Nees in Herb. Hook.*, var. foliis molliter pubescentibus.

Hab. Charles Island, *Charles Darwin, Esq.* Albemarle Island, *Mr. Macrae.*

Culmi subsolitarii, simplices, erecti, 2–3-pedales, glaberrimi. Vaginæ internodiis breviores, glabræ, pilosæ v. ciliatæ. Folia latiuscula, plana, 5–8 unc. longa, $\frac{1}{2}$ unc. lata, utrinque molliter pubescentia, marginibus ciliatis, basi barbata. Racemus elongatus, 2–5 uncialis, spicis 4–8 alternis, patentibus, 1–1$\frac{3}{4}$ unc. longis; rachi flexuosâ, glabrâ vel minutè scabridâ, spiculis angustiore, basi interdum barbatâ. Spiculæ sub 10, geminæ, glaberrimæ, latè ovato-orbiculatæ, $\frac{1}{12}$ unc. longæ. Gluma inferior fusco-maculata, 3-nervis, nervis 2 marginalibus; superior plana, medio carinata, nervis 2 marginalibus inconspicuis.

These specimens agree with others from Brazil (Piauhy, Gardner, n. 2339) except that the vaginæ are not so hirsute, a character by no means constant even in the individuals from the latter country. In the 'Flora Brasiliensis' of Martius, Nees quotes the *P. longepedunculatum* as a synonym of *P. arenarium*, from which however it remarkably differs in the spikes being more numerous (3–6), the rachis narrower, the spiculæ and glumes quite smooth, and in the softly pubescent surface of the leaves, which latter vary much in length and breadth. Our specimens again resemble those of *P. supinus*, Bosc. (Mart. *l. c.* p. 53), differing in the culms not being procumbent, and that the glumes are 3- (not 5-) nerved; and they also resemble *P. plicatulus*, Mart. (*l. c.* p. 67), with the exception of the glumes being all smooth, the lower never undulate, and the flowers much smaller than in any of the numerous authentically named specimens which exist in the Hookerian Herbarium.

42. PANICUM COLONUM, *L.*

Hab. Charles Island, *Charles Darwin, Esq.*

43. SETARIA ROTTLERI, *Spr.*

Hab. Albemarle Island, *Mr. Macrae.*

These specimens do not differ from East Indian ones. The species is probably of very common occurrence.

44. SETARIA, n. sp.? A highly remarkable and distinct-looking grass, but in too imperfect a state to allow of my pronouncing it absolutely new.

Hab. Albemarle Island, *Mr. Macrae.*

Gramen rigidum, glaberrimum, læve. Radix, ut videtur, vagè repens. Culmi prostrati, elongati, nudi, geniculati, pluri-nodosi, ad nodos dichotomè ramosi, teretes, glaberrimi, duri; nodis tumidis. Rami ex imâ basi curvatâ adscendentes, 4–6-pedales, deinde erecti, rigidi, apicem versus foliosi, internodiis sub 2–3-uncialibus. Vaginæ cylindraceæ, internodiis ½ breviores, striatæ, ad basin fissæ, marginibus mox involutis, 3–4 unc. longæ, 2 lin. latæ. Spicæ solitariæ et binæ, terminales vel axillares, filiformes, foliis subbreviores. Rachis undulata, sub lente pubescens. Spiculæ alternæ, subsessiles, distichæ? ⅛ lin. longæ, glaberrimæ, basi setis brevibus scabridis suffultæ. Gluma inferior minima, orbiculari-ovata, 3-nervis, paleis ⅓ brevior, ad apicem acuminatum eroso-ciliata. Floris inferioris palea ovato-lanceolata, acuminata, chartacea, 5-nervis, glabra; floris superioris palea inferior subsimilis, concava, 3-nervis; superior subæquilonga, 2-nervis. Squamulæ 2, obovato-quadratæ, truncatæ. Stamina 3. Ovarium minimum, ovatum; stylis 2 elongatis; stigmatibus plumosis. Caryopsis latè ovata, obtusa.

Apparently a widely-creeping and probably binding littoral grass. The upper palea of the fertile flower is decidedly 2-nerved.

45. Eutriana pilosa, *Hook. fil.*; spicis horizontalibus, locustis sub 4 confertis 2-floris, floris inferioris paleâ inferiore 3-nervi ad apicem trifidâ segmentis subulato-aristatis; superiore bifidâ bicarinatâ carinis minutè scabridis, floris superioris paleâ 1 (nempe exteriore) bifidâ inter segmenta ciliatâ longè aristatâ nervis lateralibus ultra segmenta in aristas breves productis, foliis vaginisque suprà laxè patentim pilosis.

Hab. Albemarle Island, *Mr. Macrae.*

Gramen erectum, gracile, 1½-pedale. Radix fibrosa. Culmi fasciculati, e basi ramosi, erecti, vel geniculati et adscendentes, ter quaterve nodosi, teretes, glaberrimi, striati, foliosi, nodis contractis brunneis. Vaginæ cylindraceæ, sulcatæ, infernè glabræ, supernè parcè pilosæ, pilis basi minutè tuberculatis, infra medium interdum ad basin fissæ, 2–3 unc. longæ, ad orem penicillato-barbatæ. Folia plana, lineari-lanceolata, divaricata, attenuata, acuminata, pilosa, pilis laxis mollibus patulis, 2–3 unc. longa, 1½ lin. lata. Spicæ horizontales, rariùs suberectæ, brevi-pedunculatæ, secundæ, ¼ unc. longæ; rachis compressa, ultra locustas in laminam subulatam ad apicem bifidam producta. Locustæ in quâvis spicâ sub 4, fasciculatæ, bifloræ; flos superior imperfectus. Glumæ 2, acuminatæ, 1-nerves, nervo lato dorso scabrido; superior apice vix bifida, subcarinata; inferior minor basi subremota. Flos inferior hermaphroditus, breviter pedicellatus. Paleæ 2, inferior ovato-lanceolata, dorso supernè 3-nervis, nervo medio infernè evanido, segmentis subulato-aristatis scabridis; superior subæquilonga, lineari- v. ovato-lanceolata, ad apicem breviter bifida, 2-carinata, carinis scabridis, marginibus involutis. Squamulæ 2, obovato-cuneatæ, obliquè truncatæ, emarginatæ. Stamina 3; antheris elongatis, stramineis. Ovarium ovatum; stylis 2, terminalibus; stigmatibus plumosis.

Allied to *E. affinis*, but more slender in all its parts and smaller, with shorter racemes.

The species of this curious genus, among which much confusion exists, are almost confined to America, so far as hitherto known, two only being stated as common to that continent and the Philippine Islands. In all that I have examined, the flat rachis which bears the locustæ is produced, beyond the insertion of the latter, into a scabrid rigid lamina, often bifid at its apex and forming an incomplete terminal spikelet. The number of locustæ on the rachis is variable, and they are generally in different degrees of perfection, the lower often neuter. In none of the other species have I seen traces of a third floret, or of any reproductive organs in the upper one of the two*.

46. Aristida subspicata, *Rup. & Trin. Sp. Gram. Stip.* p. 125. *ex Act. Acad. Imp. Petrop.*, ser. vi. tom. v.
Hab. Albemarle Island, *Mr. Macrae.*

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* The following are a few observations on the American species allied to *E. pilosa*:—

1. *E. curtipendula*, Trin. Kunth, Agrost. p. 280.

This species varies greatly in the degree of perfection of its upper floret, which is sometimes, though very rarely, entirely wanting. More generally it consists of a simple subulate arista, placed at the back of the upper palea of the lower floret. It is often triaristate, like that of *E. aristidoides*, Kunth, and again in other specimens (Herb. Gouan, received from seed and cultivated from Mexico); the upper floret is composed of a fully-developed lower palea, bifid, 2-lobed or bipartite, 3-nerved, the middle nerve produced into a long arista, the lateral ones near the margins of the lateral segments and produced beyond them into aristæ. Other upper florets of the same specimen present only the trifid arista.

2. *E. affinis*, Hook. fil.; spicis racemosis secundis reflexis, locustis 4–7 fasciculatis bifloris, glumis subulato-aristatis infra apicem subtrifidis, floris inferioris paleâ inferiore trifidâ: segmentis aristatis superiore subæquilongâ bifidâ, floris superioris paleâ inferiore scariosâ profundè bifidâ inter segmenta aristatâ trinervi nervis lateralibus submarginalibus in aristas productis; paleâ superiore

47. A. REPENS, *Rup. & Trin. l. c.* p. 128.

Hab. Galapagos, *Douglas.* No doubt James Island; the only one I believe upon which Mr. Douglas landed.

There is no specimen of this plant in the Hookerian Herbarium.

48. POA (*Eragrostis*) PILOSA, *L. Kunth, Agrost.* p. 329.

Hab. James Island, *Charles Darwin, Esq.*

These specimens do not differ from others of North Africa, which are not hairy at the lower base of the panicles. Except with very slight variations in the size and acuteness of the florets, the same plant is found in Peru, the East Indies (sub nom. ***P. punctata***, Roxb., paleæ sometimes scariose), North America (***P. tenuis***, Ell. δ. *capillaris*), Buenos Ayres, Brazil (***P. polytricha***, Nees), and Mexico and Brazil (***P. Mexicana***, Link), specimens of which last, in the Hookerian Herbarium, from Hort. Reg. Berol., entirely coincide with the Galapagos Island plant.

49. POA (*Eragrostis*) CILIARIS, *L. Kunth, Agrost.* p. 337.

Hab. Var. paniculâ elongatâ, vaginis hirsutis, culmis erectis.—Albemarle Island, *Mr. Macrae.*

Var. paniculâ coarctatâ, vaginis pilosis, culmis suberectis.—Chatham Island, *Charles Darwin, Esq.*

Var. paniculâ ellipticâ vel elongato-ovatâ, vaginis glabriusculis, culmis tenuibus procumbentibus.—Charles Island, *Charles Darwin, Esq.*

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minimâ (rariùs 0) integrâ v. bifidâ, foliis glaberrimis v. parcè pilosis. *Atheropogon apludoides*, *Heterostegon curtipendulus* et *Eutriana curtipendula*, Schweinitz in Herb. Hook.

Hab. North America, *Schweinitz.* St. Louis Missouri, and Texas, *Drummond.*

Very nearly allied to *E. curtipendula*, but differs in the much smaller spikelets, which bear more numerous (generally 6) flowers. The upper flower too has almost invariably 2 paleæ, and is more perfect than in that species.

3. *E. gracilis*, Hook. fil.; glaberrima, paniculâ strictâ erectâ spiculis secundis sessilibus trifloris, glumis inæqualibus superiore flosculum solitarium æquante subacutâ integrâ, paleis subæquilongis inferiore apice breviter bicuspidatâ; superiore latiusculâ convolutâ apice bifidâ dorso basi setulâ subæquilongâ acutâ, culmo erecto gracili folioso, foliis longè lineari-lanceolatis culmo brevioribus in acumen elongatum gradatim productis.

Hab. Tucuman, *Tweedie.*

A most distinct species, well-marked by its single-flowered locustæ, the subcaudate apices of the leaves and slender habit.

Apparently a highly variable plant in the length of the culms, habit of growth and hairiness of the vaginæ. Some of Mr. Macrae's specimens (from Albemarle Island) are erect, upwards of a span long, with the slender spikes two or three inches long, and the vaginæ hairy with long soft-bearded cilia seated on conspicuous tubercles; others, from the same locality, are hardly at all hairy and have smooth vaginæ: these agree with individuals from Brazil (*Martius*) and the Island of St. Vincent. Mr. Darwin's Charles and Chatham Island specimens are distinguished by their erect or procumbent culms, their more contracted or elliptical dense spikes, their much smaller leaves and their nearly smooth sheaths. In the *P. Peruviana*, Jacq., which has hirsute leaves, the upper valves of the glumes are described by Willdenow as subciliated, a character noticed by Jacquin himself (Coll. 1. p. 107), who says, "valvulæ dorso aculeatæ," but in his figure 1. t. 18, they are represented quite smooth. His specimens were raised from seed. I do not observe the length of the cilia to vary in any of the specimens (in Herb. Hook.), nor in the *P. Boryana*, Willd. (Mauritius), which seems to me undistinguishable from the West Indian plant. A small state of the same has been collected near Gedda in Arabia.

50. CALAMAGROSTIS PUMILA, *Hook. fil.*; pilosa pilis patentibus, paniculâ erectâ ovatâ laxâ compressâ, glumis lanceolato-subulatis flosculis longioribus 1–5 floris, flosculis pedicellatis basi barbatis pilis strictis superioribus pedicellatis, paleâ inferiore oblongo-lanceolatâ concavâ bifidâ trinervi nervo medio in aristam brevem producto; superiore oblongâ apice truncatâ bicarinatâ carinis scabridis, culmis basi geniculatis ramosis foliis involutis setaceis longioribus.

Hab. Albemarle Island, *Mr. Macrae.*

Gramen spithamæum, erectum. Radix fibrosa, fibris pilosis. Culmi cæspitosi, basi bis terve divisi, teretes, nodosi, ad nodos puberuli, obscurè striati, foliosi. Vaginæ vix ad basin fissæ, 1 unc. longæ, teretes, pilosæ, pilis mollibus patentibus in tuberculis minutis sitis; ligulâ brevi, scariosâ. Folia 1–2 unc. longa, erecto-patentia, lineari-lanceolata, sub 1–1½ lin. lata, involuta, laxè pilosa, ut vaginæ dorso tuberculata. Panicula 1½ unc. longa, ¼–½ lata, erecta, ovato-lanceolata. Rachis scabrido-ciliata, sulcata. Locustæ sessiles v. breviter pedicellatæ, sub 2 lin. longæ, 4–5-floræ, flore terminali abortivo, tabescente. Glumæ 2, subæquales, lanceolatæ, concavæ, acuminatæ; inferior minor, dorso latè 1-nervi versus apicem nervoque scabrida; superior longior 1-nervis. Flos infimus subsessilis, cæteri pedicellati. Paleæ 2, inferior glumis brevior, elliptico-linearis, basi extùs et ad margines sericeo-pilosa, ad apicem bifida, 3-nervis, nervo medio scabrido in aristam brevem rectam producto, nervis lateralibus submarginalibus infra segmentorum apices evanidis; superior inclusa, inferior $\frac{1}{3}$ brevior, membranacea, ad apicem minutè lacero-fimbriata, carinis tenuiter ciliatis, marginibus argutè inflexis. Squamulæ 2, majusculæ, obovato-cuneiformes, obliquè truncatæ. Stamina 3. Ovarium minimum, breviter stipitatum, obovatum; stylis 2, basi discretis; stigmatibus plumosis. Caryopsis glaberrima, lineari-oblonga, rufo-fulva, $\frac{2}{3}$ longit. paleæ inferioris.

I refer the genus of this grass with much hesitation to *Calamagrostis*. The habit is that of *Arundina*, Kunth, though it perfectly coincides with *Bromus* in generic character. The flowers are sometimes quite solitary, but often there are 3–5: the upper, where two or more exist, is generally rudimentary.

51. CYPERUS ROTUNDUS, *L.*

Hab. Albemarle Island, *Mr. Macrae.* Common also in all warm parts of South America.

52. C. STRIGOSUS, *L.*

Hab. Charles Island, *Charles Darwin, Esq.* Also found in the warm parts of South America, and at Oahu.

53. C. SURINAMENSIS, *Rottb.*

Hab. James Island, *Charles Darwin, Esq.*

Spikelets rather more lax than when in a more luxuriant state. The specimens are small, $1\frac{1}{2}$ foot high, and identical with others from the island of Trinidad.

54. C. INFLEXUS, *Muhl.*

Hab. Charles Island, *Charles Darwin, Esq.* Albemarle Island, *Mr. Macrae.* James Island, *Dr. Scouler.*

Identical with Canadian and other specimens. The species has a very wide range, from Canada to Texas in North America. It hardly differs from the *C. aristatus*, Rottb., found in Senegal, Senegambia and Abyssinia, and is also allied to a Guiana species, from which however it is quite distinct, and apparently is not a South American plant. There are two varieties in the collection.

Var. β. acaulis; foliis recurvis, capitulis inter folia subsessilibus.—Charles Island, *Charles Darwin, Esq.*

Var. γ. elongatus; foliis erectis flexuosis, culmis elongatis, 6-uncialibus.—Albemarle Island, *Mr. Macrae.*

55. C. RUBIGINOSUS, *Hook. fil.*; culmo aphyllo semitereti, involucro 6–8-phyllo, foliolis lineari-elongatis marginibus argutè ciliato-dentatis, umbellâ simplici 6–8 radiatâ, radiis inæqualibus patentibus, spicis 30–40 in capitulum congestis lineari-oblongis 8–12-floris, squamis valdè compressis obtusè carinatis navicularibus rostratis rostro recurvo dorso virescentibus lateribus rubiginosis binerviis, staminibus 3, stylo trifido.

Hab. Charles Island, *Charles Darwin, Esq.*

Erectus, glaberrimus, simplex, texturâ spongiosâ, bipedalis. Culmi erecti, nudi, semiteretes, supernè canaliculati, siccitate sulcati, sulcis nunc transversè rugosis, pallidè virescentes, glaberrimi, sub 2 lin. diam. Involucri foliola lineari-elongata, spithamæa et ultra, bi-tridentata, flexuosa, basi concava, brunnea, vaginantia, deinde plana, versus apices triquetra, marginibus carinâque argutè ciliato-dentatis. Umbella simplex, radiis 4–5 plerisque 2–3-uncialibus, semiteretibus, aliis brevioribus et 1–2 brevissimis, capitulis in axillis sessilibus. Capitula globosa, solitaria, rariùs gemina, $\frac{3}{4}$ unc. diam., e spicis 30–40 glomeratis formata. Spiculæ patentes, valdè compressæ, $\frac{1}{4}$ unc. longæ, lineari-oblongæ, obtusæ, 2 lin. latæ. Squamæ arctè et distichè imbricatæ, patentes, valdè compressæ, dorso nervosæ; nervo lato, obtusè carinato, virescente, in rostrum validum recurvum producto, scabrido, lateribus 2-nerviis, herbaceis, rubiginosis. Stamina 3; filamentis planis, membranaceis; antheris inclusis. Ovarium triquetrum, obovatum. Stylus basi vix incrassatus, deciduus, in ramos 3 flexuosos desinens. Achænium nigrum, squamâ $\frac{1}{2}$ brevius, trigonum.

A very distinct species, belonging to the section *Haspan* of Kunth. In the sharp recurved apices of the squamæ it approaches *C. inflexus*, the spikes assuming a similar squarrose appearance. Unfortunately the specimens are destitute of leaves.

56. MARISCUS MUTISII, *H. B. K.*; *var.* foliis culmo longioribus.

Hab. Albemarle Island, *Mr. Macrae.* Also found in New Grenada and Mexico by *Humboldt & Bonpland.*

Erectus, glaberrimus, basi foliosus. Radix fibrosa, fibris crassiusculis, fuscis. Culmi solitarii vel bini, basi incrassati, foliosi, supernè nudi v. foliosi, erecti, trigoni, $1\frac{1}{2}$ ped. alti,

$1\frac{1}{2}$ lin. diam., sulcati, simplices. Folia bipedalia, 3 lin. lata, numerosa, pleraque radicalia basi vaginantia; vaginis pallidè rufis, membranaceis, ad basin fissis, lineari-oblongis, truncatis, 1 unc. longis, compressis, $\frac{1}{2}$ unc. latis; lamina longissimè linearis, flexuosa, plana, nervosa, dorso acutè carinata, striata, flexuosa, marginibus minutè et remotè denticulatis: folia caulina vaginis integris, 2–3-uncialibus, anticè membranaceis, ore integerrimo truncato; lamina longissima, ut in foliis radicalibus. Involucri foliola 4–5, basi imbricata, evaginata, foliis caulinis æquilonga et iis subsimilia. Umbella longiradiata, radiis 8–10, quorum 1–2 sessiles, cæteri longepedunculati, solitarii, v. 2–5, pedunculis basi vaginis cylindricis $\frac{3}{4}$ unc. longis inclusis. Spicæ terminales, elongato-oblongæ, cylindraceæ, ad apices rotundatæ, $\frac{3}{4}$ unc. longæ, $\frac{1}{3}$ latæ laterales. Spiculæ 80–100, erecto-patentes, 1 lin. longæ, pallidè fuscescentes; squamâ inferiore basi plerumque involucellis æquilongis subulatis ciliatis suffultâ, enervi, latè ovatâ, secundâ subsimili $\frac{1}{2}$ breviore, tertiâ hermaphroditâ, sub 7–9 nervi; infimâ ter longiore convolutâ, ad apicem obtusum obliquè truncatâ, dorso scaberulâ; rachis ultra squamam fertilem dilatata, marginibus membranaceis hyalinis; squamâ quartâ parvâ, exsertâ, latè ovatâ, obtusâ, naviculari, sub 5-nervi, squamulâ auctâ. Stamina 3; filamentis planis, linearibus; antheris inclusis, subulatis, stramineis. Ovarium elongato-obovatum, trialatum; stylo basi incrassato, trifido, ramis flexuosis exsertis. Achænium trigonum.

In this and the following species the 4th scale is much reduced, forming an appendage at the summit of the dilated rachis, and having a small membranous lanceolate scale at its base, between which is an abortive flower. The leaves are longer than in the specimen figured by Kunth.

57. Mariscus brachystachys, *Hook. fil.*; culmo erecto basi repente, foliis elongatis suberectis rigidis carinatis marginibus denticulatis, involucri foliolis 3–5 striatis, spicis cylindraceis umbellatis, radiis brevissimis, squamâ hermaphroditâ infimâ bis longiore latè ovatâ basi convolutâ, lamellâ squamæ superioris elongatâ.

Hab. James Island, *Dr. Scouler.* Charles Island, *Charles Darwin, Esq.*

Very distinct from the last in the smaller size, the very rigid and more strict leaves, the almost sessile spikes, and especially in the very abbreviated spikelets of red-brown scales, with the scale of the hermaphrodite flower much shorter, broader, and more open.

Commelineæ.

58. Commelina agraria, *Kunth.*

Hab. James and Charles Islands, *Charles Darwin, Esq.*

Rather a small state of a very common tropical weed. Stems 6–8 inches. Leaves elliptical-ovate, an inch long, the surface and margin minutely hispid. Sheaths of the leaves ciliated along the upper edge.

Hypoxideæ.

59. Hypoxis erecta, *Willd.*

Hab. Charles Island, *Charles Darwin, Esq.*

I cannot distinguish these from United States specimens: they also very closely resemble others from the Brazils.

Orchideæ.

60. Epidendrum spicatum, *Hook. fil.*; caule compresso simplici folioso, foliis alternis distichis lineari-lanceolatis acutis rigidis, floribus spicatis, spicâ nutante terminali, sepalis obovato-lanceolatis acuminatis 5-nerviis, petalis æquilongis lineari-spathulatis; labello trilobo basi biauriculato disco incrassato callis 2 prominentibus instructo: lobis lateralibus venosis rotundatis marginibus eroso-crenatis intermedio bifido sinu quadrato.

Hab. James Island, *Charles Darwin, Esq.*

Radix fibrosa. Caulis spithamæus, basi vaginis foliorum tectus, supernè foliosus; vaginis compressis, striatis, $\frac{3}{4}$ unc. longis, $\frac{1}{4}$ latis. Folia erecta, patentia, 3 unc. longa, $\frac{1}{2}$ lata, siccitate striata. Racemus 2-uncialis, terminalis, nutans, sub 10-florus; floribus patentibus basi bracteatis; bracteis foliaceis, linearibus, acutis, infimis 1–2 unc. longis. Ovarium $\frac{1}{2}$ unc. longum, curvatum. Sepala patentia, obovato-oblonga, acuminata, $\frac{1}{3}$ unc. longa. Petala angustè linearia, spathulata, medio 1-nervia, sepalis æquilonga. Labellum diam. $\frac{1}{3}$ unc. Columna cylindrica.

Dicotyledones.

Piperaceæ.

61. Peperomia Galapagensis, *Hook. fil.*; caule elongato ramisque prostratis tetragonis puberulis basi nudis, ramulis pubescentibus, foliis parvis brevipetiolatis oppositis 4–5nis elliptico-oblongis obtusis glabris ad apices obtusos subpilosis coriaceis punctulatis, amentis plurimis plerisque terminalibus erectis simplicibus pedunculatis foliis $\frac{1}{2}$ v. bis longioribus.

P. Galapagensis, Miquel in Hook. Lond. Journ. of Bot.

Hab. James Island, *Charles Darwin, Esq.*

Caulis spithamæus, crassitie pennæ olorinæ. Rami oppositi, stricti v. curvati, patentes, divaricati, prostrati, præcipuè apices versus ascendentes, puberuli. Folia parva, sub $\frac{1}{3}$ unc. longa, patentia vel reflexa, obtusa v. retusa, basi rotundata, sub lente punctata; petiolo brevi, tenui. Amenta stricta, erecta, ad apices ramorum terminalia, 3–6 fasciculata, paucaque axillaria, unà cum pedunculo $\frac{1}{2}$ unc. longa et ultra, foveis nudis; nucibus parvis, latè ovatis, subacutis, basibus immersis.

Allied to *P. microphylla*, H. B. K., but differing by the apparently horizontal narrower nearly smooth leaves, not furnished with large glandular impressions, and numerous amenta.

62. P. PETIOLATA, *Hook. fil.*; glaberrima, caule prostrato tetragono?, foliis parvis oppositis longè petiolatis latè elliptico-ovatis vel rotundatis utrinque obtusis planis carnosis obscurè 5-nerviis, amentis 2–4 terminalibus elongatis.

Hab. James Island, *Charles Darwin, Esq.*

Habitu priori subsimilis, sed glaberrima. Folia punctulata, sub $\frac{1}{2}$ unc. longa, remota, petiolis æquilongis. Amenta sub 4, erecta; unico 4 unc. longo, cæteris subuncialibus, omnibus pedunculatis.

63. P. FLAGELLIFORMIS, *Hook. fil.*; glaberrima, caule elongato decumbente tetragono, ramis erectis, foliis quaternis breviter petiolatis obovato-oblongis subretusis nervo medio et intramarginali percursis, amentis 4–7 terminalibus filiformibus pedunculatis interdum di- trichotomis ad axillas bracteolatis.

P. flagelliformis, Miquel in Hook. Lond. Journ. of Bot.

Hab. James Island, *Charles Darwin, Esq.*

Caules $1\frac{1}{2}$–2 ped. longi, graciles, internodiis bi-uncialibus. Folia erecto-patentia, punctata, carnosa, $\frac{2}{3}$ unc. longa, $\frac{1}{3}$ lata, ad apicem subretusum subtilissimè ciliata; petioli 1 lin. longi. Amenta 2–3-uncialia, gracilia, erecta.

Very near the *P. portulacæfolia*, H. B. K.; the spadices are however numerous, much longer, and sometimes branched.

URTICEÆ.

64. URTICA (*Urena*) DIVARICATA, *Spr.*

Hab. Charles Island, *Charles Darwin, Esq.* Common in North America, and probably in South America also.

65. U. (*Urena*) Canadensis, *Spr.*

Hab. Charles Island, *Charles Darwin, Esq.* A common North American species.

66. Parietaria Floridana, *Nutt.*

Hab. Charles and James Islands, *Charles Darwin, Esq.* United States and Valparaiso, &c.

67. Pilea peploides, *H. & A.* (Dubreuilia, *Gaud.*)

Hab. James Island, *Charles Darwin, Esq.* Oahu? and probably the other South Sea Islands.

68. Pilea succulenta. (Urtica succulenta, *Salzmann in Herb. Hook.*)

Hab. James Island, *Charles Darwin, Esq.*

In the present confused state of this genus it is impossible to determine a solitary species. The present is also a plant of Bahia, and possibly not distinct from *P. peploides.*

Euphorbiaceæ.

69. Euphorbia pilulifera, *Spr.* (E. globulifera, *H. B. K.*) *Kunth Synops.* i. p. 386.

Hab. James Island, *Charles Darwin, Esq.* I have the same state from South Brazil.

Apparently a variety, with the stems naked, ascending below, and hairy above.

70. E. maculata, *L.*

Hab. Charles Island, *Charles Darwin, Esq.* A very common plant in the warm parts of America.

71. E. recurva, *Hook. fil.*; herbacea, erecta, glaberrima, glaucescens, foliis oppositis sessilibus lineari-oblongis basi cordatis retusis v. emarginatis recurvis coriaceis, stipulis fimbriatis, involucris axillaribus plerumque solitariis breviter pedicellatis.

Hab. Chatham Island, *Charles Darwin, Esq.*

Caulis pedalis, crassitie pennæ anserinæ, infernè nudus, articulatus, ramosus; ramis divaricatis, geniculatim flexuosis, cortice pallidè rufo-fusco subangulato tectis, ad articulos incrassatis, junioribus solummodò foliosis. Folia $\frac{1}{2}$ unc. longa, 2 lin. lata, disticha, opposita, falcato-recurva, integerrima, marginibus siccitate recurvis, pallidè flavescentia, juniora præsertim glaucescentia, gradatim minora. Stipulæ parvæ, albidæ, coriaceæ, fimbriato-laceræ. Involucra turbinata, in axillis foliorum superiorum solitaria, breviter pedicellata, unà cum pedunculo sub $1\frac{1}{2}$ lin. longa, glandulis ad os transversè oblongis nigris. Capsula 3-cocca, parva, glaberrima, sub 1 lin. diam., flavida.

Closely allied to the *E. polygonifolia*, L., though quite distinct in its upright habit, sessile leaves, keeled cocci and shorter fimbriated stipules.

72. E. AMPLEXICAULIS, *Hook. fil.*; glaberrima, erecta, glaucescens, caule supernè ramoso folioso, foliis oppositis sessilibus horizontaliter patentibus rotundato-reniformibus basi profundè cordatis amplexicaulibus integerrimis coriaceis, involucris in axillis supremis solitariis: segmentis rotundatis petaloideis, coccis obtusè carinatis.

Hab. Chatham Island, *Charles Darwin, Esq.*

Radix valida, lignosa, perennis? Caulis sublignosus, pedalis, basi simplex, nudus, multi-articulatus, internodiis $\frac{1}{2}$-uncialibus, cortice laxo fusco-purpureo glauco tectus, supernè fastigiatim dichotomè ramosus. Rami foliosi, divaricati, albido-glaucescentes, apicibus ramulorum curvatis. Folia plurima, horizontaliter patentia, uniformia, gradatim sursùm minora, basi profundè cordata, (hinc rami spuriè perfoliati apparent,) ad apices mucronulata vel retusa, interdum imò emarginata, pallidè flavo-virescentia, marginibus rubris valdè coriaceis, inferiora 5 lin. longa, sub 4 lata. Involucra parva in axillis foliorum summorum brevissimè pedunculata, turbinata, erecta, $\frac{1}{2}$ lin. longa; segmentis horizontalibus, æquilongis, stramineis, basi nigris. Capsula parva, sub 1 lin. longa; coccis subcompressis, dorso obtusè carinatis.

Allied in habit and appearance to a species from the Bahama islands, but very distinct from any I am acquainted with.

73. E. NUMMULARIA, *Hook. fil.*; herbacea, molliter pubescens, caule erecto basi glabro, ramis divaricatis, foliis parvis oppositis breviter petiolatis cordatis basi obliquis apicibus rotundatis, stipulis parvis laceris, involucris ad apices ramulorum terminalibus solitariis sessilibus: segmentis subpetaloideis, capsulis pubescentibus.

Hab. Chatham Island, *Charles Darwin, Esq.*

Caulis erectus, teres, simplex, remotè subgeniculatim articulatus, 8-uncialis, glaber, striatus, cortice fusco tectus, crassitie pennæ corvinæ, supernè fastigiatim ramosus. Rami divaricati, teretes, tenues, foliosi, foliaque molliter puberula, pube albidâ. Folia parva, plana, coriacea, sordidè rufa, subtùs virescentia, integerrima, basi obliquè cordata, lobo altero latiore, $1\frac{1}{2}$ lin. longa, $1\frac{1}{4}$ lata, plana, enervia, superiora minima; stipulis parvis; petiolis brevissimis. Involucra latè turbinata, pubescentia, segmentis subpetaloideis atris, marginibus planis, diametr. ad os $\frac{1}{2}$ lin. Capsula $\frac{3}{4}$ lin. lata; coccis compressis, pubescentibus, dorso vix carinatis.

A very distinct and curious little species.

74. E. DIFFUSA, *Hook. fil.*; herbacea, glaberrima, dichotomè ramosissima, ramis elongatis prostratis teretibus gracilibus, foliis oppositis breviter petiolatis linearibus subacutis integerrimis basi profundè et obliquè cordatis, stipulis subulatis, involucris parvis axillaribus solitariis: segmentis carnosis.

Hab. Albemarle Island, *Mr. Macrae & Mr. Cuming.*

Radix lignosus, validus, pennæ anserinæ crassitie. Caules e radice numerosissimi, geniculatim flexuosi, prostrati, glabri, 8 unc. ad pedem longi, ramosissimi, cortice fusconigrescenti. Rami dichotomi, spithamæi, stricti, graciles, teretes, læves, rufo-fusci, fragiles, laxè foliosi, ramulis ultimis filiformibus. Folia stricta, linearia, basin versus latiora et inæqualiter auriculato-cordata, lobo unico producto, integerrima, subacuta, siccitate concava, glaberrima, maculata, fusco-viridia, subcoriacea, $\frac{1}{3}$ unc. longa, $\frac{3}{4}$ lin. lata; petiolis brevissimis. Stipulæ parvæ, inconspicuæ, subulatæ. Involucra breviter pedunculata, minima, vix $\frac{1}{2}$ lin. longa, turbinata; ore 4-fido; segmentis transversè oblongis, planis, coriaceis. Capsulæ $\frac{1}{2}$ lin. longæ; coccis lateraliter compressis, glaberrimis.

General habit and appearance that of a Texian species, *E. arenaria*? Kunth, but leaves very dissimilar.

75. E. VIMINEA, *Hook. fil.*; glaberrima, caule elongato lignoso divaricatim ramoso, ramis strictis virgatis simpliciusculis supernè foliosis, foliis in ramulis brevissimis confertis crassis angustè linearibus vel ad apices dilatatis emarginatis utrinque rotundatis breviter petiolatis marginibus decurvis, stipulis majusculis latè ovatis, involucris parvis in foliorum axillis brevissimè pedunculatis solitariis.

Hab. Albemarle Island, *Mr. Macrae.*

Caules bi-tripedales, teretes, graciles, crebrè transversim nodosi, cicatrizati, quasi articulati; internodiis $\frac{1}{2}$-$\frac{3}{4}$-uncialibus; cortice fusco, subrugoso. Rami pedales, divaricati, ad caulis nodos siti, imâ basi valdè incrassati, supernè graciles, articulati, ramulos brevissimos foliosos emittentes. Folia patentia vel recurva, apices versus interdum latiora et retusa, 3 lin. ad $\frac{1}{2}$ unc. longa, $\frac{1}{2}$ lin. lata, basi rotundata, supra medio sulcata, siccitate flavo-fusca, marginibus recurvis, nervo latissimo incrassato, petiolo perbrevi crasso continuo. Stipulæ pro magnitudine foliorum majusculæ. Involucra minima, inconspicua, sub $\frac{1}{2}$ lin. longa, subsessilia, obovata, turbinata, segmentis transversè oblongis, v. subrotundatis. Cocci non visi.

I know of no species with which to compare this highly curious one. The woody stem appears jointed, but does not break at the joints. The leaves are all crowded, on very short axillary branchlets, which seldom exceed two lines in length and are covered with stipules.

76. Euphorbia, sp.?
Hab. Charles Island, *Charles Darwin, Esq.*

Evidently belonging to this genus; but the specimen in Mr. Darwin's herbarium is too imperfect for examination. It is very different from any species I am acquainted with.

77. Phyllanthus obovatus, *Muhl.* (*Maschalanthus obovatus*, Nutt. in Flora of Arkansa, Amer. Phil. Trans. 1834, p. 175.)
Hab. Charles Island, *Charles Darwin, Esq.* United States; West Indies; Brazil.

78. Acalypha* parvula, *Hook. fil.*; monoica, pubescens, ramosa, ramis ascendentibus, foliis longè petiolatis cordatis vel suborbicularibus obtusis crenato-serratis petiolis brevioribus, pedunculis androgynis gracillimis elongatis, florum fœmin. involucris solitariis v. 2–3 distantibus cucullatis 8-fidis, floribus masculis numerosis in spicam terminalem densam aggregatis.
Hab. Albemarle Island, *Mr. Macrae.*

* In this and the following species of *Acalypha* the inflorescence is monœcious and spicate; the male flowers are furnished each with a bractea at the base of the pedicel; the female have no proper perianth. In the first the spike is elongated, with a slender axillary rachis; the female flowers, sometimes solitary, are placed at the lower part of the spike, each surrounded by a tri-multifid involucre; rarely more than one is found in each of the involucres. The male flowers occupy the upper part of the spike, and are more or less densely crowded. *A. strobilifera* has the involucres containing the female flowers so numerous, that the upper or male part of the spike is sometimes obliterated, and the inflorescence resembles a strobilus. In *A. reniformis* the male and female flowers are placed together in the involucres, which in the other species are proper to the female flowers only; from whence it appears that this integument should in no case be considered a calyx.

Caulis basi nudus, prostratus. Rami divaricati, spithamæi, filiformes, crassitie pennæ passerinæ, puberuli, cortice fusco. Folia longè petiolata, remota, patula, $\frac{2}{3}$ unc. longa, latè cordata, utrinque pubescentia, siccitate atro-fusca. Pedunculi solitarii, filiformes, puberuli, $\frac{2}{3}$ unc. longi. Florum fœmin. involucra 2-flora, hirsuta, flore unico sterili? Capsulæ tomentosæ 3-coccæ, stylis 3 trifidis coronatæ. Flores masculi terminales, basi bibracteolati; perianthio extùs piloso.

79. A. cordifolia, *Hook. fil.*; tota pilis mollibus patentibus obsita, caule erecto ramoso, foliis longè petiolatis cordatis obtusis crenato-serratis glandulosis petiolis $\frac{1}{3}$ brevioribus, flor. fœmin. 1–3 involucris sub 8-fidis, pedunculis elongatis apices versus tantùm floriferis.

Hab. Charles Island, *Charles Darwin, Esq.*

Caulis pedalis et ultrà, teres, crassitie pennæ corvinæ, glanduloso-pubescens, pilisque pallidè flavis instructus. Folia plana, subrugosa, nervosa, atro-fusca, $\frac{1}{3}$–$\frac{1}{2}$-uncialia, paulò longiora quam lata. Flores fœminei 1–3, involucrati; involucris cucullatis, $1\frac{1}{2}$ lin. longis, extùs glanduloso-pubescentibus, segmentis subacutis 1. Capsulæ flavo-pilosæ. Pedunculi sub 1 unc. longi; floribus masculis in spicam brevem terminalem aggregatis, basi 1-bracteolatis, extùs pilosis.

Allied to *A. parvula*; but larger, erect, and hirsute with spreading hairs.

80. A. flaccida, *Hook. fil.*; caule elongato gracili vix ramoso piloso, foliis petiolatis ovatis subacutis obtusè crenato-dentatis basi cordatis submembranaceis utrinque pilosis, florum fœmin. involucris parvis subsolitariis cucullatis irregulariter 3-partitis, fl. masc. spicis elongatis, pedunculo hirsuto.

Hab. James Island, *Charles Darwin, Esq.*

Caulis 2–3-pedalis, gracilis, teres, crassitie pennæ corvinæ, pilis patentibus hirsutus. Folia remota, petiolata, $1\frac{1}{2}$ unc. longa, basi plus minusve profundè cordata, petiolis $\frac{1}{4}$-uncialibus. Fl. fœmin. involucris parvis, $\frac{3}{4}$ lin. longis, trifidis vel profundè 3-partitis, capsulis pilosis. Fl. masc. spicâ gracili pedunculo longiore, floribus fasciculatis.

Very distinct from any of the former species, in its larger size, lax mode of growth, subacute, ovate leaves, elongated spikes of male flowers, and especially by the very small involucre of the solitary female flower.

81. A. velutina, *Hook. fil.*; caule stricto erecto ramoso, ramis petiolis pedun-

culisque undique pilis sericeis nitidis velutino-tomentosis, foliis petiolatis ovatis subacutis sericeo-pubescentibus crenato-dentatis venis reticulatis, floribus fœmineis 2–3, involucris sessilibus, spicis abbreviatis pedunculatis.

β. *minor*; foliis minoribus unà cum petiolis vix $\frac{2}{3}$-uncialibus.

Hab. α. and β. Charles Island, *Charles Darwin, Esq.*

Caulis pedalis et ultrà, supernè foliosus, crassitie pennæ gallinaceæ, teres, pilosus, pilis densis patentibus nitidis pallidè flavis. Folia uncialia, coriacea, pilis appressis sericea, plana, exactè ovata, basi integra, petiolis $\frac{1}{2}$–$\frac{3}{4}$ unc. longis. Flor. fœmin. involucrum $1\frac{1}{2}$ lin. longum, sub 6-fidum, 2–3-florum; capsulis pilosis. Spicæ $\frac{1}{4}$ unc. longæ, pedunculo brevi tomentoso; glomerulis florum basi bracteatis, bracteolis majusculis, ovatis, acutis, pilosis.

The bracteæ on the spike at the base of the male flowers are the largest of any of the species here described, and are rather longer than the pedicels of the flowers themselves. A very distinct species.

82. A. STROBILIFERA, *Hook. fil.*; tota glanduloso-pubescens, caule erecto ramoso, ramis virgatis supernè foliosis, foliis ovatis basi cordatis crenato-serratis acutis, flor. fœmin. plurimis, involucris imbricatis cucullatis 8-fidis, rachi ultra florem in pedunculum gracilem versus apicem floriferum productâ, floribus masculis laxè spicatis.

Hab. Chatham Island, *Charles Darwin, Esq.*

Caulis pedalis, crassitie pennæ corvinæ, cortice fusco, supernè ramosus. Rami tenues, elongati, erecti, crassitie pennæ passerinæ, pubescentes, pilis ad apices capitato-glandulosis viscidis. Folia reticulata, $\frac{1}{3}$–$\frac{1}{2}$ unc. longa, puberula et glandulosa, petiolis $\frac{1}{2}$ unc. longis. Flores fœminei densè imbricati, inter se strobilum 1 unc. longum efformantes: involucrum sessile, plicatum, multifidum, segmentis acutis, $\frac{1}{3}$ unc. longum, $\frac{1}{4}$ latum, 3–4-florum; capsulis involucro sessilibus, pilosis, 1 unc. longis; seminis testa punctata, brunnea. Pedunculus ultra strobilum productus, gracilis, 1–$1\frac{1}{2}$-uncialis, floribus parvis interruptè spicatis; bracteolis majusculis ovatis, obtusis, ciliatis, pedicello subæquilongis, sub $\frac{1}{4}$ lin. longis.

The specimens of this species are very imperfect.

83. A. RENIFORMIS, *Hook. fil.*; pubescens, caule procumbente divaricatim ramoso, foliis parvis petiolatis reniformibus crenatis rugosis glanduloso-pubescentibus, involucris spicatis, spicâ strobiliformi terminali, floribus masculis solitariis sessilibus cum fœmineis involucris inclusis.

Hab. Charles Island, *Charles Darwin, Esq.*

Humilis, tota glanduloso-puberula. Caulis gracilis, valdè ramosus, ramis tenuibus prostratis foliosis. Folia patentia, reniformia, basi plùs minùsve cordata, nervosa, rugosa, profundè crenata, nigrescentia, $\frac{1}{4}$ unc. lata, 2 lin. longa, petiolis 1–2 lin. longis. Inflorescentia terminalis, foliis subtensa, $\frac{1}{3}$ unc. longa. Perianthia densè imbricata, orbiculata, intùs basi flor. fœmin. 3, masculumque solitarium gerentia, marginibus involutis, 3–5-fida, segmentis ciliatis et glanduloso-pilosis venosis. Capsula 3-cocca, valvis dorso ciliatis, stylis elongatis 3-fidis.

84. CROTON SCOULERI, *Hook. fil.*; fruticosa, ramosa, ramis incano-tomentosis, ramulis junioribus lepidotis, foliis petiolatis lineari-lanceolatis subacutis integerrimis supernè pilis stellatis sparsis infernè appressè stellato-pubescentibus junioribus squamis lepidotis interjectis, floribus elongato-spicatis, capsulis obovato-rotundatis diam. pisi communis tomentosis.

Hab. James Island, *D. Douglas & Dr. Scouler.* Chatham Island, *Charles Darwin, Esq.*

Rami lignosi, puberuli, teretes, cicatrisati, cortice fusco; ramulis canaliculatis, vestitis, versus apices foliosis. Folia alterna, plano-hemisphærica, margine obsoletè sinuato-dentata, $2\frac{1}{2}$–3-uncialia, $\frac{1}{2}$ unc. lata, supernè pilis minimis stellatis, infernè pube densè stellatâ flavidâ vel subargenteâ sericeo-incanâ vestita; juniora utrinque densè tomentosa, squamis lepidotis micantibus; petioli 3 lin. longi. Spicæ axillares v. terminales, sub 20-floræ (flores non visi), fructiferæ graciles, 3–4-unciales, nutantes, angulatæ, incano-tomentosæ. Capsulæ solitariæ, remotæ, sessiles, basi perianthio marcescente subtensæ, 3-loculares, 3-valves; stylis 3 deciduis; valvis extùs flavo-tomentosis.

85. C. MACRÆI, *Hook. fil.*; fruticosa, ramosa, ramis incano-tomentosis, foliis angustè linearibus subcarinatis petiolatis apicibus obtusis nervo valido carinatis supernè pilis stellatis sparsis infernè densè et appressè argenteo-tomentosis junioribus lepidoto-squamosis, spicis elongatis.

Hab. Albemarle Island, *Mr. Macrae.*

Fragrans: a priori differt solummodò foliorum formâ, quæ elongato-linearia, $3\frac{1}{2}$–4 unc. longa, 2 lin. lata, et spicâ breviori $1\frac{1}{2}$–2-unciali, sed his characteribus valdè distincta.

86. C. XALAPENSIS, *Humb.*? *Nov. Gen. et Sp.* vol. xi. p. 85. *Kunth, Synops.* vol. i. p. 404.

Hab. James Island, *Charles Darwin, Esq.*

I refer this with much hesitation to the plant described by Humboldt, the specimens being very imperfect and the flowers in an exceedingly young state. The upper leaves do not seem to be ter-quaternate, as stated by Kunth. It may be recognized by the following very imperfect description :—Folia petiolata, petiolo unciali ovato-oblongo, basi cordata, apicem versus rotundata, juniora submucronata, supernè pilis sparsis stellatis, infernè densè tomentosa, 3 unc. longa, 2 lata, luridè virescentia, nervis subtùs prominulis, basi ad petiolum glandulis 2 instructa.

AMARANTHACEÆ.

87. AMARANTHUS CARACCASANUS, *H. B. K.*, *Nov. Gen. et Sp.* vol. ii. p. 157.
Hab. Charles Island, *Charles Darwin, Esq.*, on cultivated ground. Probably a common South American species introduced into the Galapagos.

88. A. CELOSIOIDES, *H. B. K.*, *l. c.* p. 156, *var.*?
Hab. Charles Island, *Charles Darwin, Esq.*

Differing from the American plant of Humboldt only in having the stems rather less than there described.

89. BRANDESIA ECHINOCEPHALA, *Hook. fil.*; appressè pubescens, caule valido suberecto ramoso tereti, foliis petiolatis lanceolatis acuminatis, capitulis globosis sessilibus pedunculatisve, bracteis coriaceis lanceolatis acutè carinatis dorso ciliatis perianthio ½ brevioribus, perianthii curvati foliolis rigidis lineari-subulatis subpungentibus albidis.
Hab. Charles Island, *Charles Darwin, Esq.*

Caulis pedalis et ultrà, basi lignosus, crassitie pennæ anserinæ, cortice flavo, supernè præcipuè subtrichotomè ramosus. Folia 1–1½ pollicaria, ½–¾ unc. lata, patentia, subrigida, petiolis 1–2 lin. longis. Capitula nuda v. foliosa, alba, ⅝ unc. diametro, plerumque pedunculata, pedunculis erectis ½ pollicaribus, floribus rigidis curvatis. Bracteæ 3, subæquilongæ, pilis sericeis elongatis ciliatæ, apicibus subrecurvis. Perianthium ⅓ lin. longum, foliolis inæqualibus, exterioribus majoribus, omnibus dorso subcarinatis. Tubus stamineus elongatus, inclusus, laciniis interjectis linearibus apice laceris; antheris linearibus. Stigma capitatum, obscurè bilobum.

90. ALTERNANTHERA SUBSCAPOSA, *Hook. fil.*; radice crasso fusiformi, caule nullo, foliis radicalibus lineari-lanceolatis acutis integris basi subvillosis, ramis floriferis omnibus radicalibus gracilibus erectis dichotomè ramosis

parcè pilosis, capitulis rotundatis depressis brevi-bracteolatis, perianthii foliolis oblongis obtusis, antheris 2, stigmate bipartito.

Hab. Charles Island, *Charles Darwin, Esq.*

Radix majuscula, crassitie pollicis humani, descendens, ad collum foliosa. Folia plurima, 2–6 unc. longa, $\frac{1}{4}$–$\frac{3}{4}$ lata, substellatim patentia, petiolata, margine integra v. obscurè sinuata, glabriuscula, basi tantùm pilis albidis tomentosa, paginâ superiore sæpiùs lacunosa. Rami 3–6, omnes e collo orti, diametro pennæ passerinæ, 3 unc. ad pedales, supernè di-trichotomè divisi, ad axillas foliosi, foliis oppositis oblongo-lanceolatis subacutis. Capitula parva, alba, $\frac{1}{4}$ unc. lata. Bracteolæ 3, latè ovatæ, obtusæ, perianthio $\frac{1}{2}$ breviores. Perianthium basi villoso-barbatum, compressum, $1\frac{1}{2}$ lin. longum, segmentis subscariosis uninerviis medio maculis 2 viridibus. Tubus stamineus cyathiformis, 5-dentatus, dentibus 2 lateralibus tantùm elongatis antheriferis. Ovarium globosum, compressum.

Very unlike the other species in habit, though entirely coinciding with the genus *Alternanthera* in characters. It may be easily recognized by its singularly stout, fusiform root, radical leaves and slender branching stems, which appear like scapes.

91. Iresine Edmonstonei, *Hook. fil.*; erecta, virgatim ramosa, glaberrima, foliis ovato-lanceolatis, paniculæ compositæ ramis alternis patentibus, pedunculis alternis solitariis binisve angulatis divaricatis apice floriferis gracilibus basi obscurè bracteatis, spiculis pauci- (6–8-) floris latè ovatis, rachi villosâ, bracteolâ exteriore latè ovatâ interioribus minoribus, floribus hermaphroditis lanâ immersis.

Hab. Charles Island, Galapagos, *Charles Darwin, Esq.*

Caulis bipedalis et ultrà ?, trichotomè ramosus, teres, striatus, crassitie pennæ corvinæ; ramis elongatis patentibus demùm ascendentibus. Folia $1\frac{1}{2}$ unc. longa, in petiolum 2–3 lin. longum repentè angustata. Panicula $\frac{1}{2}$–$\frac{3}{4}$-pedalis, patula, ramis alternis gracilibus glaberrimis. Pedicelli seu ramuli ultimi divaricati, $\frac{1}{2}$–$\frac{3}{4}$-pollicares. Flores parvi, sub 1 lin. longi, bracteolis scariosis glaberrimis. Perianthii foliola oblonga, basi lanâ densâ immersa. Stamina ad basin ferè libera.

Most nearly allied to *I. celosioides*, L., of Columbia and the West Indies, but the leaves are much broader, the panicle patent, and the branches longer and more slender, the peduncles seldom if ever branched, and the flowers fewer and smaller. Also allied to the Mexican *I. interrupta*, Benth., but the peduncles are longer and the flowers not collected into capitula. The most remarkable character of the species consists in the ultimate ramuli of the panicle being so elongated and uniform in size as to resemble true peduncles bearing spikes of flowers, whereas they branch irregularly in the other species.

92. Bucholtzia nudicaulis, *Hook. fil.*; erecta, virgata, ramis elongatis nudis teretibus striatis glaberrimis v. parcè pilosis 3–4-chotomè ramosis, foliis ad axillas ramorum sparsis oppositis linearibus obtusis coriaceis marginibus recurvis subtùs adpressè pilosis, spicis ad apices ramulorum sessilibus solitariis ternisve multifloris, floribus latè ovatis extùs tomentosis.

Hab. Charles Island, *Charles Darwin, Esq.*

Suffrutex? Caulis erectus, infernè lignosus, crassitie pennæ anserinæ, supernè ramosus, pluries divisus; ramis tenuioribus, ad axillas incrassatis, supremis spicigeris divaricatis patentibus, pilis albidis sparsis, siccitate nigrescentibus. Folia $\frac{1}{2}$–1-uncialia, patentia, valdè inconspicua, suprà sulcata, subtùs nervo valido percursa. Spicæ ex apicibus ramulorum ortæ, ovatæ v. cylindraceæ, $\frac{1}{4}$–$\frac{1}{2}$-unciales, siccitate luteæ. Flores densè imbricatæ, appressæ, tomentosæ, pilis articulatis subramosis, latè ovatæ v. subtriangulares, anticè planæ, dorso convexæ. Bracteæ latè ovatæ, subcymbiformes, coriaceæ, perianthio $\frac{1}{2}$ breviores. Perianthium sub $1\frac{1}{2}$ lin. longum, foliolis latè ovatis subobtusis crassis valdè coriaceis, 3 exterioribus majoribus. Tubus stamineus profundè 10-partitus, laciniis antheriferis subulatis, sterilibus paulò longioribus supernè subdilatatis apice fimbriatis. Ovarium ovato-globosum; stylo capitato, obscurè multifido; semine abortivo.

This curious plant is evidently congeneric with *B. maritima*, of which Martius has published an excellent figure. I have kept it separate from *Frœlichia nudicaulis*, though the latter is distinctly marked in Mr. Darwin's herbarium as the fruiting state of this. I can here, however, record my opinion that the plants may be identical, as Mr. Darwin considers them: though the characters of the present agree with *Bucholtzia*, and those of the latter with *Frœlichia*, and there being no intermediate states to show the transition of the one genus into the other, I feel bound, in describing them, to follow the present arrangement of the order, and employ the same trivial names for each.

93. B. glaucescens, *Hook. fil.*; caule basi lignoso ramoso, ramis teretibus strictis erectis trichotomè divisis glaberrimis striatis glaucescentibus,

ramulis ad axillas constrictis, foliis oppositis brevi-petiolatis angustè oblongo-lanceolatis subacutis planis integerrimis glaberrimis, spicis terminalibus sessilibus ovatis densifloris.

Hab. Chatham Island, *Charles Darwin, Esq.*

Suffrutex pedalis. Rami crassiusculi, inferiores lignosi, superiores medio incrassati, subarticulati, nodosi, internodiis 2-uncialibus. Folia $1\frac{1}{2}$–2 unc. longa, sub $1\frac{1}{4}$ lata, valdè coriacea, patentia, suprà medio obscurè sulcata, infrà nervo medio crasso lateralibus evanidis. Spicæ ut in *B. nudicaule.*

Very similar to the last, though with leaves and branches perfectly glabrous and more or less glaucous; the former also are more numerous, broader, smooth and glaucous, especially underneath, and their margins not at all recurved. The only flowers are loose on the sheets with the specimens.

94. B. filifolia, *Hook. fil.*; caule basi lignoso ramoso, ramis erectis dichotomis glaberrimis, ramulis ultimis junioribus parcè pubescentibus, foliis elongatis angustè filiformibus glaberrimis carnosis?, spicis terminalibus axillaribusque sessilibus ter–quaternis cylindraceis densifloris, floribus ovato-lanceolatis acuminatis extùs pubescentibus.

Hab. James Island, *Dr. Scouler.*

Folia 1–2-uncialia, sub $\frac{1}{2}$ lin. lata, siccitate compressa. Perianthii segmenta subcuspidata.

Readily distinguishable from *B. glauca* by its leaves, and from *B. nudicaulis* by the very different shape of the flowers.

95. Frœlichia nudicaulis, *Hook. fil.*; erecta, virgata, ramis elongatis nudis teretibus striatis glaberrimis 3–4-chotomè ramosis aphyllis, spicis fructiferis terminalibus brevè pedicellatis, bracteis latè ovatis concavis scariosis, perianthio villoso-barbato ampullaceo ore 5-fido latè bialato crasso crustaceo utriculum parvum includente:—*Bucholtziæ nudicaulis* exemplar fructiferum?

Hab. Charles Island, *Charles Darwin, Esq.*

Under *Bucholtzia nudicaulis* are given the reasons for retaining this in a separate genus. The more remarkable points of difference between the present plant, of which I have only seen ripe fruit, and that where the spikes are only in flower, consist in the absence of foliage and in there being no hairs on the stems and branches (circumstances perhaps attributable to age), the scarious nature of the bracteas, and a more intimate cohesion between the segments of the perianth than I can well imagine to exist in the former, together with the development of broad wings in that organ. May they not be two sexes of a diœcious plant?

96. Cryptocarpus pyriformis, *H. B. K.*
Hab. Chatham Island, *Charles Darwin, Esq.* It is also found on the continent of South America.

In these specimens the filaments are united into the base, and placed on one side of the ovary, which is oblique, with a penicillate stigma, arising from the side opposite the phalanx of stamens.

Phytolacceæ.

97. Phytolacca decandra, *L.*
Hab. James Island, *Charles Darwin, Esq.* An abundant South American plant.

98. Boussingaultia baselloides, *H. B. K.*
Hab. Charles Island, *Charles Darwin, Esq.* Also a widely-diffused American plant.

Nyctagineæ.

99. Boerhaavia hirsuta, *L.*
Hab. Albemarle Island, *Mr. Macrae.*

100. B. decumbens, *L.*?
Hab. James Island, *Charles Darwin, Esq.*

Specimens very imperfect.

101. B. erecta, *L.*
Hab. Albemarle Island, *Mr. Macrae.*

102. B. scandens, *L.*
Hab. James and Charles Islands, *Charles Darwin, Esq.* This and the three former are all common tropical plants.

103. Pisonia floribunda, *Hook. fil.*; arborea, ramis nudis teretibus, foliis sparsis petiolatis ovato-oblongis obtusis integerrimis utrinque sed subtùs

præcipuè pubescenti-velutinis, floribus in corymbis compositis lateralibus terminalibusve dispositis, pedunculis elongatis, pedicellis brevibus, perianthio campanulato, staminibus exsertis.

Hab. James Island, *Charles Darwin, Esq.*

Rami lignosi, cortice cinereo. Folia 2–3-pollicaria, petiolis $\frac{1}{2}$ uncialibus. Corymbi pubescentes, pedunculis petiolo æquilongis. Antheræ majusculæ.

A large tree, growing between the low dry and upland moist countries, almost leafless. The specimen is very defective, and allied to a species of Bertero from the Pacific, as also to a South Brazilian species gathered by Tweedie.

Plumbagineæ.

104. Plumbago scandens, *L.*

Hab. Albemarle and Charles Islands, *Charles Darwin, Esq.* A very common tropical plant.

105. P. tomentosa, *Lam.* ?

Var. pumila; acaulis, annua, foliis stellatim patentibus obovato-lanceolatis sinuato-dentatis $\frac{1}{2}$–$\frac{3}{4}$ unc. longis parcè pilosis, pedunculo abbreviato-hirsuto, spicâ brevi 6–8-florâ, capsulis latis dispermis.

Hab. James Island, *Charles Darwin, Esq.*

These specimens are in a young or a starved state. I suppose them to belong to a large and common Chilian and Buenos Ayrean plant named *P. tomentosa*, Lam. (in Hort. Reg. Berol.). The roots of the latter are often perennial, the leaves 2–4 inches long, and, together with the peduncles, more or less hispid. The spikes vary considerably in length, from 2–3 inches. After flowering, the segments of the corolla imbricate over the ripening capsule and form a conical hood to that organ. In many respects this resembles the *P. Virginica*, L., where however the peduncles are generally long and slender, and the leaves erect and long.

Verbenaceæ.

106. Verbena officinalis, *L.*

Hab. James Island, *Charles Darwin, Esq.*

This appears to be a very widely diffused species, and the two following are certainly closely allied to it.

107. V. POLYSTACHYA, *H. B. K., Nov. Gen. et Sp.* vol. ii. p. 274. *Kunth, Synops.* vol. ii. p. 59; *var.* foliis incisis segmentis grossè serratis.

Hab. James Island, *Charles Darwin, Esq.*

Sprengel unites this species with *V. urticæfolia*, to which our plant bears a close affinity; but the margins of the leaves in the present are far more deeply cut, and the segments again coarsely serrated. They may very possibly be mere varieties of one species.

108. V. LITTORALIS, *H. B. K.*

Hab. Charles Island, *Charles Darwin, Esq.* Found in salt marshes on the American coast, from Truxillo to Lima.

109. CLERODENDRON MOLLE, *H. B. K.*

Hab. Charles Island, *Charles Darwin, Esq.* James Island, *Dr. Scouler.* Found also on the opposite coast of Columbia.

110. LANTANA RECTA, *Ait.*

Hab. Albemarle and Charles Islands, *Charles Darwin, Esq.* Apparently a very common and rather variable plant in the Brazils, West Indies and other tropical parts of South America.

111. L. CANESCENS, *H. B. K., Nov. Gen. et Sp.* vol. ii. p. 209; *var.* ramis aphyllis apices versus foliosis, foliis 1–1½ unc. longis.

Hab. Charles Island, *Charles Darwin, Esq.* Probably frequent in South America; it is the same as Gardner's no. 1385, from Rio.

112. AVICENNIA TOMENTOSA, *L.*

Hab. Chatham Island, *Charles Darwin, Esq.*

ACANTHACEÆ.

113. DICLIPTERA PERUVIANA, *Juss.*

Hab. James Island, *Charles Darwin, Esq.* Common throughout tropical South America.

RUBIACEÆ.

114. TETRAMERIUM, n. sp.?

Hab. James Island, *Charles Darwin, Esq.*

Specimens too imperfect for determination.

Borragineæ.

Galapagoa, genus novum.

Calyx 4–5-partitus, laciniis linearibus. *Corolla* infundibuliformis, tubo lato, limbo 5-fido patente, fauce nudâ. *Stamina* 5, inclusa, imo corollæ tubo inserta. *Ovarium* 4-loculare. *Stylus* terminalis, ad basin usque bipartitus; stigmata 2, obtusa. *Semina* pendula; albumine parco, carnoso; cotyledonibus planis; radiculâ majusculâ, superâ.

Genus Ehretiearum, *inter* Coldeniam *et* Rhabdiam (suadente *clariss.* Bentham) *medium, ob stylum 2-partitum staminaque fundo corollæ inserta singulare.*

Herbæ *Insularum* "Galapagos," *hispido-pilosæ.* Caules *prostrati, ramosissimi.* Folia *alterna, coriacea, versus apices ramulorum densissimè conferta.* Flores *parvi, in axillis foliorum omninò sessiles, valdè inconspicui.*

A highly remarkable genus, and abundantly distinct from any other among *Boragineæ.* Though allied to the South American forms, especially *Coldenia* from Peru, and *Rhabdia*, a Brazilian genus, it would hitherto appear to be quite confined to this curious group of islands.

115. Galapagoa Darwini, *Hook. fil.*; tota pilis albidis hispidis cana, foliis elliptico-ovatis subacutis marginibus valdè recurvis suprà setis rigidis elongatis basi incrassatis obsitis infrà nervo crasso.

Hab. Chatham Island, *Charles Darwin, Esq.* Albemarle Island, *Mr. Macrae.*

Radix crassa, lignosa, descendens, tortuosa, cortice fusco. Caules plurimi, prostrati, fragiles, ramosissimi, alternatim flexuosi, ad angulos incrassati, pedales, crassitie pennæ corvinæ, teretes, epidermide corticis albidâ hic illic parcè pilosâ. Folia plurima, parva, 1–2 lin. longa, versus apices ramulorum conferta, sæpiùs stellatim disposita, patentia, subrecurva v. incurva, elliptico-ovata, obtusa, crassa et coriacea, tota pilis albidis hispida et cana, suprà convexa, medio canaliculata, setis 3–5 instar *Urticæ* rigidis folio æquilongis instructa, marginibus latè recurvis, infrà concava, nervo medio prominente incrassato costata; petiolus folio brevior, latus, basi dilatatus, semiamplexicaulis, pilis mollibus subsericeus. Flores omninò sessiles, in axillis foliorum occlusi, solitarii. Calyx quinque- rariùs quadri-partitus, post anthesin incrassatus, laciniis erectis linearibus obtusis hispido-pilosis setâ rigidâ aciculari terminatis. Corolla infundibuliformis v. potiùs subcampanulata, tubo lato calycem paulò superante, supernè modicè ampliata, fauce nuda; limbi laciniis patentibus, rotundatis, undulatis. Stamina fundo tubi inserta, filamentis elongatis flexuosis filiformibus; antheris inclusis majusculis. Receptaculum carnosum. Ovarium minutum, sessile, profundè 4-lobum, lobis æqualibus. Ovula in loculis solitaria, pendula. Stylus terminalis, inclusus, in lacinias 2 filiformes æquilongas usque ad basin fissus. Stigmata simplicia, vix incrassata, truncata. Nuculæ 4, æquales, calyce incrassato coriaceo inclusæ, sessiles, obliquè ovatæ, dorso convexæ, globosæ, lateribus compressis supernè obtusis erostratis, secus angulos internos inter se coadunatæ, demùm ab axi inconspicuâ discedentes, distinctæ; pericarpio osseo, atro, nitido, lævi. Semen ab apice loculi pendulum; testâ subcarnosâ, laxâ; albumine carnoso v. subaqueo parco; cotyledonibus plano-convexis latiusculis; radiculâ superâ, majusculâ conum acutum basi contractum referente.

116. G. FUSCA, *Hook. fil.*; tota pilis fusco-cinereis pubescens, foliis latè elliptico-ovatis v. orbicularibus supernè subundulatis rugosisve setis mollibus marginibus recurvis nervo infernè inconspicuo.

Hab. Charles Island, *Charles Darwin, Esq.*

Quite distinct from the former species, though so similar in habit and ramification as to be easily confounded with it. Here the stems and whole plant are of a lurid brown colour: the leaves are broader and rugose on the upper surface between the lateral nerves (which in the preceding species are obliterated); they are destitute of those curious large setæ, similar to the stings of a nettle, so prominent in *G. Darwini*; their margins are less strongly recurved, and the nerve beneath is neither so broad nor so prominent. The nucules also are smaller and much narrower, and the radicle is larger, almost equalling the cotyledons in size.

117. TOURNEFORTIA RUFO-SERICEA, *Hook. fil.*; fruticosa, erecta, ramosa, velutino-tomentosa, foliis petiolatis ovato-oblongis acuminatis integerrimis, pedunculis terminalibus dichotomis polystachyis, corollâ extùs villosâ tubo calycis duplò longiore.

Hab. James Island, *Charles Darwin, Esq.*

Tota pileis sericeis rufo-brunneis densè velutino-tomentosa. Rami teretes, crassitie pennæ anserinæ. Folia 2–4-uncialia, 2–2½ unc. lata, utrinque velutina, tomento sericeo nitido, pilis demùm canescentibus, venis subtùs prominentibus; petiolis subuncialibus. Spicæ 8–10, pluries dichotomè ramosæ. Calycis segmenta ovata, acuta. Corolla 2 lin. longa, extùs villosa, pilis pallidis, limbo patente 5-fido plicato.

I entertain little hesitation in referring this, in the absence of fruit, to the neighbourhood of *T. velutina*, H. B. K., from which it mainly differs in the dense inflorescence, more copious silky clothing of hairs, and in the leaves being neither cordate at the base nor white underneath.

118. T. pubescens, *Hook. fil.*; suffruticosa erecta ramosa, ramis teretibus nudis, ramulis velutinis foliosis, foliis petiolatis elliptico-ovatis subacutis in petiolum attenuatis suprà pubescentibus subrugosis subtùs molliter velutinis, pedunculis terminalibus ramosis, spicis dichotomis, corollæ tubo calyce bis longiore, drupâ dipyrenâ pilosâ.

Hab. Chatham Island, *Charles Darwin, Esq.*

Rami lignosi, teretes, cortice fusco. Ramuli teretes, breviusculi, crassitie pennæ gallinaceæ, tomento brevi brunneo obtecti. Folia patentia, 2-uncialia, $\frac{3}{4}$–1 unc. lata, subrigida, utrinque attenuata, integerrima, suprà subrugosa, pilosa v. subscabrida, pilis albidis, subtùs velutina, pilis appressis griseis, nervis prominentibus; petiolis $\frac{1}{4}$ unc. longis. Spicæ 14–16, corymbosæ, rariùs subsolitariæ, pedunculis pedicellisque pubescentibus. Calyx parvus, hispido-pubescens, segmentis obtusis. Corollæ tubus 1 lin. longus, lobis obovato-rotundatis patentibus. Drupa conica, $1\frac{1}{2}$ unc. longa, siccitate nigra, obscurè 4-loba; nuculis 2 osseis collateralibus 2-locularibus. Testa albida, membranacea: albumine copioso.

Though very similar to several South American and West Indian species of this genus, I have been unable to refer it to any.

119. T. psilostachys, *H. B. K.* *Kunth, Synops.*; vide *Linnæa*, vol. iv. p. 470.

Hab. James Island, *Mr. Douglas & Dr. Scouler.* Very common in South America and the West Indies.

120. Heliotropium parviflorum, *L.*

Hab. Charles Island, *Charles Darwin, Esq.* James Island, *Douglas.* Frequent in South America. The specimens from James Island are larger and with more tender foliage.

121. H. Curassavicum, *L.*

Hab. Chatham Island, *Charles Darwin, Esq.* Of common occurrence throughout the tropics.

122. Cordia lutea, *Lam.* (C. rotundifolia, *Ruiz & Pavon.*)

Hab. Chatham Island, *Charles Darwin, Esq.* Albemarle Island, *Mr. Macrae.*

A particularly variable plant as regards pubescence and size, also in the marginal divisions of the leaf. Abundant in Peru and Columbia.

123. Cordia (*Varronia*) leucophlyctis*, *Hook. fil.*; fruticosa, ramosa, foliis petiolatis oblongo-lanceolatis obtusis margine undulatis rigidis rugosis utrinque scabridis supernè setis albidis basi tuberculatis densè obsitis, pedunculis folio longioribus calycibusque pilosis, floribus capitatis, dentibus calycinis subulatis.

Hab. Albemarle Island, *Charles Darwin, Esq. & Mr. Macrae.* James Island, *Dr. Scouler.*

Rami teretes, infernè cortice nigro-fusco, supernè pilis patentibus albidis undique hispidi. Folia $1\frac{1}{2}$–2 unc. longa, $\frac{1}{3}$ unc. lata, supernè præsertim asperrima, setis papillisque lacteis conspersa, siccitate nigrescentia, subtùs rugosa, fusco-viridia, pilis albidis hispida et subcana; petiolis 2 lin. longis. Pedunculi stricti, erecti, unciales et ultrà. Capitula globosa, sub 12-flora. Calyx strigosus, pilis interdum stellatis, ore contracto, segmentis subulatis. Corollæ tubus cylindraceus, 2 lin. longus, ad oram nudus, limbo revoluto brevissimè quinquefido.

A most distinct species.

124. C. (*Varronia*) linearis, *Hook. fil.*; suffruticosa, ramis gracilibus, ramulis hispidis, foliis angustè lineari-elongatis acutis integerrimis rigidis marginibus revolutis suprà pilis albidis asperis subtùs pubescentibus, pedunculis terminalibus lateralibusque, floribus capitatis.

Hab. James Island, *Charles Darwin, Esq.*

Rami elongati, crassitie pennæ corvinæ, cortice nigro. Folia sparsa, 2–3 unc. longa, $1\frac{1}{2}$ lin. lata, in petiolum brevem attenuata, supernè planiuscula, medio canaliculata, venis lateralibus crebris divaricatis, subtùs concava, fusco-virescentia. Pedunculi pubescentes, pilis rufis v. pallidis. Calyx globosus, pallidus, pubescens. Corolla cylindracea, sub $\frac{1}{2}$ unc. longa.

125. C. (*Varronia*) revoluta, *Hook. fil.*; fruticosa, ramis hispidis, foliis angustè linearibus obtusis integerrimis marginibus revolutis rigidis rugosis supernè setis albidis asperis subtùs hispido-pubescentibus, pedunculis terminalibus et lateralibus calycibusque pubescentibus, floribus capitatis.

Var. β. nigricans; foliis siccitate nigricantibus, calycibus rufo-brunneis.

Hab. Charles Island, *Charles Darwin, Esq.* *Var.* β. Albemarle Island, *Mr. Macrae.*

Rami validi, lignosi, teretes, cortice fusco, pilis albidis asperis. Folia 2–$2\frac{1}{2}$ unc. longa, 2–3 lin. lata, apicibus obtusissimis. Pedunculi foliis breviores v. subæquilongi. Flores 18–20, capitati. Corolla cylindracea, ore crenato glabro.

* Nomen e λευκὸς, *albus*, et φλυκτὶς, *papilla*.

Distinguishable from *C. linearis* by the larger size, broader and obtuse leaves and robust habit. The *var.* β. is always blacker when dry, and its peduncles and calyx are covered with rufous pubescence, but I have detected no other difference.

126. C. (*Varronia*) SCOULERI, *Hook. fil.*; fruticosa, foliis petiolatis lanceolatis obtusis subacutisve repando-dentatis supernè scabridis subtùs pilis stellatis pubescentibus, pedunculis terminalibus, floribus capitatis, calycis tomentosi segmentis filiformibus curvatis, corollâ calyce inclusâ, ore breviter 4-fido glabro.

Hab. James Island, *Dr. Scouler.*

Rami teretes, crassitie pennæ gallinaceæ, cortice nigro, ramulis hirtis. Folia $1\frac{1}{2}$ unc. longa, $\frac{1}{3}$ unc. lata, utrinque attenuata, suprà nigrescentia, pilis albidis rigidis scabrida, subtùs fusca, pubescentia, petiolis sub $\frac{1}{4}$ unc. longis. Pedunculi unciales et ultrà, pilis stellatis pubescentes. Calyx inflatus, globosus, extùs stellatim pubescens, ore parvo valdè contracto, breviter 5-fido, segmentis basi subulatis in apices vermiformes curvatos desinentibus. Corolla cylindracea, tubo calyce ferè omninò incluso, limbo breviter 5-fido, segmentis undulatis. Stamina 5, filamentis brevibus subulatis.

A very distinct plant from the former or any other species.

SCROPHULARINÆ.

127. SCOPARIA DULCIS, *L.*

Hab. Charles Island, *Charles Darwin, Esq.* A most abundant tropical weed.

128. SCROPHULARINA ?

Hab. James Island, *Charles Darwin, Esq.*

A very dwarf species, in fruit only, and too imperfect for determination.

LABIATÆ.

129. SALVIA OCCIDENTALIS, *Sw.*

Hab. Charles and James Islands, *Charles Darwin, Esq.* Very abundant in South America and the West Indies.

130. S. TILIÆFOLIA, *Vahl* (S. fimbriata, *H. B. K.*).

Hab. Charles Island, *Charles Darwin, Esq.* Also a common South American plant.

131. S. PROSTRATA, *Hook. fil.*; caule herbaceo procumbente hic illic radicante, ramis divaricatis glabriusculis, foliis longè petiolatis latè triangulari-ovatis

obtusis crenatis, utrinque parcè pilosis subrugosis purpurascentibus, racemis axillaribus breviusculis 3–4-floris, pedunculis folio brevioribus pubescentibus, calycibus campanulatis pilosis labio supremo integro inferiore apice bifido.

Hab. James Island, *Charles Darwin, Esq.*

Caules vagè ramosi, 6–10-unciales, ramis breviusculis. Folia patentia, divaricata, sub $\frac{1}{2}$ unc. longa, latitudine subæqualia; petiolo laminâ bis longiore, valido. Calyx sub 2 lin. longus. Corolla non visa.

Mr. Bentham, who had the kindness to look over the few *Labiatæ* among the Galapagos plants, pronounced this species to be new and allied to *S. tenella*, Sw., a West Indian species.

132. Teucrium inflatum, *L.*

Hab. Charles Island, *Charles Darwin, Esq.* Common throughout tropical America, and also an inhabitant of the South Sea Islands. Forster's *T. villosum* is perhaps a variety.

Solaneæ.

133. Solanum verbascifolium, *L. var.*

Hab. James Island, *Charles Darwin, Esq.* A *S. verbascifolio,* L. differt præsertim floribus majoribus.

134. S. nigrum, *L.*

Var. caule tuberculato, foliis glabriusculis.

Hab. Charles Island, *Charles Darwin, Esq.*

Var. minor; caule tereti lævi, foliis glaberrimis.

Hab. James Island, *Charles Darwin, Esq.*

Var. caule herbaceo, foliis puberulis.

Hab. James Island, *Dr. Scouler.*

This plant presents the same varieties (all of which are small-flowered) as occur on the southern parts of the American continent and in the South Sea Islands.

135. S. Edmonstonei, *Hook. fil.*; suffruticosum, inerme, viscoso-pubescens, caule tereti basi prostrato ascendente divaricatim ramoso, foliis ovato-oblongis in petiolum brevem angustatis sinuato-pinnatifidis marginibus recurvis segmentis integerrimis lobatisve obtusis, paniculâ longè pedun-

culatâ paucflorâ, calycis lobis inæqualibus lineari-oblongis obtusis corollâ campanulatâ breviter 5-lobâ extùs puberulâ dimidio brevioribus.

Hab. Charles Island, Galapagos, *T. Edmonstone, Esq.*

Perenne? Caulis basi lignosus, pedalis, vagè ramosus, uti planta tota viscoso-puberulus. Folia $1\frac{1}{2}$–2-pollicaria, obtusa, ad medium pinnatifida, lobis 4–9 erecto-patentibus, siccitate fusca, superiora subsessilia. Pedunculi 4-pollicares, 2–5-flori. Pedicelli $\frac{3}{4}$-unciales. Calycis lobi 3 lin. longi, fructiferi dilatati. Corolla 7 lin. longa. Stamina stigmaque inclusa.

A very distinct species, whose nearest ally is a species from extra-tropical North America, *S. triflorum*; it is also related to Mexican and Texian species.

136. Lycopersicon pimpinellifolium, *L.*

Hab. Chatham Island, *Charles Darwin, Esq.* Precisely similar to the South American plant.

137. L. esculentum, *L.* var. *minor.*

Hab. James Island, *Charles Darwin, Esq.*

There are perfectly similar specimens of this plant, both from the continent of South America and the South Sea Islands, in the Hookerian herbarium, under the name of *L. esculentum.* All these are smaller than the common state of the species.

138. L. Peruanum, var. *parviflorum*, Hook. fil.

Hab. Chatham Island, *Charles Darwin, Esq.*

The flowers of the Peruvian specimens are larger than these, but as they are not constant in that respect, and no other difference seems to exist, I have kept the present as a variety.

139. Nicotiana glutinosa, *L.*

Hab. Charles Island, *Charles Darwin, Esq.* Of very frequent occurrence in South America.

Dictyocalyx, genus novum.

Calyx cylindraceus, 5-fidus, lobis acutis, tubo post anthesin subinflato membranaceo, reticulatim venoso. *Corolla* membranacea, subinfundibuliformis; tubo gracili gradatim supernè ampliato; limbo plicato, brevi, vix explanato. *Staminum filamenta* elongata;

antheræ inclusæ. *Ovarium* disco carnoso insertum; *stigmate* capitato. *Capsula* evalvis, indehiscens, bisulcata, incompletè 4-locularis, calyce ventricoso inclusa. *Semina* plurima, majuscula, tuberculata, dissepimento medio prope angulum parietalem affixa; testa nitida obscurè granulata. *Embryo* arcuatus.

Herbæ Americanæ *repentes, glanduloso* (?)*-pubescentes, cum tribu* Daturearum, *suadente clariss.* Miers, *conferendæ.* Folia *membranacea, angulata v. sinuata, subopposita v. bina.* Flores *axillares.*

140. Dictyocalyx Miersii, *Hook. fil.*; caule herbaceo procumbente (?) flexuoso glanduloso-pubescente, foliis sæpiùs binis longè petiolatis triangulari- v. rhombeo-ovatis repando-dentatis petiolisque pubescentibus, floribus axillaribus longè pedunculatis, corollâ subinfundibuliformi tubo valdè elongato limbo breviter 5-fido segmentis rotundatis acuminatis trinerviis, capsulâ ovatâ acutâ sub 4-gonâ calyce membranaceo subinflato nervoso inclusâ, seminibus majusculis.

Hab. Charles and Albemarle Islands, *Charles Darwin, Esq. & Mr. Macrae.*

Caules $\frac{1}{2}$ pedales et ultrà, herbacei, divaricatim flexuosi, uti tota planta plùs minùsve glanduloso-pubescentes. Folia magnitudine varia, 1–2 unc. lata, interdùm profundè sinuato-dentata, tenera; petiolis laminâ bis terve longioribus, divaricatis. Flores numerosi, solitarii, v. rariùs bini, longitudine sat variabiles, pedunculo folio $\frac{1}{2}$ breviore. Calyx cylindraceus, sub $\frac{1}{3}$ unc. longus, nervosus, 5-fidus, segmentis acutis. Corolla membranacea, 1–2$\frac{1}{2}$ unc. longa, gradatim supernè ampliata, extùs puberula, limbo brevi vix explanato. Stamina 5; filamentis gracilibus; antheris inclusis. Ovarium parvum, disco carnoso insertum; stylo elongato; stigmate subcapitato, incluso. Capsula aterrima, nitida, utrinque bisulcata, calyce ventricoso, membranaceo, reticulatim venoso obtecta; pedicello fructifero plerumque deflexo. Semina plurima, pro genere maxima, atra, nitida, subtuberculata.

This plant I find nowhere described, though it exists in the Hookerian Herbarium, from various parts of the coasts of Peru and Columbia. It appears, judging by Galapagoan specimens, to vary considerably in the size of all its parts. From *Nicotiana* it is remarkably distinguished by the large seeds, curved embryo, habit and minor points.

141. Acnistus ellipticus, *Hook. fil.*; fruticosus, ramis lignosis apices versus foliosis, foliis petiolatis ellipticis utrinque attenuatis integerrimis glaberrimis, floribus ad axillas foliorum plurimis longè pedicellatis, pedicellis

calycibusque breviter urceolatis obscurè 5-dentatis glaberrimis, corollâ cylindraceâ extùs pubescente 5-fidâ segmentis erectis marginibus incurvis, staminibus inclusis.

Hab. Charles Island, *Charles Darwin, Esq.*

Rami validi, crassitie pennæ anserinæ, cortice griseo. Folia e ramulis brevissimis pro genere ampla, 2–3 unc. longa, $1\frac{1}{2}$ unc. lata, planiuscula, lætè viridia, summo apice obtusa; petiolis $\frac{1}{4}$ unc. longis. Pedicelli florum graciles, subunciales, infra florem gradatim incrassati. Calyx brevis, 2–3 lin. longus, subcoriaceus, ore obscurè æqualiter 5-crenatus. Corolla $\frac{1}{2}$ unc. longa, extùs fusco-brunnea, pubescens. Stamina 5, inclusa; filamentis supra medium corollæ affixis breviusculis flexuosis; antheris linearibus. Ovarium conicum, disco majusculo insidens; stylo gracili subcurvato; stigmate depresso, obscurè bilobo.

A well-marked species, ranking near *A. fuchsioides*, H. B. K.

Convolvulaceæ.

142. Ipomæa maritima, *Br.* Convolvulus pes-capræ, *Auct.*

Hab. Chatham Island, *Charles Darwin, Esq.*

143. I. linearifolia, *Hook. fil.*; glaberrima, caule filiformi volubili tereti elongato, foliis petiolo longioribus angustè linearibus basi hastatis subobtusis auriculis petiolo subparallelis, pedicellis solitariis elongatis subclavatis bracteolatis, foliolis calycinis majusculis ovato-lanceolatis acuminatis concavis dorso 5-costatis, staminibus inclusis, stigmate capitato globoso.

Hab. James Island, *Charles Darwin, Esq.*

Caules bi-tripedales et ultrà, crassitie pennæ corvinæ, cortice pallido substriato. Folia uncialia, $1\frac{1}{2}$ lin. lata, ad apices obtusos breviter apiculata, integerrima, auriculis subulatis, 2–3 lin. longis, petiolis $\frac{1}{2}$ unc. longis. Pedicelli $\frac{3}{4}$ unc. longi, validi, supra basin articulati geniculatique, supernè sulcati, gradatim incrassati, costis minutè tuberculatis. Foliola calycina $\frac{1}{2}$ unc. longa. Corolla infundibuliformis, pallidè purpurea, calyce bis longior. Capsula bilocularis, calyce inclusa, bivalvis, valvis apicem versus bifidis; seminibus fuscis.

The specimens of this plant are rather imperfect, but still appear sufficiently distinct from any other species.

144. I. tubiflora, *Hook. fil.*; glaberrima, caule simpliciusculo scandente tereti nitido parcè folioso, foliis petiolatis latè ovatis basi profundè cordatis lobis

rotundatis sinu acuto supernè productis summo apice obtusis submembranaceis venosis, pedunculo solitario unifloro petiolis longiore, pedicello brevi sub calyce vix incrassato, calycis angustè campanulati foliolis ovato-oblongis acuminatis, corollæ tubo elongato infundibuliformi calyce triplò longiore limbo patente, staminibus inclusis.

Hab. James Island, *Charles Darwin, Esq.*

Caules graciles, subnitidi, crassitie pennæ corvinæ. Folia lætè viridia, 2–3 unc. longa, sub 2 unc. lata, petiolo $\frac{3}{4}$ unc. longo. Pedunculus validus, uncialis et ultrà; pedicello crassiore, 2 lin. longo, calyce paulò longiore. Calyx pro magnitudine floris parvus, $\frac{3}{4}$ unc. longus. Corolla rosea, 2 unc. longa, tubo basi vix 2 lin. diametro, ore unciali. Stamina inclusa; antheris parvis. Stigma capitato-bilobum.

Of this plant there is only a solitary specimen in Mr. Darwin's Herbarium.

145. Evolvulus glabriusculus, *Choisy, Diss. Sec. Convolv.* p. 156.

Hab. James Island, *Dr. Scouler.*

M. Choisy looks upon this as identical with the West Indian plant, and different from the *E. alsinoides*, a widely diffused species, with which it has many points in common.

146. Cuscuta Sandvicensis, *Choisy, Monogr. Cuscut.* p. 180.

Var. *Mimosæ*, pedicellis florum brevioribus, seminibus fulvis.

Hab. James Island: in immense abundance amongst Mimosa bushes, *Charles Darwin, Esq.*

Except by the characters above cited, I am unable to distinguish this from the Sandwich Island plant described by Choisy.

Apocyneæ.

147. Vallesia glabra, *Link* (Rauwolfia, *Cav.*).

Hab. Chatham Island, *Charles Darwin, Esq.* Also found in the West Indies and on the South American continent, both on the eastern and western coasts.

There is probably but one hitherto-described species of the genus.

Goodenoviæ.

148. Scævola Plumieri, *Vahl.*

Hab. Chatham Island, *Charles Darwin, Esq.*

Professor Henslow remarks that one of these specimens is in a monstrous state, having 6 segments to the corolla, and one of the filaments furnished with 2 anthers. The same species is found in South America and the Mauritius.

Lobeliaceæ.

149. Lobelia Xalapensis, *H. B. K.*

Hab. James and Charles Islands. A frequent inhabitant of South America and the West Indies.

Compositæ.

150. Lorentea tenuifolia, *DeC. Prodr.* vol. v. p. 103.

Hab. Albemarle Island, *Mr. Macrae.*

151. L. gracilis, *Hook. fil.*; caule tenui ascendente scabriusculo parcè vagè ramoso, foliis sparsis linearibus acuminatis hispidulis pilosisque subtùs vix glandulosis basi longè ciliatis, pappo florum radii bisetoso.

Hab. Albemarle Island, *Mr. Macrae.*

Radix annua. Caules basi prostrati, spithamæi, teretes, crassitie pennæ passerinæ, brunnei, pilis brevibus hispiduli. Folia sparsa, $\frac{1}{3}$-uncialia, vix $\frac{3}{4}$ lin. lata, sessilia, subrecurva, basi paulò dilatata, suprà medio sulcata, pilis albidis hispidula, marginibus recurvis, basi utrinque longè setoso-ciliatis. Pedunculi terminales, solitarii, gracillimi, sub 1 unc. longi. Capitula $\frac{1}{4}$–$\frac{1}{3}$ unc. longa, subcylindracea. Involucri squamæ lineares, dorso pilosiusculæ. Pappus fl. radii scabridus, corolla $\frac{1}{2}$ brevior; disci flavidus, setis inæquilongis.

This may readily be distinguished by the hispid leaves, which are broader and shorter than those of any of the other species and hardly punctate, and by the bisetose pappus of the ray.

152. L. subsquarrosa, *Hook. fil.*; caule robusto, ramis suberectis divaricatis fastigiatim ramosis puberulis, foliis subsquarrosis glaberrimis subfasciculatis lineari-subulatis acuminatis subtùs grossè glanduloso-punctatis glandulis biserialibus marginibus basi longè ciliatis, pedunculis brevibus, achæniis puberulis radii epapposis disci setis inæqualibus.

Hab. Chatham Island, *Charles Darwin, Esq.*

Radix perennis, lignosus. Caulis e basi ramosus. Rami ascendentes, pluries ramosi, teretes, sublignosi, cortice rufo-brunneo puberulo. Folia perplurima, in ramis abbreviatis fasciculata, siccitate squarroso-patentia, glaberrima, $\frac{1}{2}$ unc. longa, $\frac{1}{2}$ lin. lata, glandulis orbicularibus, marginibus vix recurvis. Pedunculi in ramis brevissimis lateralibus terminales, breviores quam in præcedente, vix 1 unc. longi. Capitula ut in congeneribus.

Also a very distinct species, with much shorter leaves than *L. tenuifolia*, and shorter cilia at the base: the peduncles too are more abbreviated and stouter.

153. Ageratum conyzoides, *Linn. Sp. Pl.* 1175. *DeC. Prodr.* vol. v. p. 108.

Hab. Charles Island, *Charles Darwin, Esq.* A very widely-diffused native of the tropics, both in the old and new world. Some of the specimens have no pappus whatever, and in others the pappus is shorter than in the ordinary state of the plant.

154. Erigeron tenuifolium, *Hook. fil.*; fruticosum, ramis infernè denudatis cicatricosis, foliis patentibus angustè linearibus acuminatis basi ciliatis, capitulis terminalibus pedunculatis subcorymbosis, pedunculis folio brevioribus, involucri obconici squamis linearibus pluriserialibus.

Hab. Charles and James Islands, *Charles Darwin, Esq.*

Rami lignosi, teretes, crassitie pennæ anatinæ, cicatricibus foliorum delapsorum subannulati, supernè subfastigiatim di- trichotomè ramosi, cortice pallidè fusco. Folia versus apices ramulorum fasciculata, patentia, 1 unc. longa, vix $\frac{1}{2}$ lin. lata, glaberrima v. parcè pilosa, marginibus subrecurvis basi ciliatis in ramum subdecurrentibus. Pedunculi plurimi, $\frac{1}{2}$ unc. longi, validi, in axillis foliorum summorum, inferiores longiores, unde corymbosi, bracteati, bracteis in squamas involucrales gradatim desinentibus. Capitula obconica v. subcampanulata, basi angustata, $\frac{1}{3}$ unc. longa. Involucri squamæ plurimæ, gradatim longiores, angustè lineares, subscariosæ, post anthesin patentes v. reflexæ. Receptaculum paulò convexum, papillosum. Flores radii pauci, ligulâ oblongâ revolutâ 3-nervi; disci tubo parcè piloso, dentibus glanduloso-incrassatis. Stamina ecaudata. Stylus fl. radii ramis linearibus, obtusis, marginibus incrassatis; disci brevioribus, cono dorso glanduloso terminatis. Achænia compressa, subtrigona, puberula. Pappus 1-serialis, rigidus; setis inæqualibus, scabrido-pilosis, flavidis.

This species and the following nearly agree with the character of *Solidago*, but the habit and inflorescence are entirely different, and the involucres are neither cylindrical nor elongated. The scales of the involucre are more imbricated and conical than in *Erigeron*, the flowers of the ray fewer and probably yellow. Mr. Bentham, who has had the kindness to inspect both the *Compositæ* and *Leguminosæ* of this curious collection, agrees with me as to the propriety of including these in *Erigeron*, though they form a group in that genus quite distinct from any other.

155. Erigeron lancifolium, *Hook. fil.*; fruticosum, foliis erectis lanceolatis in petiolum attenuatis integerrimis utrinque puberulis subcoriaceis, capitulis pedunculatis subcorymbosis.

Hab. Albemarle Island, *Charles Darwin, Esq.*

Rami teretes, cicatricati, cortice brunneo tecti; ramulis glanduloso-puberulis, divaricatis. Folia pleraque erecta, interdùm patentia, plana, penninervia, $1\frac{1}{2}$ unc. longa, 3 lin. lata. Inflorescentia et capitula omninò ut in priore, sed pedunculis longioribus, capitulis majoribus, achæniis brevioribus, pappoque saturatiore.

156. Hemizonia squalida, *Hook. fil.*; glanduloso-puberula, caule gracili supernè ramoso parcè folioso, foliis sparsis sessilibus linearibus obtusis integerrimis basi paulò dilatatis utrinque glanduloso-pilosis, capitulis solitariis terminalibus nutantibus, involucri squamis lineari-lanceolatis flores radii amplectentibus, ligulis lineari-cuneatis, receptaculi paleis 1-serialibus in coronam membranaceam subcoalitis.

Hab. Galapagos Archipelago, *Adm. du Petit Thouars.*

Caulis diametro pennæ passerinæ, ramosus. Folia sparsa, 3–4 lin. longa, vix $\frac{1}{3}$ lin. lata. Capitula brevissimè pedunculata, cum radio sub $\frac{1}{2}$ unc. diametro. Involucrum hemisphæricum $\frac{1}{4}$ unc. latum, basi bracteis plurimis linearibus subæquilongis suffultum, squamis 1-serialibus dorso glandulosis, marginibus involutis subscariosis. Radii circa 10, tubo gracili pubescente, ligulâ latiusculâ, apice trifidâ. Achænia glaberrima, obovata, modicè obcompresso-trigona, dorso valdè gibbosa, membranacea, pappo nullo. Paleæ receptaculi intra flores radii positæ, 1-seriales, membranaceæ, lanceolatæ, acuminatæ, ad medium coalitæ, involucri squamis æquilongæ, dorso subglanduloso-pilosæ. Fl. disci tubulosi, achæniis marcescentibus; pappi squamellis brevibus, inæqualibus.

A very distinct species of a genus hitherto supposed to be peculiar to California.

Desmocephalum, n. g.

Capitula in axillis foliorum densissimè congesta, monoica, sex-flora; floribus 3 fœmineis ligulatis, cæteris masculis tubulosis. *Involucrum* compressum; foliolis 3–5, inæqualibus. *Receptaculum* minimum, epaleaceum. *Corolla fœm.* tubo brevi, lato, piloso; ligulâ latâ, involutâ, bifidâ: *masc.* quadrifida, dentibus extùs hispido-barbatis. *Antheræ* ecaudatæ. *Stylus fl. masc.* indivisus, acutus; *fl. fœm.* in ramos 2 elongatos desinens. *Achænium* latè obcuneatum, compressum, subtrigonum, supernè pilosum, foliis involucralibus immutatis tectum.

Genus Elviræ *affine.* Radix *annua.* Caulis *pedalis, herbaceus, teres, erectus, e basi trichotomè divisus; ramis ascendentibus, pubescentibus.* Folia *opposita, petiolata, ovata, obtusè duplicato-serrata, coriacea, suprà scabriuscula, nitida, subtùs pubescentia, nigricantia.* Capitula *axillaria, densissimè congesta, massam depresso-sphæricam $\frac{1}{2}$ unc. latam efformantia.* Folia *involucrantia latè ovata, acuminata, hispida.* Corollæ *valdè inconspicuæ.*

157. Desmocephalum inelegans, *Hook. fil.*
Hab. Charles Island, *Charles Darwin, Esq.*

Microcoecia, n. g.

Capitula axillaria, pauca, valdè compressa, monoica, subtriflora; floribus fœmineis ligulatis, masculis tubulosis. *Involucrum* compressum, 3–4-foliolatum, foliolo unico latè obovato unilaterali, cæteris parvis collateralibus. *Receptaculum* minimum, epaleaceum. *Corolla fl. fœm.* tubo gracili; laminâ rotundatâ, obscurè crenatâ: *fl. masc.* 4-fida, tubo supernè ampliato, segmentis extùs barbatis. *Antheræ* semi-exsertæ, ecaudatæ. *Stylus fl. fœm.* in ramos 2 elongatos desinens; *fl. masc.* indivisus. *Achænium* cuneatum, compressum, obscurè trigonum, parcè pilosum.

Herba *pusilla, repens, scaberula; ramis gracilibus, ascendentibus.* Folia *opposita, petiolata, rigidula, ovata, acuta, serrata, suprà hispidula, subtùs cana, venis prominulis.* Capitula *minima, breviter pedicellata.* Involucri *foliolum exterius planum, acuminatum, nervosum, marginibus basi involutis.* Flores *exserti, flavi.*

158. Microcoecia repens, *Hook. fil.*
Hab. James Island, *Charles Darwin, Esq.*

A singular little plant, also allied to *Elvira* and *Milleria*, but very distinct from both those genera. The stems are about a span long: the leaves $\frac{1}{4}$ inch long.

Macraea, n. g.

Capitulum multiflorum, heterogamum, radiatum; floribus radii squamis involucri tectis, paucis, 1-seriatis, fœmineis; disci tubulosis. *Involucri* hemisphærici squamis sub 2-seriatis, disco brevioribus. *Receptaculum* convexum, paleaceum; paleis deciduis flores involucrantibus. *Corollæ* radii tubo brevi, gracili; ligulâ latâ bifidâ: disci tubo 4-fido, dentium marginibus incrassatis. *Antheræ* breviter appendiculatæ. *Stylus fl. radii* in ramos 2 obtusos desinens; *fl. disci* ramis cono latiusculo terminatis. *Achænium* obovato-cuneatum, compressum, trigonum, hispidum, pappo brevi e squamis paucis ciliatis coronatum.

Genus Heliopsideis *relatum.* Frutex *ramis erectis, virgatis, nodosis.* Folia *in ramis abbre-*

viatis fasciculata, rigida, linearia, integerrima, pilosa, suprà nitida, marginibus revolutis. Pedunculi *folia superantes, graciles, sericei.* Capitula *sphærica.* Flores *flavi, radii pauci.* Receptaculi *paleæ lineares, apicibus incurvis acuminatis dorso hispidis.*

159. MACRAEA LARICIFOLIA, *Hook. fil.*

Hab. Charles Island, *Charles Darwin, Esq.* Albemarle Island, *Mr. Macrae & Charles Darwin, Esq.*

160. LECOCARPUS PINNATIFIDUS, *Decaisne, in Voy. Venus.*

Hab. Chatham and Charles Islands, *Charles Darwin, Esq.*

The leaves of this curious plant are variously cut, sometimes being very deeply pinnatifid, with the segments narrow, as in Decaisne's excellent figure, and at others lanceolate and inciso-pinnatifid, with the segments much broader.

161. SCALESIA ATRACTYLOIDES, *Arnott in Lindley, Introd. to Nat. Ord.* p. 204; *and in Hook. Journ. of Bot.* vol. iii. p. 312.

Hab. Galapagos Islands, *Mr. Cuming.*

162. SCALESIA INCISA, *Hook. fil.*; scaberula, foliis scabridis longè petiolatis ovatis ad medium pinnatisectis lobis inæqualiter serratis, pedunculo brevi solitario terminali, capitulis discoideis, involucro cylindraceo, receptaculi squamis trifidis.

Hab. Chatham Island, *Charles Darwin, Esq.*

Suffrutex? Rami terminales stricti, indivisi, teretes, crassitie pennæ corvinæ, apices versus foliosi, scaberuli, guttis minimis gummi adspersi, pallidè rufo-fusci, apicibus nigricantibus. Folia alterna, erecto-patentia, subrecurva, ovata, 2-uncialia, coriacea, rigida, utrinque regulariter pinnatisecta, lobis erectis grossè serratis, suprà subtùsque tuberculis minutis scabrida, hic illic obscurè hispidula. Petioli $\frac{3}{4}$ unc. longi, stricti. Pedunculi solitarii, subterminales, petiolo æquilongi, stricti, erecti, robusti. Capitulum $\frac{1}{3}$ unc. latum, cylindraceum, diametro angustiore; involucri squamis lineari-oblongis, obtusis, subbiserialibus, extùs glanduloso-puberulis. Flores circiter 20, omnes tubulosi, hermaphroditi, squamis brevioribus apice trifidis inclusi. Achænia omninò calva, compressa. Corollæ tubus elongatus, piloso-glandulosus, sursùm campanulatus; segmentis recurvis, extùs ad margines glandulosis. Stylus exsertus, breviter bifidus, ramis divergentibus.

The species of *Scalesia* form a very natural genus, and all those now to be described agree in every essential particular with the generic character, drawn up by Arnott from an examination of *S. atractyloides* alone. The flowers of the ray in some have ligulate corollas, but they are neuter, and such species are here grouped together. The division of the style is a variable character; it has long arms in some of the flowers and is very short in others. Judging by Mr. Darwin's excellent specimens, this and the following species appear very distinct from one another. The habit of the present is rather different from the rest.

163. SCALESIA PEDUNCULATA, *Hook. fil.*; frutescens, ramis cicatricosis, foliis in ramis terminalibus petiolatis ovatis longè acuminatis integerrimis utrinque pubescentibus, pedunculis strictis elongatis petiolo triplò longioribus, capitulis discoideis majusculis latè breviter campanulatis.

Hab. James Island, *Charles Darwin, Esq.*

Rami ultimi simplices, crassitie ferè pennæ anserinæ, glabri, striati, supernè pubescentes, ad apices villosi, gummiferi, e lapsu foliorum cicatricati. Folia patentia, in ramis terminalia, basi cuneata, apices versus longè attenuata, plana, nervosa, molliter pubescentia, 3–4 unc. longa, petiolis gracilibus, $\frac{1}{2}$–$\frac{3}{4}$-uncialibus, interdum ut folia juniora albo-sericeis. Pedunculi axillares, 3 unc. longi, crassitie pennæ corvinæ, sericei v. pubescentes. Capitula multiflora, circa $\frac{3}{4}$ unc. diametro, latiora quam lata, basi truncata, pedunculo intruso. Involucri squamæ latè obovatæ, acutæ, pubescentes v. sericeæ. Corollæ involucro longiores, tubo puberulo; antheris $\frac{3}{4}$ exsertis.

A very handsome species.

164. SCALESIA DARWINII, *Hook. fil.*; sericeo-pubescens, ramis gracilibus longè nudis cicatricatis, foliis terminalibus recurvis longissimè lineari-lanceolatis integerrimis breviter petiolatis sericeis basi villosis, capitulis brevissimè pedunculatis depresso-hemisphæricis, involucri squamis subfoliaceis elongatis extùs villosis.

Hab. James Island. Characteristic of the vegetation of James Island, forming woods of straight trees in the alpine or damp region.—*Darwin, MS.*

Rami flexuosi, crassitie pennæ corvinæ, cortice cinereo tecti, cicatricibus foliorum lapsorum tuberculati, supernè puberuli, ad bases foliorum sericei. Folia ad apices ramulorum numerosa, conferta, breviter petiolata, 4 unc. longa, $\frac{1}{4}$ unc. lata, patenti-recurva, in acumen longè attenuata, utrinque sericeo-pubescentia, marginibus integerrimis subrecurvis, subtùs reticulatim venosa; petiolis brevibus, $\frac{1}{4}$ unc. longis, pulcherrimè pilis albidis sericeo-villosis. Pedunculi inter folia omninò occlusi, breves, densè sericei. Capitula magna, 1 unc. diametro, subsessilia, depresso-globosa, multiflora. Involucri squamæ foliaceæ, floribus bis longiores, angustè lanceolatæ, attenuatæ, valdè inæquales. Corollæ tubus puberulus; antheris ferè omninò exsertis.

This, in the form of the leaf, resembles *S. atractyloides*, but in other respects is a perfectly different plant. The large capitula, white silky pubescence, and its imparting a character to the landscape of James Island, render the present species one of the most interesting of this singular genus.

165. Scalesia gummifera, *Hook. fil.*; pubescens, ramis validis supremis foliosis, foliis petiolatis ovatis ovato-lanceolatisve acuminatis utrinque attenuatis serrulatis in petiolum decurrentibus, pedunculis gracilibus solitariis petiolo æquilongis, capitulis parvis radiatis cylindraceis.

Hab. Albemarle Island, *Mr. Macrae.*

Rami robusti, pubescentes, crassitie pennæ olorinæ, tuberculis subannulatis notati, furcati; ultimi elongati, sæpè hirsuti, undique foliosi. Folia patentia, inferiora reflexa, 3 unc. longa, acuminata, subundulata, basi cuneata, suprà molliter pubescentia, venis obscuris, subtùs sericea v. hirsuta, seniora venis prominulis rugosa, petiolis 1 unc. longis, latiusculis, pubescentibus. Pedunculi graciles, axillares, petiolo longiores, pilosi. Capitula parva, inconspicua, sub $\frac{1}{3}$ unc. longa, cylindracea, longiora quàm lata, siccitate nigrescentia. Involucri squamæ erectæ, oblongæ, obtusæ, extùs puberulæ. Corollæ radii ligulati, 1-seriales, disci tubo elongato glaberrimo; ligulâ suberectâ, oblongâ, multinervi; achænio elongato, calvo, angusto, 3-costato; flores disci ut in congeneribus.

The specific name is suggested by the gummy exudation on this plant, but which is perhaps more or less common to the whole genus.

166. Scalesia affinis, *Hook. fil.*; pubescens, foliis ovatis acuminatis in petiolum brevem gradatim attenuatis serratis subtùs hirsutis, pedunculis gracilibus petiolo multò longioribus, capitulis radiatis majusculis campanulatis.

Hab. Charles Island, *Charles Darwin, Esq.*

S. gummiferæ simillima, sed differt præcipuè foliorum petiolis brevibus v. subnullis, capitulisque duplò majoribus latioribus campanulatisque.

Very similar to the last; still the several excellent specimens in Mr. Darwin's herbarium seem sufficiently distinct. *S. affinis* has very short petioles, and its capitula are nearly thrice the size of those of *S. gummifera*, are broader also in proportion, and of a campanulate form.

167. WEDELIA TENUICAULIS, *Hook. fil.*; herbacea, pubescens, caule gracili tereti erecto supernè ramoso, ramis erecto-patentibus gracilibus, foliis flaccidis petiolatis elliptico-oblongis acutis serratis basi cuneatis, pedunculis filiformibus erectis pilosis folia superantibus, capitulis discoideis hemisphæricis, involucri squamis latè ovatis subacutis flosculos radii vaginantibus, receptaculo paleaceo, floribus omnibus hermaphroditis, disci paleis vaginatis, achæniis pilosis bi–trisetosis.

Hab. Albemarle Island, *Mr. Macrae.*

Annua. Caules bi–tripedales, stricti, diametro pennæ corvinæ. Folia sparsa, alterna, patula, membranacea, utrinque puberula. Petioli gracillimi $\frac{1}{2}$–2-unciales. Pedunculi axillares, $1\frac{1}{2}$–3-unciales, filiformes. Capitula parva, depresso-hemisphærica, $\frac{1}{4}$ unc. lata. Involucri squamæ exteriores paucæ, 6–8 lin. longæ, pilosæ, nervosæ. Flores sub 10, omnes tubulosi, tubo gracili glabro. Achænium maturum latè obconicum, nigrum, pubescens, turgidum, pappo rigido bi–trisetoso scabriusculo coronatum.

The present species is closely allied to the *W. discoidea*, Schlect., a West Indian plant: they possibly form a new genus.

168. JÆGERIA GRACILIS, *Hook. fil.*; annua, patentim pilosa, caulibus plurimis ascendentibus elongatis trichotomè ramosis teretibus gracilibus, foliis patentibus sessilibus ovato-oblongis acutis obscurè dentatis subhispido-pilosis, pedunculis axillaribus filiformibus, capitulis depresso-sphæricis discoideis, squamis involucri lanceolatis non vaginantibus pilosis trinerviis, floribus omnibus tubulosis basi pilosis, achæniis calvis.

Hab. Charles Island, *Charles Darwin, Esq.*

Herba ramosa, pedalis, ramis gracilibus. Folia inferiora uncialia, supernè gradatim minora, membranacea, virescentia; petiolo nullo. Pedunculi erecti, 1 unc. longi. Capitula 2–3 lin. lata, seniora paleis persistentibus apice nigris onusta. Flores hermaphroditi; radii squamis involucri oppositi, 5-fidi; styli ramis brevibus obtusis. Receptaculum elongato-conicum. Achænium oblongo-lanceolatum, compressum, glaberrimum, coronâ cupuliformi minimâ.

This differs from its congeners in the capitula being discoid, and in the scales of the involucre and of the receptacle not sheathing the flowers.

169. Jægeria prorepens, *Hook. fil.*; piloso-pubescens gracilis, caule repente radicante parcè di-trichotomè ramoso, foliis sessilibus oblongis obtusis obscurè dentatis utrinque subhispido-pilosis, pedunculis axillaribus filiformibus folio æquilongis v. longioribus, capitulis parvis radiatis subsphæricis, squamis involucri ovato-lanceolatis acutis flores radii vaginantibus, receptaculi paleis involutis, fl. radii ligulatis, ligulâ latâ bifidâ.

Hab. James Island, *Charles Darwin, Esq.*

Caules 6 unc. longi, repentes, radicantes, ramis ascendentibus v. erectis. Folia uniformia, $\frac{1}{3}$ unc. longa. Capitula 2 lin. lata.

Allied to the *J. hirta*, but a much smaller plant, of a different habit of growth, and with leaves rounder at the base.

170. Spilanthes diffusa, *Hook. fil.*; herbacea, hispido-pilosa, caule gracili prostrato ascendente subsimplici, foliis petiolatis ovatis acutis interdùm basi cordatis integerrimis utrinque hispidis, capitulis discoideis latè ovatis obtusis longè pedunculatis, involucri squamis uniseriatis oblongis obtusis dorso pilosis, floribus omnibus tubulosis hermaphroditis, styli ramis erectis, achæniis omninò calvis, receptaculo columnari.

Var. β. minor, vagè ramosa.

Hab. Charles Island; *var.* β. James Island, *Charles Darwin, Esq.*

Caules tenues, 3 unc. ad spithamæum, ramis divaricatis elongatis. Folia $\frac{1}{2}$–$\frac{3}{4}$ unc. longa, planiuscula, subcoriacea, utrinque pilis sparsis albidis hispida v. substrigosa, interdùm obscurè sinuata; petiolis 2–4 lin. longis. Capitula parva, $\frac{1}{4}$ unc. longa, juniora globosa demum elongata. Receptaculi paleæ flores vaginantes, subscariosæ, obtusæ, dorso obscurè ciliatæ. Achænium atrum, glaberrimum. Corollæ dentibus 4–5 glanduloso-incrassatis. Stamina inclusa, nigra. Styli ramis breviusculis, erectis, apicibus subacutis recurvis.

A very insignificant weed, though apparently undescribed: it differs from the generic character of *Spilanthes* in the arms of the styles being erect.

171. Chrysanthellum pusillum, *Hook. fil.*; annua, glaberrima, caulibus gracillimis ramosis, ramis ascendentibus, foliis omnibus petiolatis ovatis dissectis laciniis linearibus acuminatis, capitulis longè pedunculatis hete-

rogamis paucifloris, floribus radii ligulâ lineari apice bidentatâ disci 4-fidis, involucri squamis oblongis obtusis nervosis, achæniis oblongis glaberrimis calvis.

Hab. Albemarle Island, *Charles Darwin, Esq.*

Herba spithamæa, vagè ramosa, ramis ascendentibus gracillimis. Folia pauca, $\frac{1}{2}$ unc. longa. Pedunculi filiformes, 2–3-unciales. Capitula vix 2 lin. lata. Flores radii pauci, 1-seriati; disci tubulosi, nervis incrassatis. Receptaculum planum, paleis lanceolatis onustum. Stylus fl. radii ramis obtusis, fl. disci ramis appendicibus valdè elongatis terminatis. Achænia lævia, integumento crassiusculo non crustaceo.

Much the most slender species of the genus with which I am acquainted.

172. Aplopappus lanatus, n. sp.; fruticulosus, totus arachnoideo-lanatus, foliis membranaceis angustè lineari-spathulatis acuminatis integerrimis v. remotè serratis marginibus revolutis crispatulo-undulatis, capitulis terminalibus subsolitariis breviter pedunculatis nutantibus, involucri latè campanulati squamis linearibus imbricatis dorso lanatis, floribus radii perpaucis sterilibus ligulatis pappo pauci-setoso, disci plurimis achæniis villosis pappo setis plurimis scabridis subinæquilongis rufo-fulvis.

Hab. Galapagos Archipelago, *Adm. Du Petit Thouars.*

Specimen mancum 4-pollicare basi validum lignosum; ramis gracilibus herbaceis. Folia $\frac{3}{4}$–1 unc. longa, vix $1\frac{1}{2}$ lin. lata, integerrima, rariùs remotè argutè serrata. Capitula $\frac{1}{3}$ unc. longa, e floribus radii inconspicuis primo visu discoidea. Receptaculum alveolatum, fimbrilliferum.

A very distinct species, allied to *Heterotheca* in the flowers of the ray being neuter, very few in number, and incompletely developed.

Umbelliferæ.

173. Helosciadium laciniatum, *DeC. Prodr.* vol. iv. p. 105.

Hab. Charles Island, *Charles Darwin, Esq.*

174. Helosciadium leptophyllum, *DeC. Prodr.* vol. iv. p. 105.

Hab. James Island, *Charles Darwin, Esq.*

These specimens are starved and very diminutive. It is more than probable that this, the former and *H. ranunculifolium*, DeC., will all merge into one species.

LORANTHEÆ.

175. VISCUM HENSLOVII, *Hook. fil.*; foliosum, ramis dichotomis teretibus, foliis breviter petiolatis obliquè ovato-lanceolatis subacutis basi subattenuatis 5-nerviis opacis, spicis 6–8-articulatis folio $\frac{1}{2}$ brevioribus: axillaribus geminis: terminalibus ternis, vaginulis bifidis acutis, floribus hexastichis.

Hab. Charles Island, *Charles Darwin, Esq.*

Rami crassitie pennæ anserinæ, teretes, hic illic articulati, internodiis 1–2-uncialibus; articulis vaginatis, ad axillas foliosis. Folia tripollicaria, valdè coriacea, $1\frac{1}{2}$ unc. lata, venis primariis 5 parallelis, paginâ inferiore reticulatim venosâ; petiolo $1-1\frac{1}{2}$ unc. longo, crassiusculo. Spicæ ad axillas foliorum 2–4, sæpè terminales, erectæ vel adscendentes, $1\frac{1}{2}$–2 unc. longæ, articulis supremis sterilibus. Baccæ parvæ, sub 1 lin. diametro, globosæ, semi-immersæ.

Very near the *Viscum Perrottetii* of Guiana, judging by the description in DeCandolle's 'Prodromus'; the leaves are however smaller, the spikes with more articulations, and the principal nerves of the leaf can hardly be considered as branched. In the specimens of this and the following species the branches are di- or rarely trichotomous, and the leaves only in the axils of the branches, never at the other articulations of the stem. The flowers appear confined to the axils, and do not spring, as in some species, from other parts of the plant.

176. VISCUM GALAPAGEIUM, *Hook. fil.*; foliosum, ramis teretibus lignosis dichotomè divisis, foliis breviter petiolatis latè obovatis apice rotundatis valdè coriaceis aveniis, spicis axillaribus solitariis vel ad apices ramulorum ternis articulatis cylindraceis, floribus subhexastichis, ovariis semi-immersis.

Hab. Chatham Island, *Charles Darwin, Esq.*

Priori affine, sed foliorum aveniorum formâ distinctum. Rami crassitie pennæ anserinæ, internodiis 3-uncialibus. Folia 2 unc. longa, subsessilia v. petiolo brevi instructa. Spicæ $\frac{3}{4}$ unciales multiarticulatæ, ad articulos vaginatæ; vaginis breviter bifidis.

RUBIACEÆ.

177. RUBIA (sp.)?

Hab. Charles Island, *Charles Darwin, Esq.*

Apparently an unnamed Peruvian species; but the specimens from the

Galapagos have neither flower nor fruit. It approaches the *R. Reblun* (Hook. & Arn.) of Chili.

Borreria, *Meyer*.

The following species belong to DeCandolle's second section, "floribus in axillis subfasciculatis aut solitariis," and they all seem peculiar to the small group of islands under consideration. The corollas are furnished with a tuft of hair above the faux. The stipules have long cilia. The flowers and fruit are small, and the seeds rough with depressed tubercles, but the latter organs afford scarcely any character.

178. Borreria dispersa, *Hook. fil.*; radice lignosâ, caulibus diffusis prostratis vagè dichotomè ramosis acutè tetragonis glaberrimis v. pilis minutissimè conspersis lævibus nitidis, foliis subsessilibus latè ellipticis mucronatis suprà glabriusculis marginibus subrecurvis ciliatis subtùs glaberrimis, corollæ limbo calycem vix superante.

Hab. Charles and James Islands, *Charles Darwin, Esq.*

Caules graciles, vix diam. pennæ passerinæ. Folia pallidè virescentia, coriacea, 4–5 lin. longa, subtùs pallidiora.

179. Borreria linearifolia, *Hook. fil.*; caulibus elongatis gracilibus procumbentibus vagè divaricatim ramosis, infernè teretiusculis sublignosis, ramulis acutè tetragonis glaberrimis nitidis, foliis patentibus lineari-lanceolatis planis acutis mucronatis suprà tenuiter hispido-pilosis marginibus lentè recurvis ciliatis subtùs glaberrimis, corollâ ut in *B. dispersâ.*

Hab. James Island, *Charles Darwin, Esq.*

Caules pedales et ultrà, graciles, remotè foliosi, infernè cortice rufo tecti, subteretes. Folia $\frac{1}{2}$–$\frac{3}{4}$ unc. longa, plana, $1\frac{1}{2}$–2 lin. lata, luridè viridia, subtùs pallidiora.

Very different from the last in the form of the foliage.

180. Borreria suberecta, *Hook. fil.*; tota hispido-pilosa, radice caulibusque inferioribus lignosis, ramis striatis suberectis virgatis acutè tetragonis foliosis, foliis linearibus pungentibus patulis curvatisve marginibus revolutis utrinque hispido-pilosis coriaceis, calycis laciniis ovato-lanceolatis acuminatis corollam subæquantibus, fructibus majusculis pilosis.

Var. β. flaccida, ramis tenuioribus, foliis submembranaceis.

Hab. Albemarle Island, *Mr. Macrae.*

Caules pedales, infernè teretes, lignosi, cortice rufo-fusco glaberrimo tecti, supernè tetragoni, hispido-pilosi. Folia in ramulis abbreviatis fastigiata, 3–4 lin. longa, vix 1 lin. lata, luridè viridia. Fructus 1 lin. longus.

The variety β. is in a very imperfect state, and may possibly belong to the former or to another species; it is much slenderer, and the leaves are scarcely hispid underneath.

181. Borreria perpusilla, *Hook. fil.*; hispidula, radice lignosâ, ramis divaricatis acutè tetragonis, foliis lineari-oblongis v. elliptico-lanceolatis acutis suprà hispido-pilosis subtùs glaberrimis marginibus revolutis ciliatis, floribus majusculis, corollâ campanulatâ laciniis calycinis bis longiore ovarioque latiore, fructibus pilosis.

Hab. James Island, *Charles Darwin, Esq.*

Radix crassitie pennæ corvinæ, pro plantâ maxima, lignosa, fibras plurimas emittens. Rami substricti, vix unciales. Folia 1–$1\frac{1}{2}$ lin. longa, fusco-viridia, patentia. Flos folia vix longitudine æquans.

A very distinct little species, barely an inch long.

182. Borreria ericæfolia, *Hook. fil.*; tota glaberrima, caule lignoso robusto, ramis subsimplicibus plurimis subfasciculatim ramosis strictis erectis gracilibus teretibus, ramulis tetragonis, foliis parvis in ramulis brevissimis lateralibus fasciculatis lineari-subulatis paulò curvatis pungentibus rigidè coriaceis marginibus revolutis, fructu glaberrimo.

Hab. Chatham Island, *Charles Darwin, Esq.*

Suffrutex, verosimiliter pedalis. Caulis basi crassitie pennæ anserinæ, statim in ramulos subsimplices plurimos divisus. Ramuli $\frac{1}{2}$–$\frac{3}{4}$-pedales, stricti, erecti, virgati, graciles, diametro pennæ corvinæ, nunc longè nudi, cortice fusco-castaneo tecti, ramulis ultimis subfiliformibus tetragonis. Folia parva, vix 3 lin. longa, $\frac{1}{2}$ lin. lata, rigida, pungentia, margine supra basin revoluta, siccitate nitida, flavo-fusca. Flores ad apicem ramorum rari, inconspicui. Calycis laciniæ ovato-subulatæ, acuminatæ, marginibus subciliatis, corollam æquantes. Fructus ut in congeneribus.

183. Borreria parvifolia, *Hook. fil.*; ramis gracilibus virgatis ramulosis infernè subteretibus angulatisve ramulis brevibus foliosis per totam longitudinem sparsis, foliis parvis coriaceis subfasciculatis lineari-obovatis

obtusis marginibus vix recurvis suprà hispidis subtùs glabriusculis, fructu glaberrimo.

Hab. Albemarle Island, *Mr. Macrae.*

A priore, cui valdè affinis, differt ramis ramulosis, ramulis foliiferis longioribus, et præcipuè foliis latioribus obtusis paginâque superiore scabridis.

184. Borreria divaricata, *Hook. fil.*; caule prostrato? lignoso, ramis teretibus divaricatim ramosis virgatis remotè foliosis, cortice pallidè cinereo, ramulis tetragonis scaberulis, foliis parvis fasciculatis oblongis obtusis coriaceis rigidis margine ciliatis paginâ superiore hispidulis, floribus inconspicuis, lobis calycinis acuminatis subciliatis, corollæ tubo brevi fauce longè barbatâ, fructu glaberrimo.

Hab. Charles Island, *Charles Darwin, Esq.*

Suffrutex parvulus. Caulis spithamæus, teres, strictus, parcè divaricatim ramosus. Rami ultimi angulati v. tetragoni, scaberuli, remotè foliosi. Folia sub 1 lin. longa, in ramulos breves fasciculata.

185. Borreria falcifolia, *Hook. fil.*; caule tereti robusto lignoso, ramis elongatis strictis gracillimis parcè ramosis, ramulis divaricatis angulatis glabriusculis, foliis parvis linearibus obtusis basi subattenuatis suprà scaberulis medio sulcatis marginibus scaberulis revolutis, fructu glaberrimo.

Hab. Albemarle Island, *Mr. Macrae*? (*in Herb. Hook.*).

A very distinct species, though, like the former, the only peculiarity lies in the leaves, which in all the Galapagos Island species of this genus, whether gathered by Darwin or Macrae, present tangible and constant specific characters. All the above differ exceedingly from their congeners on the American coast.

186. Spermacoce tenuior, *L.*

Hab. James Island, *Charles Darwin, Esq.*

187. Chiococca trisperma, *Hook. fil.*; foliis petiolatis ovato- vel elliptico-lanceolatis utrinque attenuatis acuminatis glabris coriaceis subnitidis, stipulis latissimis breviter cuspidatis, racemis multifloris, corollæ tubo calyce quadruplò longiore, staminum filamentis glaberrimis, ovario profundè trilobo, fructu triloculari loculis 1-spermis.

Hab. Chatham Island, *Charles Darwin, Esq.*

Rami stricti, graciles, teretes v. obscurè tetragoni. Folia 2 unc. longa, subrecurva, coriacea, longè acuminata, glaberrima, siccitate flavescentia, venis subtùs obscuris. Racemi oppositi, axillares, foliis breviores, cernui v. nutantes, 12–15-flori, pedunculo gracili. Flores pedicellati, pedicellis sub 2 lin. longis, basi bracteolatis. Calycis tubus urceolatus, profundè trilobus; limbus 4-fidus, segmentis brevibus ovatis subacutis. Corollæ tubus obconicus, limbi laciniis linearibus. Stamina ut videtur epigyna, filamentis brevibus glaberrimis. Stylus apice obscurè 3-lobus. Fructus immaturus trilobus, 3-pyrenus, pyrenis osseis, compressis, monospermis; semina ex apice loculi pendula, oblonga, compressa, immatura testâ brunneâ.

This has entirely the habit of *Chiococca*, and might even at first sight be confounded with *C. racemosa*. It is however abundantly distinct, differing even from the generic character by its 3-celled ovary and smooth filaments; the latter indeed are so represented in *C. racemosa* of Hooker's 'Exotic Flora,' of which Andrews remarks that the stigma is trifid.

188. Chiococca?
Hab. Albemarle Island, *Mr. Macrae.*

Specimens with neither flowers nor fruit: the leaves are smaller, narrower, and more elliptic-lanceolate than those of the former.

189. Chiococca racemosa, *Jacq.*
Hab. James Island, *Dr. Scouler.*

In a very imperfect state, but apparently the South American plant, which is extremely variable; the three species of DeCandolle's first section being with difficulty distinguishable from each other.

190. Psychotria, sp.?
Hab. Charles Island, *Charles Darwin, Esq.*

The leaves and whole plant quite glabrous.

191. Psychotria rufipes, *Hook. fil.*; pedunculis petiolis foliisque subtùs ad nervos rufo-tomentosis, ramis teretibus, foliis petiolatis obovato-lanceolatis obtusis basi attenuatis suprà glabris subtùs pubescentibus, stipulis majusculis concavis latè ovatis integris ramis latioribus, paniculis terminalibus v. axillaribus brevibus, floribus ad apices ramorum congestis

breviter pedicellatis, calycis limbo obsoleto, corollâ tubulosâ extùs villosâ intùs barbatâ laciniis linearibus obtusis reflexis, fructibus ellipticis.

Hab. James Island, *Charles Darwin, Esq.*

Rami robusti, glaberrimi, læves, siccitate nigri, albo-maculati, ultimi infra stipulas subtomentosi. Folia 3–5-pollicaria, patentia, plana, subtùs pilis mollibus pubescentia, ad nervos rufo-tomentosa, margine integerrimo plano. Petioli 3–4 lin. longi, rufo-tomentosi. Stipulæ coriaceæ, extùs subpubescentes, rarò bidentatæ. Panicula uncialis, 3-ramosa. Flores 2 lin. longi, extùs pilis albidis villosi. Fructus 2½ lin. longus; carpellis dorso 8–10-sulcatis.

PORTULACEÆ.

192. SESUVIUM EDMONSTONEI, *Hook. fil.*; ascendens, caule basi lignoso dichotomè ramoso ramisque siccitate cellulis furfuraceis undique obsitis, foliis internodio longioribus linearibus obtusis integerrimis basi gradatim angustatis carnosis, floribus axillaribus terminalibusque breviter pedunculatis, pedunculis cum flore æquilongis basi bibracteolatis, calycis laciniis lanceolatis acuminatis.

Hab. Charles Island, *A. Goodridge, Esq.*

Caules basi angulatim flexuosi, teretes, crassitie pennæ anserinæ, ramique siccitate e cellularum serie externo inflato furfuracei. Internodia vix uncialia. Folia uncialia, 1–1½ lin. lata, valdè carnosa. Bracteolæ oppositæ, oblongæ, subscariosæ. Pedunculus ½ unc. longus. Perianthium basi conicum, laciniis erectis concavis, apicibus uncinatim incurvis, marginibus membranaceis inflexis. Stamina plurima, inclusa. Ovarium oblongum.

The narrow foliage and other characters will amply distinguish this species from its congeners.

PLEUROPETALUM, n. g.

Calyx persistens, bipartitus, sepalis latè ovatis. *Petala* 5, subæqualia, libera, concava, coriacea, siccitate multicostata. *Stamina* 8, toro inserta, filamentis in tubum membranaceum coalitis, antheris elongatis ovarium vix superantibus. *Styli* 4, lineares. *Ovarium* uniloculare, pluri-ovulatum; ovulis placentæ basilari funiculis elongatis adnexis.

Suffrutex? *perennis, glaberrima, siccitate nigricans, ramis teretibus strictis, apices versùs foliosis.* Folia *petiolata, patentia, elliptica, utrinque attenuata, longè acuminata, integerrima.* Flores *in paniculas breves paucifloras terminales dispositi, breviter pedicellati, inconspicui.* Calyx *parvus, carnosus.* Petala *majuscula.*

193. PLEUROPETALUM DARWINII, *Hook. fil.*

Hab. James Island, *Charles Darwin, Esq.*

Rami in exemplaribus nostris 6 unc. longi, subsimplices. Folia $1\frac{1}{2}$–2-pollicaria, in apicem attenuatum producta. Petala sub 2 lin. longa.

Loaseæ.

194. Acrolasia squalida, *Hook. fil.*; hispido-pilosa, caule decumbente vagè ramoso, ramis angulatim flexuosis divaricatis, foliis parvis petiolatis ovatis subacutis lobatis angulatisve, floribus sessilibus, calycis tubo subcylindraceo elongato-turbinato: lobis lanceolatis, petalis inæqualibus latè obovatis dorso apices versùs pilosis.

Hab. Charles Island, *Charles Darwin, Esq.*

I have referred this to Presl's genus *Acrolasia,* though it is very dubious if that be distinct from *Bartonia.* The specimens are in a most imperfect state, yet appear to belong to a very well-marked species.

Passifloreæ.

195. Passiflora (*Cieca*) lineariloba, *Hook. fil.*; caule ramisque gracillimis teretibus, ramulis pubescentibus, foliis brevè petiolatis glaberrimis tripartitis: laciniis subæquilongis lineari-elongatis acutis integerrimis lateralibus divergentibus, petiolis suprà medium biglandulosis, cirrhis simplicibus.

Hab. James Island, *Dr. Scouler & Mr. Douglas* (*Herb. Hook.*).

Rami 1–2-pedales, flexuosi, crassitie pennæ passerinæ, ramulis pube brevi subvelutinis. Folia patentia, in lacinias 3 elongatas lineares divisa, sinubus obtusis, ad petiolum rotundata, laciniis 2 unc. longis, planis, sub 3 lin. latis; petiolo $\frac{1}{4}$ unc. longo pubescente, glandulis 2 instructo.

A very distinct and undescribed species, but the specimens are very bad.

196. Passiflora (*Cieca*) tridactylites, *Hook. fil.*; glaberrima, caule gracili parcè ramoso, ramis teretibus elongatis, foliis petiolatis imâ basi subcordatis profundè trilobis: lobis lineari-oblongis acutis integerrimis submembranaceis lateralibus brevioribus divaricatis interdùm obtusis, pedunculis cirrhisque simplicibus ex iisdem axillis, involucro nullo, calyce 5-lobo: lobis linearibus obtusis, ovario longè pedicellato.

Hab. Charles Island, *Charles Darwin, Esq.*

Caulis diametro pennæ corvinæ, flagellaris. Petioli $\frac{1}{2}$ unc. longi, infra laminam bibracteolati. Foliorum lobus intermedius 2–3-uncialis, laterales $1\frac{1}{2}$–$2\frac{1}{4}$-unciales, omnes sub $\frac{1}{2}$ unc. lati, suprà virides subnitidi, infrà subglauci, sinubus rotundatis. Pedunculus perbrevis. Flos $\frac{3}{4}$ unc. diametro; filamentis coronæ sepala vix æquantibus.

197. PASSIFLORA (*Cieca*) PUBERULA, *Hook. fil.*; tota pilis brevibus sub lente micantibus pubescens, caule tereti ramoso, foliis trilobis basi cuneatis: lobis lineari-lanceolatis acutis integerrimis lateralibus $\frac{1}{2}$ brevioribus erecto-patentibus sinubus obtusis, cirrhis simplicibus pedunculisque arcuatis ex iisdem axillis, involucro nullo, calyce 5-lobo.

Hab. James Island, *Charles Darwin, Esq.*

Caules graciles, elongati. Petioli $\frac{1}{3}$ unc. longi, supra medium biglandulosi. Folia uncialia basi cuneata, ad apicem petioli rotundata, utrinque pilis brevibus crispatulis sub lente nitentibus pubescentia; lobus intermedius acutus v. acuminatus, $\frac{1}{4}$ unc. diametro; laterales erecto-patentes. Pedunculi petiolo longiores, arcuati. Calyx 5-lobus, segmentis angustè linearibus dorso pubescentibus. Bacca ovato-oblonga, sub $\frac{1}{3}$ unc. longa.

FICOIDEÆ.

198. OPUNTIA GALAPAGEIA, *Henslow in Magazine of Zoology and Botany*, vol. i. p. 467. tab. xiv. f. 2.

Hab. James Island, *Charles Darwin, Esq.*

199. CEREUS ?, sp.

Hab. Galapagos, *Charles Darwin, Esq.*; vid. *Henslow, l. c.*

CUCURBITACEÆ.

200. SICYOS VILLOSA, *Hook. fil.*; caule petiolis paniculâque tomento laxo patente glanduloso vestitis, cirrhis corymboso-multifidis, foliis longè petiolatis latè ovato-rotundatis basi profundè cordatis obscurè sinuato-lobatis spinuloso-dentatis suprà papillatis subtùs puberulis, floribus masculis paniculatis, pedunculo folium superante tripartito, ramis multifloris, pedicellis patenti-reflexis elongatis.

Hab. Charles Island, *Charles Darwin, Esq.*; forming great beds, and very injurious to the other vegetation.

Caules siccitate profundè sulcati, crassitie digiti minoris, toti, ut petioli cirrhi paniculæque, pilis mollibus patentibus apice glanduliferis vestiti. Folia $\frac{1}{2}$ ped. lata, et ferè ejusdem diametri, membranacea, obscurè sinuato-lobata, basi pro $\frac{1}{3}$ longitudinis bifida v. cordata, lobis rotundatis, sinu acuto, paginâ superiore papillis minutis albidis conspersâ, nervis pubescentibus, inferiore pilis albidis puberulâ, margine ad apices nervorum subspinuloso-dentato. Petiolus folio longior v. subæquilongus. Cirrhus 3-uncialis, deindè in flagellas plurimas fissus. Panicula pedalis, supernè in ramos 3 divisa, ramis multifloris. Flores longè pedicellati, divaricatim patentes; pedicellis villosis, gracilibus, $\frac{1}{2}$-uncialibus. Flores masculi diametro 2–3 lin., lutei. Calycis tubus brevis, dentibus 5 subulatis. Corolla calyci adnata, extùs pubescens. Columna antherifera in glandulam insidens, erecta, filamentis 3, antheris 5? Pedunculus florum fœmineorum ad basin masculorum, solitarius, 2 unc. longus, apice multiflorus. Flores ignoti. Fructus ellipticus, $\frac{1}{2}$ unc. longus, pubescens, setisque axillaribus retrorsùm sub lente pilosis obsitus. Semen unicum.

Mr. Darwin mentions this as a very pernicious weed. It is a distinct species from any I have seen, and I believe not hitherto described.

201. Elaterium cordatum, *Hook. fil.*; glabriusculum, foliis membranaceis rotundatis basi profundè cordatis lobis rotundatis approximatis sinu obtuso membranaceis margine obscurè sinuato-dentatis utrinque sparsè papillatis ad nervos minutè setosis, cirrhis bifidis, pedunculis masculis elongatis bi–trifidis bi–trifloris, floribus luteis fœmineis ad basin pedunculi maris solitariis, calyce longè tubuloso basi truncato infra limbum brevissimè 5-dentatum hirsuto.

Hab. James Island, *Charles Darwin, Esq.*

Caulis gracilis, elongatus, glaberrimus v. parcè pilosus. Folia remota, 2–3 unc. lata, basi ad $\frac{1}{3}$ longitudinis biloba, apice rotundata et breviter acuminata, marginibus ad apices nervorum obscurè dentatis, juniora interdùm angulata, petiolis longitudine variis. Pedunculi flor. fœm. $\frac{1}{2}$–1 unc. longi, 2–5-flori. Calycis tubus 3–4 lin. longus. Petala patentia, cum tubo calycis æquilonga v. longiora, lineari-subulata. Columna antherifera gracilis; antheris elongatis. Flos fœmineus semper (in exemplari unico) ad basin pedunculi floris masculi solitarius, breviter pedicellatus. Fructus ignotus.

A well-marked species, probably peculiar to the Galapagos group.

Myrtaceæ.

202. Psidium Galapageium, *Hook. fil.*; ramis teretibus v. raró angulatis divaricatis cortice cinereo tectis, ramulis tomentosis, foliis parvis breviter petiolatis ellipticis acutis coriaceis junioribus utrinque pilosis venis sub-

obscuris glandulis pellucidis minutis, pedicellis ex axillis foliorum subsolitariis unifloris ½ folii æquantibus gracilibus tomentosis teretibus, alabastris breviter pyriformibus, fructu magnitudine pisi globoso.

Hab. James Island, *Dr. Scouler & Charles Darwin, Esq.*

Frutex? ramis gracilibus; ramulis tomento fulvo obtectis. Folia ¾ unc. longa, ½ lata. Flores plurimi, pedicellis ½ unc. longis, curvatis nutantibusve, alabastris 2 lin. longis.

Apparently distinct, though, like many of its congeners, difficult to be defined. Dr. Scouler's specimens are only in bud; the leaves are young and turn black in drying. The foliage of Mr. Darwin's specimen is more coriaceous, and there are berries, which are globose and 3-seeded: the testa is singularly thick and osseous.

Rhizophoreæ.

203. Rhizophora Mangle, *Linn. DeC. Prodr.* vol. iii. p. 32.

Hab. Chatham Island, *Charles Darwin, Esq.*

Leguminosæ.

204. Crotalaria lupulina, *DeC. Prodr.* vol. ii. p. 133.

Hab. Albemarle Island, *Charles Darwin, Esq.* Tropical shores of America.

205. Crotalaria puberula, *Hook. fil.*; ramis junioribus foliisque sub lente puberulis, caule suberecto ramoso, stipulis parvis setaceis, foliis trifoliolatis obovatis obtusis, racemis oppositifoliis brevibus paucifloris, corollâ ⅓ unc. longâ, leguminibus sub 6-spermis oblongis glabriusculis.

Hab. Charles Island, *Charles Darwin, Esq.*

Variat foliis ⅓–⅔ unc. longis. Caulis interdùm lignosus.

C. lupulinæ affinis, sed floribus leguminibusque triplò longioribus.

206. Dalea parvifolia, *Hook. fil.*; fruticulosa, glabra, ramis diffusis divaricatis verrucosis, foliolis sub 8 parvis obovatis obtusis coriaceis suprà concavis subtùs ramulisque nigro-punctatis, spicis terminalibus ovatis sericeo-villosis densifloris, bracteis ovatis acuminatis concavis cum calyce æquilongis, calyce longè villoso: segmentis subulatis tubo longioribus.

Hab. James Island, *Charles Darwin, Esq.*

Fruticulus, e foliis valdè deciduis quasi aphyllus. Rami 4–6 unc. longi, cortice cinereo-fusco obtecti, verrucis parvis undique conspersi. Folia in ramulis brevissimis subfasciculata, 2–3 lin. longa, foliolis vix 1 lin. longis. Spicæ erectæ, $\frac{1}{2}$–$\frac{1}{3}$ unc. longæ, ovatæ v. cylindraceæ, densè villosæ, multifloræ, ad apices ramulorum sessiles. Pedunculus villosus, strictus. Bractea navicularis, subitò acuminata v. longè apiculata. Calyx sub 3 lin. longus, undique pilis elongatis sericeis densè villosus. Corolla calyce ter longior, siccitate purpurea. Carinæ foliola oblonga, obtusa, longè unguiculata. Legumen calyce inclusum, membranaceum, grossè glanduloso-punctatum, obliquè trapezoideum, utrinque attenuatum, apicem versus longè ciliato-barbatum; seminibus 2.

An exceedingly well-marked species, having most affinity with *D. ramosissima*, Benth. Voy. Sulphur, Botany, p. 11. tab. x.

207. Dalea tenuicaulis, *Hook. fil.*; fruticulosa, diffusa, ramosa, glaberrima, ramis nigro-punctatis, ramulis plurimis gracillimis foliosis erecto-patentibus, foliis 8–10-foliolatis; petiolo filiformi; foliolis parvis obcordatis planiusculis utrinque nigro-punctatis, spicis in ramulis breviusculis terminalibus v. lateralibus ovatis villosis, bracteis navicularibus gradatim acuminatis, calycis laciniis subulatis tubo lato ovato densè pilis villosis sericeo.

Hab. Albemarle Island, *Charles Darwin, Esq.*

Caulis lignosus, basi robustus, irregulariter ramosus. Rami teretes virgati, superiores elongati, gracillimi, ultimi setâ porcinâ vix crassiores, omnes cortice striato pallidè rufo-fusco tecti, nigro-punctati, primarii ramulos abbreviatos foliiferos gerentes. Folia subfasciculata, patentia, subflexuosa, 1 unc. longa, petiolo gracillimo creberrimè nigro-punctato; foliolis caducis, magnitudine variis, 2–4 lin. longis, pallidè fusco-virescentibus, emarginato-bilobis, nervo valido percursis. Pedunculi in ramulis terminales, v. e ramulis abbreviatis foliiferis quasi laterales, $\frac{3}{4}$-unciales, pubescentes. Spica ovata, obtusa, sub 12-flora, floribus approximatis. Calyx densè sericeo-villosus, pilis fulvis nitidis, tubo brevi ovato, laciniis angustè subulatis. Carina calyce quadruplò longior, foliolis oblongis obtusis extùs basi maculâ flavâ notatis, unguibus laminæ æquilongis. Alæ subsimiles. Vexillum plicatum.

208. Tephrosia littoralis, *Pers.* *DeC. Prodr.* vol. ii. p. 253. *var.* foliolis subsericeis.

Hab. Albemarle Island, *Mr. Macrae.*

Mr. Bentham, to whom I am much indebted for assistance in determining the *Leguminosæ* and *Compositæ*, pronounces this to be merely a variety of *T. littoralis*, a West Indian plant.

209. PHACA EDMONSTONEI, *Hook. fil.*; caule decumbente subramoso petiolisque subsericeis, foliolis sub 9-jugis angustè elliptico-obovatis subacutis utrinque sericeo-pubescentibus, pedunculis folium superantibus, racemis oblongis paucifloris, dentibus calycinis subulatis, petalis breviusculis, leguminibus obovatis inflatis breviter stipitatis tenuissimè tomentosis demum glabratis.

Hab. Galapagos, *Adm. Du Petit Thouars*. Charles Island, *T. Edmonstone, Esq.*

Radix lignosus; caulis validus, crassitie pennæ corvinæ, simplex v. basi divisus, substriatus, puberulus; stipulis acutè semisagittatis. Foliola $\frac{1}{2}$–$\frac{3}{4}$-uncialia, utrinque sed subter præcipuè sericeo-pubescentia. Pedunculi floriferi foliis $\frac{1}{2}$ longiores, axillares, suberecti, apice floriferi, fructiferi 8–10 unc. longi. Racemus oblongus, sub 15-florus. Flores vix $\frac{1}{2}$ unc. longi. Calyx sericeus, vexillo $\frac{1}{3}$ brevior. Petala brevia, latiuscula. Legumen chartaceum, tenuiter tomentosum, pallidè flavidum, obovatum, apice abruptè acuminatum, basi in stipitem brevem attenuatum. Semina sub 12, imbricata, obliquè reniformia, compressa, fusco-castanea, sub 2 lin. longa.

A very handsome and distinct species, allied to the *P. densifolia*, Sm., which is smaller, more villous, has 15 jugate leaflets of a much shorter and broadly-ovate figure, and longer petals: also to *P. macrodon*, Hook., of the same country, which may readily be distinguished by the calycine teeth.

210. DESMODIUM FILIFORME, *Hook. fil.*; tota velutino-pubescens, caule simpliciusculo gracili elongato, foliis sparsis pinnatim trifoliolatis; foliolis ovato-lanceolatis acutis utrinque pubescentibus lateralibus minoribus; petiolo retrorsùm piloso, stipulis parvis membranaceis glaberrimis, racemis terminalibus elongatis laxifloris, floribus remotis, pedicellis solitariis v. binis gracilibus, bracteis lineari-subulatis, calycis pilosi laciniis acuminatis.

Hab. James Island, *Charles Darwin, Esq.*

Caulis bipedalis, subfiliformis. Petioli $\frac{2}{3}$ unc. longi. Foliola pallidè viridia, $\frac{1}{3}$ unc. longa, venosa, utrinque piloso-pubescentia. Racemi 2–4 unc. longi, flexuosi, 8–10-flori. Flores ut videtur flavi. Pedicelli $\frac{1}{3}$ unc. longi. Calyx breviter campanulatus. Corolla 4 lin. longa. Legumina desunt.

211. RHYNCHOSIA RETICULATA, *DeC. Prodr.* vol. ii. p. 385.

Hab. Chatham Island, *Charles Darwin, Esq.* West Indies, Peru, &c.

DeCandolle describes the corolla as shorter than the calyx in the present species, and Mr. Bentham remarks that this was probably the case in the specimens which that author examined, because the corolla is often abortive in the *Phaseoleæ*.

212. RHYNCHOSIA MINIMA, *DeC. Prodr.* vol. ii. p. 385.
Hab. Albemarle Island, *Charles Darwin, Esq.* West India Islands.

213. PISCIDIA ERYTHRINA, *Linn.* *DeC. Prodr.* vol. ii. p. 267.
Hab. Chatham Island, *Charles Darwin, Esq.* West Indies.

214. PHASEOLUS (*Drepanospermum*)* MOLLIS, *Hook. fil.*; subvolubilis, totus molliter velutino-pubescens, foliolis subæqualibus latè ovatis integris apice rotundatis utrinque pubescentibus marginibus recurvis reticulatim venosis petiolulatis lateralibus obliquis, stipulis stipellisque parvis atris, racemis axillaribus elongatis laxifloris folio bis terve longioribus, floribus solitariis geminisve, pedicellis suberectis, bracteolis parvis, calycibus puberulis obtusè lobatis, leguminibus compressis velutinis lineari-oblongis rectis.
Hab. James Island, *Charles Darwin, Esq.*

Caulis elongatus, ut videtur volubilis, teres, pilis mollibus subferrugineis pubescens, crassitie pennæ corvinæ. Petioli $1\frac{1}{2}$-pollicares basi incrassati, stipulis 2 parvis atris aucti; foliola $1\frac{1}{4}$ unc. longa et lata, nervis subtùs prominulis, juniora densè sericeo-velutina. Racemi semipedales et ultra, 12–15-flori, densè velutini, substricti. Flores plerumque gemini, purpurei. Pedicelli 3 lin. longi. Calyx latior quam longus, segmentis brevibus valdè obtusatis, superiore obsoleto. Vexillum vix $\frac{1}{4}$ unc. longum, obtusum.

215. VIGNA OWYHENSIS, *Vogel in Linnæa*, vol. x. p. 585, *var.*
Hab. James Island, *Charles Darwin, Esq.* South Sea Islands, Chili, &c.

216. DESMANTHUS DEPRESSUS, *Kunth, Mimoseæ*, p. 115. t. 35. *DeC. Prodr.* vol. ii. p. 444.
Var. foliolis paucijugis.
Hab. Charles Island, *Charles Darwin, Esq.*

217. ACACIA CAVENIA, *Hook. fil. & Arn. Bot. Beechey*, p. 21.
Hab. Albemarle Island, *Charles Darwin, Esq. & Mr. Macrae.* Chili and Bonaria.

218. Acacia flexuosa, *H. B. K.* *DeC. Prodr.* vol. ii. p. 463.
Hab. James Island, *Dr. Scouler.* West Indies and Chili.

Leaves acute and larger than in the preceding, and peduncles longer.

219. Acacia tortuosa, β. glabrior.
Hab. James Island, *Charles Darwin, Esq. & Dr. Scouler.* Guayaquil, Jamaica and West Indies.

220. Prosopis dulcis, *Kunth, Mimoseæ,* p. 110. tab. 34. *DeC. Prodr.* vol. ii. p. 447.
Hab. Charles Island, *Charles Darwin, Esq.*: eaten by the curious Lizard (*Amblyorhynchus*) that inhabits this island. Mexico to Mendoza, West Indies, &c.

221. Cassia picta, *Don, Gardener's Dict.* vol. ii. p. 444.
Hab. Chatham and Albemarle Islands, *Charles Darwin, Esq. & Mr. Macrae.* Guayaquil.

Rhamneæ.

222. Discaria pauciflora, *Hook. fil.*; ramis ramulisque teretibus spinescentibus, foliis sparsis caducis oblongo-obovatis oblongisve integerrimis mucronulatis breviter petiolatis, floribus sparsis solitariis binisve subsessilibus quinquefidis, petalis latissimè spathulatis bifidis ungue brevi, ovario biloculari.
Hab. Albemarle Island, *Charles Darwin, Esq.*

Forming thickets generally near the sea. In habit resembling the other species of the genus, from which it is sufficiently distinguished by the very small flowers and bilobed petals.

Ord. ——— ?

223. Castela Galapageia, *Hook. fil.*; ramis strictis inermibus cortice glabro cinereo rimoso indutis, foliis lineari-lanceolatis acutis valdè convexis.
Hab. Chatham Island, *Charles Darwin, Esq.*

I cannot venture to unite the present plant with the *C. erecta*, Turp., or *C. Nicholsonii*, Hook., one of them having spinous branches, and the other terete and pubescent ones. The latter species indeed is perfectly different, for the flowers are larger, and the filaments longer, narrower, and less hairy. I have never seen specimens of *C. erecta*.

CELASTRINÆ.

224. MAYTENUS OBOVATUS, n. sp.; inermis, ramis divaricatis, foliis petiolatis obovatis v. obovato-cuneatis coriaceis obtusis v. plerumque retusis emarginatis integerrimis v. obscurè sinuato-dentatis, floribus axillaribus rarò solitariis, pedicellis unifloris.

Hab. Chatham Island, *Charles Darwin, Esq.*

Caulis fruticosus? ramis angulatim flexuosis, cortice fuliginoso striato tectis. Folia subuncialia, basi cuneata, ad apicem rotundata retusa v. obcordata, interdum apiculata, coriacea, utrinque opaca, siccitate flavo-virescentia venis obscuris. Flores in racemis axillaribus brevibus aggregati, parvi, inconspicui; pedicellis petiolis brevioribus, gracilibus. Calycis lobi rotundati. Petala $\frac{1}{2}$ lin. longa, deltoideo-ovata. Stigmata 3–4. Fructus majusculus, erectus, oblongo-obovatus, $\frac{1}{2}$ unc. longus, trigonus angulis subacutis, perianthio persistente suffultus, siccitate fusco-ruber, unilocularis, trivalvis, valvis intùs medio costatis; semina in fundo capsulæ 3.

Specimens coinciding with *Maytenus uliginosa*, Kunth, except that the leaves are cuneate, not rounded at the base, and that the upper ones especially are retuse or emarginate, sometimes even obcordate.

SPONDIACEÆ.

225. SPONDIAS EDMONSTONEI, *Hook. fil.*; foliis glaberrimis impari-pinnatis; petiolo supernè alato; foliolis 2–3-jugis elliptico-lanceolatis utrinque angustatis grossè serratis, racemis paniculatis folio brevioribus, pedunculis pedicellisque gracilibus, bracteis oblongo-linearibus obtusis caducis.

Hab. Albemarle Island, *Mr. Macrae.* Charles Island, *T. Edmonstone, Esq.*

Rami validi, teretes, hic illic tumidi, crassitie pennæ olorinæ, cortice sublævi pallidè rufo-fusco tecti, ramulis abbreviatis subuncialibus validis transversè creberrimè striatis annulatimque constrictis, apice floriferis foliiferisque, bracteolis squamæformibus. Folia e summo apice ramuli orta, fasciculata, patentia, juniora tenerrimè, ad nervos tenuissimè puberula, seniora subcoriacea, 4–7 unc. longa, petiolo inter foliola alato, parte infrafoliolaceo gracili elongato basi subincrassato. Foliola 1–1$\frac{1}{2}$ unc. longa. Bracteolæ reflexæ, $\frac{1}{2}$-unciales, caducæ. Panicula 2$\frac{1}{2}$-uncialis, erecta, ramis ramulisque gracilibus patulis. Flores masculi (solùm mihi noti) campanulati, 1$\frac{1}{2}$ lin. longi, tetrameri. Calycis limbus brevissimus, segmentis lineari-oblongis, erectis, obtusis, corollâ ter brevioribus, apice ciliatis. Petala angustè lineari-obovata, acuminata. Stamina petalis breviora; filamentis lineari-subulatis; antheris oblongis. Discus obtusè 8-lobus. Ovarii rudimentum minimum bilobum.

Wholly distinct from any known congener, though allied to a Guayaquil species, *S. purpurea*, L.

Xanthoxyleæ.

226. Xanthoxylum pterota, *H. B. K.* *DeC. Prodr.* vol. i. p. 725.

Hab. James Island, *Charles Darwin, Esq.* West India Islands.

The specimens are in bud only and very imperfect; unarmed, as are some of *X. pterota* in Hook. Herb.

Zygophylleæ.

227. Tribulus cistoides, *L.* *DeC. Prodr.* vol. i. p. 703.

Hab. Albemarle and James Islands, *Charles Darwin, Esq. & Mr. Macrae.* Tropical America.

No fruit, and therefore incapable of satisfactory determination.

Sapindaceæ.

228. Cardiospermum molle, *H. B. K.* *DeC. Prodr.* vol. i. p. 601.

Hab. Chatham Island, *Charles Darwin, Esq.* Tropical America.

Byttneriaceæ.

229. Waltheria reticulata, *Hook. fil.*; ramulis divaricatis pubescentibus, foliis cordato-ovatis acutis infrà præcipuè reticulatim venosis marginibus crenato-dentatis crispatis utrinque appressè velutinis tomentosis, floribus in axillis foliorum 3–5 subfasciculatis breviter pedicellatis, calyce oblongo obtusè 5-dentato, petalis spathulatis calyce $\frac{1}{2}$ longioribus.

Hab. Chatham, James and Albemarle Islands, *Charles Darwin, Esq., Mr. Macrae & Mr. Douglas.*

Rami cortice fusco tecti, crassitie pennæ anatinæ. Petioli 4–5 lin. longi. Folia $\frac{3}{4}$–1 unc. longa, interdum lineari-oblonga, semper venis subtùs prominulis reticulata. Flores parvi. Calyx 2 lin. longus. Habitus *Melochiæ tomentosæ*, L.

Malvaceæ.

230. Malachra capitata, *L.* *DeC. Prodr.* vol. i. p. 440.

Hab. James Island, *Charles Darwin, Esq.* Very common in the West Indies.

231. Gossypium purpurascens, *Poir.* (an G. Barbadense, *Willd.*?)

Hab. Chatham and James Islands, *Charles Darwin, Esq.*

Professor Henslow remarks that the capsule is 4-locular instead of 3-locular, but that this character of the capsule is one which cannot be relied on.

232. Sida (*Abutilon*) depauperata, *Hook. fil.*; pubescens, ramis teretibus virgatis lignosis cinereis albo-maculatis, foliis sparsis petiolatis latè cordatis acutis obtusè crenatis coriaceis utrinque velutinis venis reticulatis senioribus rugosis supernè scaberulis ferrugineis, pedicellis brevibus 2–3-floris, calyce latè campanulato rufo-ferrugineo segmentis obtusis, corollâ calyce bis longiore, carpellis 5–6, seminibus 3–5.

Hab. Charles Island, *Charles Darwin, Esq.*

Rami crassitie pennæ anatinæ, pedales, teretes. Folia ramis terminalibus majora, $1\frac{1}{2}$ unc. longa, petiolo $\frac{1}{4}$–$\frac{3}{4}$ unc. longo, ramis lateralibus multò minora. Flores $\frac{1}{3}$ unc. diametro, flavi.

Though the specimens are very imperfect, they evidently belong to a hitherto undescribed and quite distinct species.

233. Sida (*Malvinda*) tenuicaulis, *Hook. fil.*; caule erecto ramoso lignoso, ramis puberulis gracilibus parcè foliosis subflexuosis, stipulis subulatis, foliis petiolatis lineari-oblongis utrinque rotundatis subduplicato-crenato-serratis suprà (siccitate) brunneis subtùs canis reticulatim venosis, pedunculis axillaribus folio brevioribus, lobis calycinis acutis, carpellis sub 4 calyce omninò inclusis obliquè ovatis acutis bidentatis obscurè transversè reticulatis monospermis.

Hab. James Island, *Charles Darwin, Esq.*

Fruticulus bipedalis; ramis cortice fusco tectis, gracilibus, elongatis, parcè foliosis. Folia subuncialia, petiolo laminam subæquante v. breviore. Calyx 3 lin. longus.

Near *S. spinosa*, L.; the leaves however are smaller, and the carpels much less and quite included in the calyx, and only toothed at the apex.

Caryophylleæ.

234. Drymaria glaberrima, *Bartl. Rel. Hænk.* (*an* D. divaricata, *H. B. K.*?)

Hab. James Island, *Charles Darwin, Esq.* Warm parts of South America, Peru and Columbia.

235. Mollugo verticillata, *L.* *DeC. Prodr.* vol. i. p. 391.

Hab. Chatham Island, *Charles Darwin, Esq.* West Indies and South America.

Var. β. Chatham and Albemarle Islands, *Charles Darwin, Esq.* & *Mr. Macrae.* Warm parts of South America.

Highly variable. In young specimens the peduncles are short, and the flowers almost capitate, but in older ones these parts differ extremely in length.

POLYGALEÆ.

236. POLYGALA (*Timutua*) OBOVATA, *Hook. fil.*; glaberrima, caule basi lignoso erecto ramoso, foliis sparsis v. rariùs confertis oblongis lineari-oblongisve obtusis v. subacutis coriaceis enerviis grossè pellucido-punctatis subglaucescentibus, racemis brevibus ovatis laxis, alis elliptico-oblongis subacutis capsulam æquantibus.

Hab. Chatham Island, *Charles Darwin, Esq.*

P. paniculatæ, L. affinis; sed foliis coriaceis latioribus, floribus majoribus, spicisque multoties brevioribus.

237. POLYGALA (*Timutua*) GALAPAGEIA, *Hook. fil.*; glaberrima, caule gracillimo erecto parcè ramoso, ramis virgatis, foliis sparsis coriaceis linearibus utrinque attenuatis acuminatis, racemis spicæformibus valdè elongatis, alis ovato-oblongis obtusis capsulam æquantibus.

Hab. Charles and Albemarle Islands, *Charles Darwin, Esq.* & *Mr. Macrae.*

Fruticulus $1\frac{1}{2}$-pedalis, gracillimus. Folia 3–4 lin. longa. Racemi 1–3-unciales, gradatim elongati, seniores basi e floribus delapsis cicatricati. Flores *P. paniculatæ,* L. sed duplò majores.

CRUCIFERÆ.

238. SENEBIERA PINNATIFIDA, *DeC.*, et varietas *incisa*, *DeC.*

Hab. James Island, *Charles Darwin, Esq.* West coast of South America.

MENISPERMEÆ.

239. CISSAMPELOS PAREIRA, *Lamarck.*

Hab. Charles and James Islands, *Charles Darwin, Esq.* All tropical America.

X. *On the Vegetation of the Galapagos Archipelago, as compared with that of some other Tropical Islands and of the Continent of America.* By

JOSEPH DALTON HOOKER, *Esq., M.D., F.R.S., F.L.S. &c. &c.*

Read December 1st and 15th, 1846.

THE Florula of the Galapagos Islands, which I recently had the honour of laying before this Society, was drawn up with the view of enabling me to discuss at length the geographical distribution of the plants contained in that singular Archipelago. As a field of observation, this group possesses the rare advantage of being one whose vegetation has never been interfered with by any aborigines of the human race; and it is only very lately that the operations of man, or of animals introduced by his means, have disturbed the indigenous Flora, and that to a very limited extent only. It possesses the further singularity of containing a Flora differing by upwards of one-half its species from that of the rest of the globe, a peculiarity shared by no other tract of land of equal size, excepting perhaps the Sandwich group; whilst only three out of the 123 new species, collected by various voyagers, have been previously described.

Before commencing the study of the plants, I was assured of their being of a very novel character, especially from the masterly sketch of the unique zoology and the unequal dispersion of the species over the several islets composing this group given by Mr. Darwin, to whose comprehensive view of the natural history of the Galapagos this essay can be considered as supplementary only. The results of my examination have been, that the relationship of the Flora to that of the adjacent continent is a double one, the peculiar or new species being for the most part allied to plants of the cooler parts of America, or the uplands of the tropical latitudes, whilst the non-peculiar are the same as abound chiefly in the hot and damper regions, as the West Indian islands and the shores of the Gulf of Mexico; also that, as is the case with the Fauna, many of the species, and these the most remarkable, are confined to one islet of the group, and often represented in others by similar, but specifically very distinct congeners.

This examination has led me to take a survey of the vegetation of several other tropical islands, whose plants present much peculiarity, and to trace the effects of isolation in geographical position upon vegetation; as well as certain characters in some orders, their distribution and proportions, which seem to distinguish insular floras from the continental.

Before entering upon the details of the vegetation, I shall shortly allude to the position of the Galapagos, and some of their most important features of climate and soil which affect the plants, and which I shall extract from the Journals of Mr. Darwin and of other voyagers, including one by the late Mr. T. Edmonstone, hitherto unpublished.

The Archipelago consists of ten islands situated under the equator, between 500 and 600 miles west of the mainland of America at Guayaquil, and the same from the Isthmus of Panama, which lies to the north, and 3000 miles from the nearest of the tropical Pacific islands. The islets are wholly volcanic; several of the peaks attain a height of 3000 to 4700 feet, some having their flanks studded with innumerable small craters. These are considered to have been formed in the sea, and to be, as compared to the adjoining continent, of recent formation.

The climate is far from intensely hot, being moderated both by the insularity of their position and the low temperature of the waters of the great south-polar current which washes their shores. The extremes of temperatures observed at different times of day between 9 A.M. and 3 P.M. for thirty-five days in September and October include a range of eight degrees only (73° and 65°). These are however, according to Capt. Fitzroy's observations, taken on board ship. The plants on shore are exposed to a much higher and very prejudicial temperature. Thus Mr. Darwin experienced a heat of 93° in his tent, when the thermometer stood at 85° only in the wind and sun, but which, when plunged into the soil, rose at once to 137°, and would have risen higher had the tube been longer. On the other hand, nocturnal radiation does not in all probability reduce the temperature proportionally, the nights being generally misty. The prevailing weather is overcast and gloomy, the winds varying for the period alluded to between south and east. A failure of this, the trade-wind, caused the extraordinary rise of the thermometer mentioned above.

The nature of the coasts and surface of the islands is in some measure indicated by the plants contained in the various collections, some of the more generally diffused of which may thus be classified with reference to locality.

The genera *Avicennia* and *Rhizophora*, species of both of which bear the name of Mangrove in different parts of the world, prove that in some of the islands at least (Charles and Chatham) there is a phænogamic vegetation below high-water mark. On the other hand, from the steepness of the coasts and dryness of the soil near the ocean, there appear to be few maritime plants. Those which I presume to be more strictly such are *Cissampelos Pareira*, *Tephrosia littoralis*, *Scævola Plumieri*, *Convolvulus maritimus*, *Calystegia Soldanella*, *Verbena littoralis* and *Heliotropium Curassavicum*, all natives of the South American coast, and to which may probably be added some of the peculiar *Amaranthaceæ*.

The lower parts of the island are very arid and rocky, presenting thickets of starved shrubs and leafless trees, and to these situations are assigned* the weeds of the Flora, such as herbaceous or suffrutescent *Malvaceæ* and *Euphorbiaceæ*, many species of *Borreria*, some *Compositæ*, various *Lycopersica*, *Verbenæ*, *Galapagoa*, *Boerhaavia* and some grasses; to which may be added some larger shrubs, as small trees of *Acacia*, *Castela*, *Cactus* and *Opuntia*. Where marshy land occurs, and this is not uncommon on the summits, several species of *Cyperus* and *Mariscus* appear; and to a salt lake, which is beautifully fringed with succulent plants, belong *Portulaca*, some *Amaranthaceæ*, *Pleuropetalum*, and probably *Sesuvium*.

On ascending the hills the climate and vegetation both suddenly change, the sea-vapours are condensed on the higher parts of the islands, and a comparatively luxuriant flora is the consequence. From these more favoured localities are brought the greater number of the very peculiar vegetable forms of the island; curious arborescent *Compositæ*, which have no near allies in other parts of the globe, and of which there are eight species in this group, all

* In thus assigning localities to the species, I have been guided in many cases by notes attached to the specimens, in some by the plant growing in islands of a uniform surface and character, and in not a few instances by a knowledge of the situations which the species affect in other parts of the world.

closely related to one another. Associated with these are trees of *Phytolacca, Leguminosæ, Psidium, Psychotria, Chiococca* and *Clerodendron,* all tropical in appearance, accompanied by others no less characteristic either of a warm and equable temperature, humid atmosphere or wooded region; such are the genera *Passiflora, Viscum, Ipomœa, Epidendrum* and *Peperomia,* with the great majority of the Ferns, and all the *Jungermanniæ* and *Musci* that have been collected on the group.

The naturalists who have explored this archipelago are very few in number, and as all have added more or less to a knowledge of its botany, I shall mention their names in the order of the date of their respective visits. Mr. Hugh Cuming in 1829 paid a very short visit to the islands. The late David Douglas and Dr. Scouler touched at James's Island on their way to the Columbia River. Mr. Macrae landed on three of the islets when employed in collecting by the Horticultural Society, and formed a rather considerable herbarium. In 1835, Mr. Darwin spent some weeks in the archipelago, visited four islets, and formed the excellent collection of upwards of 200 species which forms the groundwork of this essay. Admiral Du Petit Thouars collected a few plants in one island only, for specimens of which I am indebted to the kindness of M. Decaisne of Paris, and very recently one of the Galapagos group was the last place explored by the lamented Mr. Edmonstone in the winter of 1845. His herbarium is second to that of Mr. Darwin in numbers, and contains several plants which are not in any of the others. The total number of species brought together from these various sources amounts to 265, of which 225 are flowering plants, and 28 Ferns. The other orders of *Cryptogamia* have not been attended to by any collector: of these there are 2 *Musci,* 6 *Hepaticæ,* 3 *Lichens* and a *Fungus.* All the above, except perhaps 17, natives of Charles, the only inhabited island, are truly indigenous to the group: but that this is only an approximation to the real number of species inhabiting the archipelago is probable from the circumstance of only 40 of these having been collected by more than one of the six collectors whose herbaria I have examined.

Under any circumstances it appears that the Flora of the Galapagos is an exceedingly poor one when compared with that of other tropical islands of their own or even less extent. Thus the Cape Verds, scarcely so well explored, (and whose mountains, which attain 8000 feet, have not been ascended above 1000 feet,) are known to yield upwards of 300 species on a soil quite as sterile as that of the Galapagos, whilst the Sandwich and Society groups are much richer, though further detached from any continent. What however is known suffices to institute a comparison between the vegetation of this group and that of the neighbouring continent and with that of other tropical islets; a subject which divides itself into the following branches:—

I. As the most important considerations regarding the vegetation of a country relate to its most characteristic natural orders, I shall first offer a few observations upon the number of species contained in the different families, and on the proportion which each of the principal ones bears to the whole Flora, and then compare the results with what have been obtained on the neighbouring continent, or on other islands somewhat similarly circumstanced with the Galapagos.

II. Here, as in other countries, the vegetation is formed of two classes of plants; the one peculiar to the group, the other identical with what are found elsewhere. In this there are even indications of the presence of two nearly equal Floras, an indigenous and introduced, and these are of a somewhat different stamp; for the introduced species are for the most part the plants of the West Indian islands and of the lower hot parts of the South American coast; whilst the peculiar Flora is chiefly made up of species not allied to the introduced, but to the vegetation which occurs in the Cordillera or the extra-tropical parts of America.

III. In the third place, I shall allude to the most singular feature in the botany of the group, the unequal dispersion of the species, the restriction of most of them to one islet, and the representation of others by allied species in two or more of the other islets.

The first peculiarity in the Flora of the Galapagos which demands attention is the paucity of Monocotyledonous plants, which hardly equal $\frac{1}{9}$ of the Dicotyledons. In all tropical countries the *Monocotyledones* bear a smaller proportion to the *Dicotyledones* than is found in the temperate or colder latitudes: Baron Humboldt has stated this proportion to be $\frac{1}{6}$ of the vegetation for the tropics of the new world, and Mr. Brown $\frac{1}{5}$ for that of the old. As however that of Baron Humboldt was obtained from materials collected partly from very high levels, where the tropical proportion no longer obtains, it is probable that Mr. Brown's results are the more accurate. If the Galapagos number of *Monocotyledones* is small as compared with that of the continent, it is even more so with regard to that of other tropical islands: thus in St. Helena they equal nearly $\frac{1}{5}$ of the *Dicotyledones*, in the Society Islands $\frac{10}{42}$, and in the Sandwich Islands $\frac{1}{4}$. This paucity is not due to the sterility of the soil or dryness of the climate, for the Cape Verd proportion is $\frac{1}{5}$, these islets being, as I have mentioned above, equally barren with the Galapagos.

Although I can offer no explanation of this apparent anomaly, it may not be out of place to notice here, that the tropical islands in general possess proportionally more *Monocotyledones* than do the continents. This is no doubt due to the same causes which determine the increased proportion which the temperate zone shows over the tropical, and is the more striking from this circumstance, that the nearer the tropical islet is to a great continent, the greater does the proportional number of *Dicotyledones* become, as is shown by the Galapagos and Cape Verds, both adjacent to great continents, possessing more than the Sandwich Islands, Society group, St. Helena, or Ascension.

The individual species of the very largest Monocotyledonous families being more widely dispersed than any of equal extent amongst the Dicotyledonous, is also a reason why the insular proportion of the latter should be different from the continental*.

If the insular tropical proportion be assumed to be $\frac{1}{4}$, it is larger than that for the islands of the Atlantic immediately beyond the tropics. Thus for the Canaries (lat. 28°) it is probably $\frac{1}{6}$, and for Madeira $\frac{10}{54}$; whence they again increase

* And for the same reason great caution is required in deducing the continental proportions from small local collections, however complete in themselves. The results obtained from a small area are almost necessarily erroneous if applied to the greater one of which it forms a part, although the general features of vegetation may be well displayed by the latter. To this I attribute the remarkable discrepancy between the results obtained for West Tropical Africa by Mr. Brown, after an examination of the Congo Expedition plants, and those which my examination of the Niger Expedition collections led to, the *Monocotyledones* equalling $\frac{1}{4}$ in the former case, and $\frac{10}{64}$ in the latter, of the *Dicotyledones*. This appears to be owing to the same species of *Cyperaceæ* and *Gramineæ* (which form the majority of the *Monocotyledones* in both instances) prevailing throughout a great extent of coast, but accompanied by different species of *Dicotyledones* at different parts of the same tract. Hence it is probable that up to a certain point the Monocotyledonous proportion will decrease as the area under examination is extended, and the proportion for the tropics may even fall short of $\frac{1}{5}$.

on approaching the frigid zone, from Madeira (lat. 32°) $\frac{10}{54}$, Azores (lat. 38°) $\frac{10}{41}$, Great Britain (lat. 50°·57) $\frac{1}{4}$, Shetland (lat. 60°) $\frac{10}{33}$, which is the maximum for the northern hemisphere. In the arctic regions, on the other hand, all the proportions obtained, either from isolated localities (except Melville Island) or from extended tracts, tend to confirm Mr. Brown's first theory, that the proportion is again inverted. Thus that of Iceland (lat. 65°) is $\frac{10}{48}$, Spitzbergen (lat. 78°·80) $\frac{10}{49}$, east coast of Greenland $\frac{1}{5}$, the Arctic American islets (lat. 68°) $\frac{10}{53}$, Baffin's Bay (lat. 70°·76) $\frac{10}{57}$, Port Bowen and Prince Regent's Inlet (lat. 74°) $\frac{1}{7}$. To this regular progressive decrease, Melville Island offers the only exception, its proportion being that of the Shetlands*.

From the above facts it may be assumed that equable, temperate, and rather humid climates are most favourable to a Monocotyledonous vegetation, for it diminishes both under the extreme cold of the arctic zone and the great heat of the tropics; on the other hand increasing towards the southern temperate and antarctic zones, where such conditions are best fulfilled, proportionally with the latitude, to as far south as a Phænogamic vegetation extends.

With regard to the amount of peculiarity existing in the two great divisions of flowering plants in any country, it is a curious subject, but one towards the illustration of which little has been done. Generally speaking the *Monocotyledones* present much the lesser proportion of novelty; but this is not the case in the Galapagos, nearly one-half of whose Monocotyledonous plants (10 out of 22) are confined to that group: whence it may be inferred, that the paucity of this division there in reference to the whole Flora is owing in some measure to obstacles to the transport of seeds from the continent.

The prevailing natural orders in the Galapagos are the Ferns, containing 28 species; *Compositæ* 28; *Leguminosæ* 24; *Euphorbiaceæ* 18; *Rubiaceæ* 15; *Solaneæ* 13; *Gramineæ* 12; *Amaranthaceæ* 10; *Verbenaceæ* 9; *Cyperaceæ* and *Boragineæ* each 7: of the other 43 orders none are so extensive, or are otherwise worthy of particular mention, except *Cordiaceæ*, of which there are six species, only one or perhaps two of which inhabit the adjacent continent. All

* With regard to Melville Island, it should be borne in mind that it is beyond those limits up to which every degree of latitude is marked by some one or more peculiar species of plant which is not found beyond it. It is on the verge of the extinction of terrestrial vegetation in that longitude, and therefore presents us with such species only as can struggle successfully against the climate they there encounter.

of these orders will be recognised as forming a great part of the vegetation of every tropical country, except the *Amaranthaceæ,* which however find their maximum on the west coast of South America. Hence it is not to the prevalence of any particular natural order, or the undue number of species contained in any one, that the Galapagos owe their extraordinary amount of novelty. All the general features of a tropical vegetation are retained, and even the genera to a great extent, but the change is in the species, of which one half are confined to that archipelago; and this peculiarity in species not only relates to the difference existing between the Galapagos and the mainland of America, of which it is a botanical province, but to the separate islets of the archipelago, which, as Mr. Darwin aptly remarks, should be called "a group of satellites, physically similar, organically distinct, yet intimately related to each other, and all related in a marked though much less degree to the great American continent."

Glumaceæ.—This somewhat artificial group, including *Gramineæ*, *Cyperaceæ* and *Junci*, has been defined by Humboldt as including the majority of *Monocotyledones* in all latitudes. In the tropics of America these collectively form $\frac{1}{11}$ of the flowering plants, which is precisely the Galapageian proportion, and one that would not be expected if the fewness of the *Monocotyledones* previously alluded to be borne in mind. Two conclusions may be drawn from this, that this paucity is owing to the scarcity of petaloid families, and that the fewness of *Gramineæ*, to which I shall next refer, is compensated by the *Cyperaceæ*.

Gramineæ.—This order forms little more than $\frac{1}{20}$ of the Phænogamic flora, the smallest proportion I have obtained from any country. This is the more remarkable, as nearly three-fourths are peculiar, proving that the order, though having many species which are well adapted for transport, has not sent its colonists to the Galapagos in the same proportion as it has to other countries; as to the Sandwich Islands for instance, three-fourths of whose grasses are those of other countries. This paucity is further conspicuous from the islands within the tropics being richer in *Gramineæ* than the continents, where they do not form more than $\frac{1}{12}$, whilst in the Sandwich Islands they amount to $\frac{1}{8}$, and in the Society's, lying in the same longitude and equidistant from the equator on the opposite side, also $\frac{1}{8}$, which is the Cape Verd proportion also; a singular concurrence, considering that in all three localities the species are very different. The relative abundance of *Cyperaceæ* to *Gramineæ* is extremely fluctuating, though in a measure amenable to very conflicting causes, which we can only partially follow. Of the Galapageian *Gramineæ* the *Poæ* and *Paniceæ* are nearly equal, which is very unusual within the tropics; one of the species belongs to *Eutriana*, a genus almost peculiar to America, and particularly to the mountainous regions or cooler parts. Two new species belong to *Aristida*, which is also represented by a species in the sterile island of Ascension.

The Compositæ are in every respect the most remarkable family in the Galapagos, both as regards number of new species and new genera, and from their forming much of the wood of the islands. They also are the most instructive, as the species are very clearly defined: the peculiar genera have representatives in the different islets; and whilst the new species are almost wholly allied to plants from the Andes or extra-tropical parts of America, the old are almost universally the weeds of the low coast of the same continent. It is not therefore with this family as with some others, that the new species are, though permanently, only partially distinct from the continental ones, and possibly varieties due to climatic causes; but they are the representatives of species which are only found beyond the reach of direct migration, or are to a great extent entirely new genera.

In respect of the peculiarity of their *Compositæ*, the Galapagos may be compared with some other tropical islands, as the Sandwich group and St. Helena; also with two extra-tropical islands, Juan Fernandez and New Zealand. All of these have a larger amount of peculiarity in their floras than any other tracts of land of the same size. It has been noticed that the four last-named islands or groups are remarkable for possessing a great proportion of arborescent *Compositæ*, and in this too the Galapagos share, though the comparison can be carried no further between any of them; for whilst the order is here represented by *Melampodineæ* and *Heliantheæ*, in Juan Fernandez it is by *Senecioneæ* and *Cichoraceæ*, in St. Helena chiefly by *Asteroideæ*, in the Sandwich group by *Verbesineæ* and *Bidentineæ*, and in New Zealand by *Helichryseæ* and *Astereæ*. In all these cases, the further the islands are from the mainland, the less evidence do the *Compositæ* they contain afford of the botanical province to which each may belong. Thus the Galapagos contain, in the peculiar plants of this order alone, internal evidence of a strong botanical relation between that Archipelago and Mexico, which a further examination of other orders confirms. Juan Fernandez in like manner abounds in a tribe peculiarly copious in Chili, and the New Zealand arborescent *Compositæ* are allied to, though generically and specifically very different from, those of New Holland: but on the other hand, the peculiar genera of the Sandwich group are scattered through many tribes, belonging some to the old world and others to the new; whilst in St. Helena (the whole of whose *Compositæ* are shrubby or arborescent, and all belonging to peculiar genera), the order seems made up of the fragments of groups characteristic of very remote parts of the world: the majority belong to a genus of *Estereæ* related to what occurs in New Zealand; others to such *Labiatifloræ* as Juan Fernandez possesses; a third genus to the Melampodinous family of the Galapagos, and the fourth belongs to the same tribe of American *Compositæ*.

This order here equals $\frac{1}{8}$ of the whole Phænogamic plants, or is nearly the same as its proportion is for the flora of the whole world, and the same as that of the Sandwich group, but smaller than that of Juan Fernandez, and especially of St. Helena, where it equals one-third of the flowering plants remaining there. On the other hand, the Society group, in possessing only $\frac{1}{35}$ of *Compositæ*, the smallest number relatively to the whole flora of any tropical country, betray their relationship to the flora of the torrid zone in the old world, which in this respect is strikingly contrasted with that of the new; for it is not improbable that there are more species of this order contained in the comparatively narrow belt of land comprised between the tropics of America, than the same latitudes produce from the west coast of Africa eastwards to the remotest of the Pacific islands.

Except St. Helena, there is no part of the globe whose *Compositæ* are so nearly unexceptionably different from those of any other country as the Galapagos. Of the 17 genera in which they are included, 5 are widely different from any previously known; and of the species, 28 in number, 23 are peculiar and 5 are tropical weeds, readily introduced by man, and found in the colonized islets alone; whence their origin is suspicious. Of the 12 remaining genera, 9 are almost exclusively American, and the remainder of more general distribution. The last circumstance connected with this order to which I shall allude, is the gummy exudation for which the shrubby *Scalesiæ* are conspicuous, and which is equally a characteristic of some of the St. Helena *Compositæ.* The species in both instances are inhabitants of arid spots, fully exposed to the sun of the torrid zone, which together seem favourable to the copious secretion of gums and gum-resins in various parts of the world.

Leguminosæ.—This order is second only to the last in number of species, of which there are 24 contained in the various collections, but differs conspicuously in its proportion of novelty, there being no peculiar genus, and only 7 species which are not found on the adjacent continent. Of all the large natural orders of flowering plants, the *Leguminosæ* contain by far the largest amount of universally diffused species, including very many of the littoral weeds of the tropics. Observation proves that this is in a great measure due to the transporting power of water, for neither do the seeds of the dispersed species bear winged appendages, nor are they of such a size as renders it probable that they are carried by aërial currents. The ubiquitous species possess, on the other hand, remarkable powers of resisting the effects of time and exposure, besides a vegetative power that enables them to overcome obstacles in the soil and climate of the locality they are transported to; qualities which the *Compositæ* probably possess in a very limited degree, for we see their feathery pappus to have had little effect in spreading the majority of the individual species beyond any but very narrow limits.

Of the Galapageian genera only *Dalea* and *Galactia* are exclusively American, and all but the 7 species mentioned above are common tropical species, particularly in the West Indian islands.

Euphorbiaceæ form a very large proportion of the Galapageian Flora, consisting of 18 species, included in the tropical genera *Acalypha, Croton, Euphorbia* and *Phyllanthus.* They form $\frac{1}{11}$ of the Phænogamia, very much exceeding the proportion for the tropics of the new world, which is stated by Baron Humboldt as $\frac{1}{35}$, or of Western Africa, which Mr. Brown gives as $\frac{1}{28}$. In amount of peculiar species this order here ranks next to *Compositæ*, $\frac{5}{6}$ of the whole belonging to species very distinct from those of other countries; the remainder are common West Indian or Southern United States plants.

In the prevalence of peculiar *Euphorbiaceæ* and *Rubiaceæ*, this group has features in common with the similarly barren island of Ascension, where almost the only Dicotyledonous plants are one of *Rubiaceæ* and a prostrate *Euphorbia*, allied to, and of the same habit as, the Galapageian ones. The *Aristida* too of Ascension, which is there the only abundant grass, is represented here by two congeners which occupy similar situations. This feeble though decided analogy existing between the vegetation of arid volcanic islets in opposite oceans is very singular, and is a feature analogically repeated as it were by the two moister islands of Juan Fernandez and St. Helena, which possess very similar and closely-allied peculiar forms of *Wahlenbergia*.

The shrubby Crotons of this group are no doubt conspicuous features in the vegetation; the other species of the order are mere weeds.

Rubiaceæ.—An order largely represented, including upwards of $\frac{1}{15}$ of the flowering plants, whilst of the tropical Flora of the neighbouring continent they form but $\frac{1}{29}$, and of that of the whole globe $\frac{1}{23}$. The amount of peculiarity is also very large, though (as in *Euphorbiaceæ*) the new species are found under a very few genera; in this case 11 of the 15 are such, belonging to three genera, of which one, *Borreria*, alone contains 8. This last and *Euphorbia* contain the majority of the weeds of the Galapagos, and are further the two largest Phænogamic genera in the group.

It is singular to remark to what different genera of plants various islands are indebted for their greatest peculiarity, and how often it is the case that such genera give a character of individuality to the scenery. This is effected in the Galapagos by covering the lower lands with *Euphorbia* and *Borreria*, whilst the large genera *Scalesia*, *Croton* and *Cordia* give the conspicuous features of the vegetation of the higher regions. In like manner in Juan Fernandez and St. Helena the most conspicuous, which are also the largest genera, are of *Compositæ* and *Campanulaceæ*; and in the Sandwich Islands *Goodeniaceæ* and *Lobeliaceæ*; while in the Society group, on the other hand, out of upwards of 200 genera, *Piper* is the only one containing as many as 3 peculiar species. This leads me to another remark, that the greater the amount of peculiarity an insular flora presents, the closer relationship do the species it contains bear to one another. This is best shown by observing the proportion that the species bear to the genera, which more frequently contain several species in the peculiar than in the borrowed floras. This may be stated in another form, thus: the more an island is indebted to a neighbouring continent for its vegetation, the more fragmentary does its flora appear, migration being effected by the transport of isolated individuals, generally in nowise related, while an independent flora is generally made up of groups, the lowest order of which we call genera. Hence the Coral Islands, whose flora is wholly borrowed, seldom have two species belonging to the same genus; as Keeling Island, for instance, on the west, and Malden Island to the eastward of the Pacific, in both of which the genera are to the species as 1 : 1; or the Society group, which presents so little novelty, and whose proportion of genera is as 1 : 1·3. In the Sandwich Islands, on the other hand, our very imperfect materials give a proportion of 1 : 2; the Galapagos of 1 : 1·7; and St. Helena about the same.

In the abundance and peculiarity of *Rubiaceæ*, the Galapagos may be compared with the Sandwich group, which contain 18 species of this order unexceptionably peculiar, and all belonging to genera even confined to those islands. None of the Galapageian species belong to any but very common genera*.

Of SOLANEÆ there are 13 species, a considerable number in proportion to the extent of the Flora, but almost the whole of them derived from the neighbouring coast. Only one, a species of *Acnistus*, is previously undescribed, except the *Dictyocalyx*, which is however a native of the shores of Peru. *Solanum nigrum* is the only flowering plant common to Great Britain and the Galapagos, except *Verbena officinalis* and *Calystegia Soldanella*; all are found in most intervening shores.

The AMARANTHACEÆ are the only other family of flowering plants appearing to demand a particular notice, for their abundance and novelty are without a parallel in any tract of land of equal extent. This is partly to be accounted for by their being partial to the immediate neighbourhood of the sea, but is more due to the position of the Galapagos being near to America, where, according to Martius, they attain their maximum. Littoral and widely diffused as many plants of this order are, we do not find one of the ubiquitous species in this group; and indeed, except two belonging to the genus *Ama-*

* In respect of *Rubiaceæ*, the vegetation of the Sandwich group has no analogy with that of any other islands. The Society Islands contain many more species, but all belonging to Asiatic genera. Even the specifically peculiar *Rubiaceæ* of St. Helena and Ascension have Cape congeners, and there is no genus of this order confined to Juan Fernandez.

ranthus itself, and these hardly identical with previously described plants, there is no species common to the Galapagos and adjacent continent. The *Amaranthaceæ* form $\frac{1}{23}$ of the Phænogamous Flora of the Galapagos, which is a ten-times greater proportion than the order bears to the vegetation of the whole globe.

Filices.—The very variable characters of the species belonging to this order and their geographical limits being very far from defined, I hesitate in considering the data they afford as of equal value with those obtained from the Phænogamic Flora. The number found in the Galapagos, 28, is certainly small, considering how numerous they are on Cocos Island, a very few degrees to the north, and on Juan Fernandez to the south. Their scarcity, together with the absence of any Tree-fern, is no doubt due to the dryness of the land and atmosphere, though the upper regions, where an epiphytical orchideous plant flourishes, are to all appearance sufficiently humid for their wants. Judging from botanical grounds of the humidity of a climate, we must be guided by the prevalence of Ferns or their scarcity; and when the nature of the species belonging to this order is considered, it will be found that many of the Galapageian species are common to drier parts of and arid places in the tropics, such as *Marginaria incana, Litobrochia pedata, Polystichum coriaceum, Nephrodium molle* and some others; whilst the extensive genera *Hymenophyllum* and *Trichomanes* are entirely wanting, together with the whole order of *Lycopodiaceæ*, including that most frequent of all tropical plants, *L. cernuum*, L. A small proportion, equalling $\frac{1}{5}$ of the whole, are new; the remainder are the common plants of the West Indies and South America.

The Galapagos are further the only tropical group of islands of any extent which contain no *Dicksonieæ* and *Cyatheæ*, except the Cape Verds; a further evidence of the aridity of the climate.

The remaining orders are all small and demand little notice; they may however be enumerated under three heads, according to the distribution of the Galapageian species they contain:—

1. Orders, all the Galapageian species of which are common to both the old and new world, are:—*Menispermeæ* 1; *Cruciferæ* 1; *Caryophylleæ* 2; *Sapindaceæ* 1; *Zygophylleæ* 1; *Rhizophoreæ* 1; *Scævoleæ* 1; *Plumbagineæ* 1; *Commelineæ* 1.

2. Orders whose Galapageian species are American solely:—*Xanthoxyleæ*, a West Indian species; *Simarubeæ*, the West Indian *Castela Nicholsonii*; *Umbelliferæ*, 2 *Helosciadia*; *Lobeliaceæ*, the Mexican *L. Xalapensis*; *Apocyneæ*, the West Indian *Vallesia glabra*, Lk.; *Plantagineæ*, the Chilian *P. tomentosa*; *Phytolacceæ*, *P. decandra*; *Chenopodiæ*, *Cryptocarpus* and *Boussingaultia*; *Hypoxideæ*, *H. erecta*, Willd.

3. Orders containing only such Galapageian species as are confined to that group:—*Polygaleæ*, 2 species; *Byttneriaceæ*, a new *Waltheria*; *Celastrinæ*, a new plant of the American genus *Maytenus*; *Rhamneæ*, a *Discaria* allied to a Chilian species; *Myrtaceæ*, a *Psidium*; *Cucurbitaceæ* 2; *Cacteæ*, a *Cereus* and *Opuntia*, the latter one of the largest of the order; *Passifloreæ*, 3 new species allied to West Indian congeners; *Loaseæ* 1; *Portulaceæ*, a new genus and a new species of *Sesuvium*; *Lorantheæ* 2; *Piperaceæ*, 3 very distinct species of *Peperomia*; *Orchideæ*, an epiphytical *Epidendrum*.

4. The other orders are:—*Malvaceæ* 4, including 2 *Sidæ*, considered as new, but possibly altered states of continental species; *Convolvulaceæ*, 4 species, two belonging to the first of the foregoing divisions, one to the second, and three, a *Cuscuta* and two *Ipomœæ*, to the third. *Verbenaceæ* 9; two belonging to the first division, and the rest (except possibly two which are indeterminable) to the second; *Labiatæ* 5, one to the first division, three to the second and one to the third; *Scrophularinæ*, the ubiquitous tropical *Scoparia dulcis*, and an indeterminable, probably new plant; *Boragineæ*, a new genus, *Galapagoa*, with two species, the wandering *Heliotropium Curassavicum*, two new *Tournefortiæ* and two South American plants; *Acanthaceæ*, *Dicliptera Peruviana*, and a new *Tetramerium*; *Nyctagineæ*, an undescribed *Pisonia*, and four very widely distributed *Boerhaaviæ*; *Urticeæ* 5, all common South American plants, one of which, *Pilea peploides*, is also found in the old world.

The general results of this summary of the orders, and of the comparison of these and of the species with those of the continent of South America and the other islands, which in peculiarity of flora for their size may be compared with the Galapagos, (as New Zealand, the Sandwich group, Juan Fernandez and St. Helena,) are, 1st, That there are points of agreement inexplicable in our state of knowledge; such are the peculiarities of *Rubiaceæ* and of frutescent and arborescent *Compositæ*; which is rendered the more remarkable from the species and genera of those orders contained in one group of islands having little or no relation with those of the others. 2ndly, That the chief points of difference are explicable, and owing chiefly to the relations the islands bear to the nearest continents, and to the nature of the soil and climate, &c.; such are the absence of Ferns, and the peculiar forms of *Compositæ* and *Rubiaceæ*, and other orders having their nearest allies on the neighbouring continents. 3rdly, The smallest amount of novelty will be found amongst the more perfect plants, if such be so considered as possess a double floral envelope and polypetalous corolla, including the *Thalamifloræ* and *Leguminosæ*, whilst the greatest amount of new species exists in the lower orders, as *Amaranthaceæ* and *Piperaceæ*, or in the incomplete genera of *Euphorbiaceæ*, and in the *Compositæ*. On the other hand, there are somewhat fewer peculiar and new plants amongst the *Monocotyledones* than the *Dicotyledones*; and the amount of novelty amongst the Ferns is small in comparison to the higher orders.

II. In this second part of the essay I propose to treat of the Flora of the Galapagos as divisible into two types: these are the West Indian (including Panama), to which the plants common to other countries and the dubious species almost universally belong; and the Mexican and temperate American type, or that under which the great majority of the peculiar species will rank. Those which I have called dubious species consist of a few plants which more properly belong to neither of these divisions, including all such as are so nearly allied to continental forms as to appear scarcely distinguishable specifically, or if distinguishable, dependent on characters which, though sufficiently obvious, are extremely liable to variation; such are possibly altered forms of introduced species, dependent on the combination of circumstances which they are exposed to in the Galapagos for the appearances they assume: such plants are noticed in the descriptions given of the species, and it is sufficient to state here, that they nearly all belong to the West Indian type.

The species which I have referred to the Mexican type (from the affinities of the remarkable *Compositæ*) include those whose nearest allies belong to Mexico or the higher levels in Columbia, or to the lower latitudes of the Southern United States, California or Chili; unlike those of the West Indian type, they are all specifically entirely distinct from their continental congeners, and are about 45 in number, belonging to such genera as *Discaria*, *Dalea*, *Phaca*, *Galactia, Opuntia, Cereus, Viscum,* all the new genera of *Compositæ,* besides *Aplopappus* and *Hemizonia,* species of *Ipomœa, Psidium, Cordia, Tournefortia, Croton, Peperomia, Epidendrum, Eutriana* and *Aristida.* Those belonging to the Savannah lands of the United States, or dry parts of the tropics rather than the damp, hot, low grounds, are 24 (out of the 45) of *Polygala, Galapagoa, Elaterium, Sicyos,* 7 species of *Borreria,* 6 of *Acalypha,* and 5 of *Euphorbia,* besides a *Brandesia* and *Alternanthera.* Thirteen from the following genera, though very distinct, are exceptional, as being allied to plants of the same range as those included in the West Indian type; they belong to *Desmodium, Phaseolus, Acrolasia, Pleuropetalum, Pisonia, Frœlichia,* 3 species of *Bucholtzia, Mariscus, Cyperus,* and *Paspalum.*

If, on the other hand, the species common to other parts of the world, including those which are possibly allied, be contrasted with the above, they will be seen to belong to a different type of vegetation, being inhabitants of hot, low and marshy countries, or purely littoral species; they amount to 120, 88 of which are natives of the West Indies or Southern United States. Again, of these, 35 are common to the old and new world, affording no evidence of botanical relationship to any country; whilst the following 26, some of them remarkable species, are particularly prevalent over the Caribbean Sea, Gulf of Mexico and Galapagos.

Paritium tiliaceum.	*Spermacoce tenuior.*
Sida rhombifolia.	*Wedelia frutescens.*
Gossypium purpurascens.	*Spilanthes Acmella.*
Malachra capitata.	*Convolvulus alsinoides.*
Turnera ulmifolia.	*Lantana recta.*
Xanthoxylum pterota.	*Varronia dasycephala.*
Mimosa asperata.	*Hyptis capitata.*
Parkinsonia aculeata.	*Heliotropium Indicum.*
Poinciana pulcherrima.	*Phyllanthus obovatus.*
Tephrosia littoralis.	*Urtica Canadensis.*
Rhynchosia reticulata.	——— *divaricata.*
——— *minima.*	*Poa pilosa.*
Chiococca racemosa.	*Digitaria serotina.*

Of the remainder of the 120, the following I have assumed to be confined to the west of the American Cordillera and the Galapagos, or only to cross to the eastward on the lowest part of Mexico.

Drymaria glaberrima.	*Verbena littoralis.*
Acacia Cavenia.	——— *polystachya.*
Cassia picta.	*Plantago tomentosa.*
Baccharis pilularis.	*Cryptocarpus pyriformis.*
Dictyocalyx Miersii.	*Boussingaultia baselloides.*
Clerodendron molle.	*Mariscus Mutisii.*

Again, these 120 are of such common occurrence over a large extent of coast, that their introduction into the Galapagos by causes now in operation can hardly be doubted. Presuming that such is the case, it may not be out of place to trace here the course of migration, the means by which it may have been effected, and the facilities for transport presented by the individual species.

The position of the group between the Pacific Islands and America, points to these as the only mother-countries from which plants could have migrated. We have seen that many are common to the latter country; but as at least 15 species are also found in the South Sea Islands, it may be supposed that there has been migration from that quarter, especially as many plants are dispersed in a very remarkable manner over every group in the Pacific, establishing themselves very soon after the formation of any new land, and whose further extension to the Galapagos might have been deemed possible*.

There are 16 species found both in the Galapagos and South Sea Islands, which is nearly the half of what are common to the latter locality and America,—a very large proportion; but as they are unaccompanied by any

* The species to which I allude as being so very prevalent over the tropical South Sea Islands, are:—

Oxalis corniculata.	*Scævola Kœnigii.*
Dodonæa viscosa.	*Cordia orientalis.*
Lepidium piscidium.	*Pisonia mitis.*
Tephrosia piscatoria.	*Achyranthes velutina.*
Guilandina Bonduc.	*Aleurites triloba.*
Sesuvium portulacastrum.	*Pandanus odoratissimus.*
Metrosideros polymorpha.	*Cocos nucifera.*
Portulaca oleracea.	*Davallia solida.*
Adenostemma viscosum.	*Phymatodes vulgaris*;

together with several other Ferns, some *Cyperaceæ* and *Gramineæ*.

Polynesian species not found in America, it is perhaps the more probable that they migrated from the eastward into the Galapagos*.

The means of transport which may have introduced these plants are, oceanic and aërial currents, the passage of birds, and man.

To the first of these divisions the majority of the littoral species may be referred; they are about 20 in number, chiefly such as are common to most warm latitudes, as:—

Cissampelos Pareira.	*Avicennia tomentosa.*
Tribulus cistoides.	*Scævola Plumieri.*
Tephrosia littoralis.	*Ipomæa maritima.*
Rhizophora Mangle.	*Calystegia Soldanella.*
Verbena littoralis.	*Heliotropium Curassavicum.*

To the non-littoral species, also possibly introduced by marine currents, belong the greater part of the remaining *Leguminosæ*, the *Boragineæ*, *Verbenaceæ* and *Solaneæ*. These and the above have seeds too large for probable transport by winds; they possess no means of attaching themselves to birds, &c., whilst the indurated seed-coats of some, and the exalbuminous embryos of many, probably aid them in resisting for some time the effects of salt water.

It is only such species as have small seeds, or in which these are furnished with wings or other appendages, that offer aids to the transport by winds; they are few in number: such are *Gossypium*, *Baccharis* and *Ageratum*, the caryopsides of which last are, singularly enough, *in this group only* deprived of pappus. *Lobelia Xalapensis*, *Scoparia dulcis* and the *Urticeæ* have very small seeds.

That birds are active agents in transporting species may be presumed from

* The more clearly to show the discrepancy between the Floras of the Pacific and Galapagos, I may mention that I have examined that of Malden Island, the nearest of the Tropical Polynesian Islands to the Galapagos. Most of its species are very abundant over all the tropical South Sea Islands, and none are absolutely peculiar: they are, 1. *Phymatodes vulgaris*; 2. *Davallia solida*; 3. *Eragrostis*, sp.; 4. *Guettarda*, sp.; 5. *Euphorbia ramosissima*; 6. *Achyranthes velutina*; 7. *Boerhaavia*; 8. *Lepidium piscidium*; 9. *Sida*; 10. *Oxalis corniculata*; 11. *Tribulus cistoides*; 12. *Crotalaria*; 13. *Portulaca*; 14. *Talinum patens*; 15. *Coprosma*, sp.; of which only the *Tribulus*, and perhaps the *Portulaca*, are Galapageian, whilst even the Ferns and 8 of the 15 genera are not so. This, coupled with the fact stated above, that there is no species an inhabitant of the Galapagos and the old world, that is not equally found in the new, are conclusive against the probability of any direct migration from the westward.

the very considerable number of widely diffused plants which are admirably adapted for availing themselves of this means of transport; though, on the other hand, the exquisite care with which sea-fowl plume themselves must not be overlooked, nor the slender chance there is of a seed remaining attached to a body subjected to such violent motion and constant immersion as these birds undergo. The plants which may have been thus introduced are species of *Tribulus, Siegesbeckia, Nicotiana, Dicliptera, Plumbago, Pisonia, Boerhaavia, Poa ciliaris* and *Setaria Rottleri*: all belonging to this section are ubiquitous plants throughout the tropics.

As no land-bird is common to the Galapagos and mainland of America, this group is deprived of one very frequent means of transport,—the stomachs of birds, which often receive seeds as the food, especially of the migratory species; these pass undigested from them in a locality far removed from that where they were collected, not only with unimpaired vitality, but with the process of germination accelerated.

Man is the last agent to which I alluded: that he has been already active is very perceptible from the fact, that Charles Island, the only colonized island, contains the smallest proportion of peculiar plants, and numerically far the most of these common to and probably introduced from the coast with cultivation.

If the non-peculiar plants of the Galapagos then have been introduced from the continent of America, it is the currents and winds that we must regard as the agents; of these, the winds are steady south-east trades, blowing from the coast of Peru, by which the West Indian species cannot have been carried. The currents are more variable; and to these I would direct attention, and have brought together all the information on this subject I could command, from the voyages of the English and French in the seas between the Galapagos and American shores.

The principal oceanic current is a branch of the Antarctic or Southern Polar; it is a large body of cold water, which flows northwards from the icy regions to the equator, parallel to, or perhaps impinging on the west coast of South America, and becoming deflected at its northern limit near the Galapagos, where its course is between W. and N.W., flowing with so great rapidity between some of the islands as to render much interchange of seeds between such by its means highly improbable. To its influence the canes, bamboos and palm-nuts, mentioned by Colnett as being drifted on the south-east coasts of the Galapagos, are perhaps, though remotely, due; and to its agency may be ascribed the introduction of the following littoral Peruvian and Chilian plants:—

Vigna Owyhensis.	*Lycopersicum Peruanum et pimpinellifolium esculentum.*
Acacia Cavenia.	*Verbena littoralis.*
Nicotiana glutinosa.	——— *polystachya.*
Dictyocalyx Miersii.	*Plantago tomentosa.*

Had this body of water flowed along more fertile coasts than the desert shores of Peru, or received any large rivers in its course, the Flora of the Galapagos might have presented a very different appearance. On the other hand, let it be borne in mind, that the sterility of the coasts of this archipelago is peculiarly unfitted to the propagation of any but the most vigorous weeds of the tropics; had it been otherwise, it cannot be doubted that the palms, canes and bamboos (which are probably originally from the Guayaquil river, and taken up by the north edge only of this current,) would have vegetated here as well as in Cocos Island, only 300 miles to the north, whose vegetation is of tropical luxuriance*.

Another current, that by which the West Indian plants are probably introduced, is one which, though not laid down in any chart, appears from the observations of Captain Fitzroy to flow from the Bay of Panama, on the north-east of the Galapagos, and mingle its waters with the polar current; its origin is in the heated waters of that gulf; and the evidence of its visiting the Galapagos rests not only on the presence of so many species of plants, but on the fact, that the currents which wash the shores of the northern islands of the group are sometimes 10 degrees warmer than the south polar current at the southern islands; whilst the intervening space is far too narrow to admit of the supposition that the difference is owing to local causes. This current is doubtless a very partial one, but its effect is powerful, rendering the climate of one part of the group very different from that of the other,—a difference which is accompanied by certain changes in the vegetation.

There is one other point demanding attention, which relates to the crossing

* The presence of this current is of the highest importance in effecting the distribution of antarctic Algæ, for its cold waters are the means of carrying far into the tropics of this meridian, species which in other longitudes are entirely confined to very high latitudes.

of the common West Indian forms of vegetation from the east to the west coast of South America. So powerful a check to migration are the Andes, that almost throughout their whole length there is no mingling of the Floras of the east and west sides of America. The narrow Isthmus of Panama offers the only exception to this chain being continuous in the tropics; there the land is described as low and flat; and Mr. Hinds, in particularly alluding to this circumstance, states, that consequently the mahogany crosses from the Atlantic to the Pacific side. By this means, many species which prevail over the Mexican and Caribbean Seas from the Bahamas to Honduras, are further extended, first, for a short distance west to the Pacific, and then along its shores to Guayaquil on the south, and probably to California on the north, their further extension being probably checked by the dry plains of Peru on the one hand, and the changes in the climate of California on the other. Seeds of these are always liable to be exposed to the influence of that current, which I have noticed as flowing to the Galapagos from the Gulf of Panama.

I shall conclude this part of my essay with pointing out the adaptation of the several plants for transportation, under the natural orders to which they severally belong.

Menispermeæ.—*Cissampelos* presents a hard inner coat of the pericarp. Albumen scanty, fleshy.

Cruciferæ.—*Senebiera didyma,* the only Galapageian species, forms an exception to the general rule, that the plants of this order are impatient of transport from the oily nature of their cotyledons; it is, as DeCandolle remarks, probably a native of Buenos Ayres, whence it has been diffused over nearly all the globe, and is continuing to spread.

Curvembryosæ.—An artificial group, sufficiently natural however for the present purpose. Seeds very minute in some, as *Drymaria* and *Mollugo.* The *Chenopodeæ*, *Phytolacceæ* and *Portulaceæ* have a constitutional predilection to salt water. Albumen farinaceous in the greater part of the Galapageian genera.

Malvaceæ.—Indurated pericarp of many. The floral envelopes of *Malachra* are well-adapted to stick to various means of transport.

Sapindaceæ.—Crustaceous testa and exalbuminous seed of *Cardiospermum.*

Zygophylleæ.—*Tribulus cistoides* offers singular advantages for transportation in its woody seed-vessels, their spines beset with reversed prickles, and exalbuminous seeds.

Xanthoxyleæ.—Osseous testa of *Xanthoxylum.*

Simarubeæ.—*Castela* has a crustaceous endocarp and scanty albumen.

Leguminosæ.—Generally firm testa, exalbuminous seeds, and great power of some to retain vitality.

Rubiaceæ.—The densely corneous albumen of many may afford a sufficient protection to the seed.

Umbelliferæ.—*Helosciadium laciniatum* is one of the few species enjoying a wide range, for which I can offer no explanation.

Compositæ.—Exalbuminous seed. Pappus of *Baccharis* and adhesive pubescence of *Siegesbeckia orientalis.*

Lobeliaceæ and *Scrophularinæ.*—Very minute seeds of *Scoparia dulcis* and *Lobelia Xalapensis.*

Rhizophora, Avicennia and *Scævola.*—These all have a predilection for salt water, and constitutional power in the embryo of resisting its destructive effects. *Scævola* has a hard putamen and scanty carnose albumen; the other species are exalbuminous.

Apocyneæ.—*Vallesia* I believe to be a salt-marsh or sea-side plant; it has a scanty albumen.

Convolvulaceæ.—These have a scanty mucilaginous albumen. Two of them, *Ipomæa maritima* and *Calystegia Soldanella,* are sea-side species, with particularly wide ranges.

Solaneæ.—Small seeds and adhesive glands of *Nicotiana glutinosa*; indurated osseous testa of *Dictyocalyx, Solanum* and *Lycopersicum.*

Verbenaceæ.—Exalbuminous embryo and osseous endocarp of *Clerodendron* and *Lantana.*

Labiatæ, Cordiaceæ and *Boragineæ.*—Nucumentaceous pericarps and very scanty albumen. *Cordia* and *Boragineæ* are exalbuminous.

Acanthaceæ.—Exalbuminous hooked seeds.

Plantagineæ.—Very dense corneous albumen.

Plumbagineæ and *Plantagineæ.*—Viscid glands on calyx, and hooked prickles of some *Pisoniæ.*

Euphorbiaceæ and *Urticeæ.*—Non-peculiar species of these may have been introduced through the agency of man into Charles Island.

Hypoxideæ and *Commelineæ* offer no apparent facilities for the extraordinary range of the two species that represent these orders.

Cyperaceæ.—These have some facilities for adhesion to foreign substances, and the firm nature of the pericarp, further covered by the coalescing scales of the perianth, are protections.

Gramineæ.—The ciliated glumes of *Poa ciliaris* and the awns of *Setaria Rottleri* are the only very evident aids to migration which I can adduce. The resistance of the seed to the action of salt water must be very slight indeed.

Cryptogamia.—The excessive minuteness of the sporules in this great class, together with the sporadic appearance of these where they are most minute, and the sudden development of others in suitable situations, leave little doubt that their diffusion by the winds is a never-ceasing though invisible operation.

From the above it appears, that of the species presumed to be introduced into the Galapagos through various agencies, about 40, or nearly so, have exalbuminous seeds; and of the 50 albuminous-seeded ones, the majority have that substance dense or carnose; some farinaceous, but only two or three oily. These results agree to a considerable extent with what the gardener practically deduces, from the success or failure which attends the planting of seeds from foreign climes. The *Leguminosæ* and *Solaneæ*, the very two orders the Galapagos' proportion of which shows so undue an amount of continental American species, are in miscellaneous collections of seeds, those which best retain their vitality during long voyages.

III. The last feature in the Galapageian Flora to which I alluded is, that the several islets are tenanted for the most part by different plants; this difference between the Florulæ is as decided as that which exists between the botany of the whole coast and that of America, or even more so in proportion, if it be remembered how very similar the islets are in climate and geological structure, and how close to one another in geographical position.

Were this peculiarity effected only by those species which may have come from the continent, it would have admitted of some explanation, so capricious are the elements which regulate the interchange of species, and so uncertain in their effects even when apparently most uniform in their action. But in this case, the difference is most marked in the distribution of the species that are Galapageian only, the individuals of which are not common to every part of the archipelago, but for the greater part confined each to one solitary islet; only 13 of the 128 peculiar flowering plants and ferns having been found hitherto on two of the four whose Flora we know, two upon three of the islets, and but one upon all four. On the other hand, the amount of difference, though great numerically, is as regards its nature restricted within very narrow limits, the plants of one island being represented in others by similar though not identical species, producing a similarity in all general features combined with a difference in details.

Such well-marked and at the same time very narrow limits to the dispersion of nearly 130 species, is probably nowhere to be met with but amongst the Galapagos, and, wonderful though it must appear, it is still very much the accident of their birth-place; it is in a great measure due to the want of means of intercourse, especially atmospheric storms, between the several islets, and argues no physical peculiarity or want of vigour in the species themselves. Supposing all the species now inhabiting the Galapagos to be collected on a continuous surface, equalling in area the aggregate of the islets forming that archipelago, then would the Flora lose much of its characters; the strife with its neighbours for position, which marks all stages of the life of any two or more contiguous plants, would terminate in a few replacing the many, and the introduced species bearing a greater proportion to the indigenous, whilst the individuality of the Flora would thus be lessened in degree or wholly destroyed. It must be admitted, that the first steps towards ensuring the continuance of many species in a given area, are to isolate them, and to cut off the means of migration; exactly as in a garden the plants are protected from encroachment mechanically, and the seeds of the more volatile collected betimes, to prevent a like effect being naturally brought about.

Though, however, this in some degree explains why the florulæ of the islets should be distinct in character, it can give no clue to the representation of species amongst them; which representation, whether it be regarded in the light of the whole group bearing the imprint of America, with but few of the productions of that continent, or of the several islets each individually distinct combining to form an harmonious whole, is a mystery which it is my object to portray, but not to explain; and I shall proceed to show the amount of this difference, and its relation to the physical features of the islets.

The following table shows the amount of peculiarity in each island of flowering plants and ferns, and the proportion confined to itself; those common to itself and one or more other islets; and such as are found on the American continent.

Name of island.	Total number of species.	Confined to Galapagos, *i. e.* total excluding those common to America.	Absolutely peculiar to the islet.	Confined to the group, but found likewise on other islets.
Charles Island	96*	47	32	13
James Island	100	48	38	10
Albemarle Island ..	47	27	20	7
Chatham Island ..	40	21	17	4
Whole group	253	123		16

* I have excluded seventeen species from the flora of this islet, as being almost certainly introduced with cultivation.

Hence it appears that James Island is the most rich in species, as might be expected from its central position in the archipelago, and from its containing very elevated land. Albemarle, though the largest, is on the other hand singularly deficient in individuals and kinds, and, as well as Chatham Island, is described as peculiarly sterile and arid. Charles Island, the smallest of all, is almost the richest in species; and though it does not follow that it is hence peculiarly productive for man, we cannot but couple its varied flora with the fact, that it is the only one hitherto colonized.

With regard to the relative amount of peculiar species possessed by each islet, it would seem to be affected by its climate, and may be thus expressed:

Charles Island has 22 species common to other islets, which are as 1 : 4·4 of its whole flora.
James Island has 23 species common to other islets, which are as 1 : 4·3 of its whole flora.
Albemarle Island has 18 species common to other islets, which are as 1 : 2·6 of its whole flora.
Chatham Island has 17 species common to other islets, which are as 1 : 2·4 of its whole flora.

This accordance of the proportions obtained for the two fertile islets and of those for the two sterile is very striking, and especially as they are obtained from collections made by six different and wholly independent voyagers, and indicate that sterility of soil has proved an important agent in preventing the confusion of the floras, and also shows how few are the agents of migration; for Albemarle being the westernmost, and Chatham the easternmost of the whole archipelago, they would otherwise have shown very different proportions.

If we analyse the florulæ still further, and seek to know how far each has profited by immigrants from America, a similar difference will be found between the fertile and the sterile islets.

Charles Island contains 49 American plants, which are to whole flora as 1 : 1·9.
James Island contains 52 American plants, which are to whole flora as 1 : 1·9.
Albemarle Island contains 20 American plants, which are to whole flora as 1 : 2·3.
Chatham Island contains 19 American plants, which are to whole flora as 1 : 2·1.

Whence it appears that the fertile islets, though in position not more favourably placed for receiving the plants of the American coast, still show, not only numerically but proportionally, their aptitude for supporting a richer flora than that which is peculiar to the group.

The nature of the collections is hardly such as to warrant the drawing any further conclusions, the numbers representing the relationship of the peculiar and non-peculiar plants of each islet to one another being small. There is however one point which demands a notice, and that is, the obvious relation between the distribution of the peculiar species over the four islets in question and the direction of the easterly current. Chatham Island being situated east of the group, it follows that the current can never transport insular species to it: on the other hand, Albemarle, on the west, lies directly in its course. Now, excluding the American plants altogether, we have the following evidence of the western islands being peopled by colonists from the eastern; shown by the proportion each islet contains of the Galapageian species found on others.

Chatham Island;	its Galapageian species found on other islets are to whole florula as 1 : 5·0.
James Island;	its Galapageian species found on other islets are to whole florula as 1 : 4·8.
Albemarle Island;	its Galapageian species found on other islets are to whole florula as 1 : 3·9.
Charles Island;	its Galapageian species found on other islets are to whole florula as 1 : 3·1.

The amount of difference between the islets is, as I have stated above, mainly specific, and is apparent in no less than fifty-eight of the peculiar species of the archipelago, which thus represent one another, and for whose names I would refer to the catalogue of the species already before the Society.

The above remarks I have confined to the most salient features of the Galapageian Flora, and such as I would hope may not be materially affected by future investigations in this most interesting archipelago. There are others which appeared prominent, it is true, but which required for their confirmation more ample collections than have hitherto been formed, and these I have suppressed until materials for their establishment shall be forthcoming*.

Royal Gardens, Kew, November 1846.

* The following described species, collected by the late T. Edmonstone, Esq. in Charles Island, together with one undescribed found by Mr. Darwin in Chatham Island, were omitted in my enumeration, but are included in the foregoing remarks.

1. *Digitaria serotina*, Michx.—2. *Alternanthera radicata*, n. sp. (See below).—3. *Heliotropium Indicum*, L.—4, 5. *Clerodendron*, species 2 (exemplaria manca).—6. *Hyptis capitata*, Jacq.—7. *Varronia dasycephala*, Desv.—8. *Nicotiana*, sp.—9. *Physalis*, sp.—10, 11. *Solani*, species 2.—12. *Calystegia Soldanella*, R. and S.—13. *Wedelia frutescens*, Jacq.—14. *Spilanthes Acmella*, L.—15. *Eupatorium*? sp.—16. *Baccharis pilularis*, DeC.—17. *Compositа*.—18. *Galactia*, n. sp.—19. *Poinciana pulcherrima*, L.

—20. *Parkinsonia aculeata,* L.—21. *Acacia,* sp.?—22. *Piptadenia?* sp.—23. *Mimosa asperata,* L.—24. *Turnera ulmifolia,* L.—25. *Sida rhombifolia,* L.—26. *Paritium tiliaceum,* St. Hil.

Alternanthera radicata, *Hook. fil.*; radice validâ lignosâ apice 3–5-cipiti, foliis stellatis recurvis lanuginosis teretibus carnosis elongato-linearibus integerrimis obtusis medio supernè canaliculatis, ramis floriferis radicalibus abbreviatis lanuginosis apice oligocephalis, capitulis globosis, perianthii foliolis oblongis obtusis emarginatis, antheris 2, stigmate bipartito.

Hab. Chatham Island, *C. Darwin, Esq.*

Radix pro plantâ maxima, elongata, lignosa, crassitie pollicis, supernè divisa. Folia perplurima, patenti-recurva, 1½–2 unc. longa, teretia, 1 lin. diametr., basi densè lanuginosa, ceterùm arachnoideo-tomentosa. Caules floriferi (seu scapi) foliis breviores, validi, supernè bracteati, simplices v. divisi, plerumque monocephali; bracteis 3–4, capitulo brevioribus, lanuginosis. Capitula alba, ⅓ lin. lata, multiflora; floribus compressis lanâ subscariosâ immersis, 1½ lin. longis. Bracteolæ floribus paulò longiores, laterales dorso acutæ, postica concava. Perianthii foliola enervia. Tubus stamineus cyathiformis, brevis; filamentis fertilibus 2, lateralibus, dilatatis, sterilibus nullis. Ovarium orbiculare, compressum. Stigmata brevia.

The root of this species is much larger than that of *A. subscaposa*, with which it agrees in habit. The foliage will distinguish it from that, and from every other described species.—*July* 1847.

ERRATA.

Page 194. *No.* 105 *should be* Plantago tomentosa, *Lam.*?

— 195. *Before No.* 114 *dele* Rubiaceæ.

— 229. Castela Galapageia, *Hook. fil.*=varietas inermis *C. Nicholsonii*, Hook. *The genus should be referred to* Simarubeæ.

XI. *On the* Ambrosinia ciliata *of Roxburgh. By the late* William Griffith, *Esq., F.L.S. &c. &c. Communicated by* R. H. Solly, *Esq., F.R.S., L.S. &c. &c.*

Read November 4th, 1845.

My attention was first directed to this extraordinary plant by Dr. Wallich in the early part of last June (1835). I must however observe, that Dr. Wallich was previously acquainted with many parts of its structure, and his artists were at the above time engaged in making a drawing of the plant, in which many of the points about to be described were represented.

A slight examination was sufficient to convince me that this plant, although referred to *Ambrosinia* by Roxburgh, did not at all agree with the characters laid down as distinctive of the original genus of that name. Dr. Wallich, to whom I had mentioned my belief that it constituted a new genus, very kindly suggested the name of *Myrioblastus,* which name I had adopted in my original manuscript. I have since however ascertained that *Ambrosinia spiralis* and *ciliata* of Roxburgh have been separated from that genus by Fischer, and together constitute his genus *Cryptocoryne.* To this Schott in the 'Meletemata Botanica' adds *Caladium ovatum* of Ventenat. Although the above separation appears judicious, yet, as very little additional light is thrown upon the plant in question, I have only to regret the inability to adopt a very classical and appropriate name.

Ord. Nat. Aroideæ.

Class. Linn. Monœcia Monandria.

Cryptocoryne, *Fischer in Schott et Endlicher Meletemata Botanica,* fasc. 1. p. 6 (charactere incompleto).

Char. Gen. *Spatha* tubo brevi ad apicem diaphragmate (septo) obliquo semipartito, limbo elongato. *Spadix* basin versus ovariis cincta, medio filiformis nuda, suprà antherifera, apice conico nudo calloso septo pilei instar tecto. *Antheræ* biloculares, transversè dehiscentes. *Glandulæ* 0. *Ovaria* 5–7 coalita. *Styli* 0. *Stigmata* 5–7 obliqua. *Fructus* nudus, 5–7-locularis, dehiscentiâ septicidâ. *Semina* 00, ascendentia; *testa* cellulosa, tenuissima; *albumen* nullum; *plumula* polyphylla, hilo subopposita.

Obs. Character ex *Cryptocoryne ciliatâ* omninò excerptus.

Crypt. ciliata, foliis oblongo-lanceolatis, spathæ limbo tubuloso convoluto apice dilatato oblongo-lanceolato ciliato.

CRYPTOCORYNE CILIATA, *Fisch. l. c.* (sine char.)

Ambrosinia ciliata, *Roxb. Synops. MS.*, p. 435. *Ejusdem Icon. Pict. in Hort. Bot. Calcutt. asservat.*, vol. xiii. t. 84. *Cor. Pl.* t. 262. *Fl. Indica,* vol. iii. p. 491.

A. ciliaris (Roxb.), *Spr. Syst.* iii. p. 771.

Hab. Ad ripas limosas fluminis Hooghly æstubus alternis ferè omninò submersa. Floret fructusque profert per totum ferè annum.

Rhizoma maximâ parte subterraneum, subsimplex, cylindricum, carnosum, cicatricibus foliorum infernè distantibus obliquisque supernè aggregatis et semicircularibus notatum, radiculas plures subsimplices crassitie pennæ corvinæ ad cicatrices exserens. Stolones plures (rariùs nulli) compressiusculi, elongati, hinc illinc squamis vaginantibus quarum extimæ (quoad axin) foliaceæ stipati, apicem axeos versus originem ducunt et latè radicant; plurimi rudimentarii, squamis omninò involuti, intra petiolorum bases exstant. Folia; petiolus limbi circiter longitudine, cellulosus, infra medium dilatatus et vaginans, cæterùm teretiusculus; pagina oblongo-lanceolata, acuta, apice obsoletè cucullata, integerrima, glabra, penninervis, nervo medio crasso et infrà valde prominulo: membranæ foliaceæ, obtusiusculæ, venosæ, cum foliis mixtæ occurrunt, juniores folia juniora arctè altèque amplectentes. Cilia plurima, subulata, plana, membranacea, brunnea (adultiora quasi sphacelata), erecta, ad insertiones petiolorum membranarumque utrinque uniseriatim disposita occurrunt. Spathæ in axillis foliorum solitariæ, breviusculè pedunculatæ, foliis breviores. Pedunculus compressiusculus, sub-biuncialis. Tubus brevis, compressiusculus, ad apicem processu celluloso, e sinu convolutionis originem ducente, incompleto, deorsum convexo, quasi cochleato, pilei instar spadicis apicem tegente et retinente, bipartitus. Limbus in tubum longissimum hinc sulcatum convolutus, apicem versus dilatatus in paginam obliquam, oblongo-lanceolatam, apice obsoletè cucullatam, obtusiusculam, extùs longitudinaliter venosam et cinereo-viridem, intùs fusco-purpurascentem luteo plùs minùs tinctam, processubus longis, subulatis, carnosis, sæpiùs simplicibus, aliquando 2–3-partitis, purpureo-sanguineis ciliatam; os partis tubulosæ convolutæ obliquum, albidum punctulis rubescentibus, margine crenulatâ, lutescenti-viride, parum elevatâ cinctum. Spadicis clavatæ apex conicus, cellulosus, callosus, albus, obtusiusculus; junior cum septo coalitus; pars antherifera incrassata; media omninò nuda, gracilis, filiformis; basilaris ovariis coalitis cincta. Antheræ indefinitè plurimæ, apicem spadicis versus longitudinaliter dispositæ, sessiles, biloculares, quasi truncatæ, medio constrictæ, juniores membranâ conicâ margines thecæ truncatas insuper prominente clausæ, demùm membranâ lapsâ ore magno circulari hiantes. Pollen globosum, læve. Ovaria 5–7 (plerumque 6) circa spadicis basin verticaliter sita, inter se et cum spadice in ovarium 5–7-loculare coalita. Ovula indefinitè plurima, ascendentia, pilis cellulosis longis intermixta; foramen conspicuum hilo oppositum; tegumentum simplex. Styli 0. Stigmata 5–7 obliqua, extrorsùm spectantia, papillosa, subapiculata. Fructus nudus, breve pedunculatus, ovato-globosus, ovi circiter magnitudine, profundè latèque 5–7-sulcatus, ad apicem apiculis conicis totidem extrorsùm curvatis et stigmatum reliquiis notatus, secus sulcos in valvis totidem coriaceis, demùm revolutis, dehiscens, septis axique carnoso-fungosâ areolatâ liberis factis. Semina plura cuivis loculo, ascendentia, sub-biseriata, subovata, compressa, basi pilis inconspicuis, irregulariter sitis cincta. Tegumentum exterius (testa) cellulosum, membranaceum, tenuissimum, diaphanum, ad basin multò magis cellulosum et crassius, hinc et sæpiùs extrorsùm radiculâ perforatum: interius incompletum, callosum, urceolato-globosum, pallidè brunneum; cavitatis parte infimâ membranâ cellulosâ vestitâ. Embryo gemmiformis. Radicula brevis, conica, obliqua, vaga, sæpiùs extrorsùm spectans et testam perforans: cotyledon carnosa, nucleo ferè omninò arctè amplexa, sub fructûs dehiscentiam ad nuclei apicem constrictam amputata, parte inclusâ cum tegumentis citò separante. Plumula maxima, sæpiùs placentam versus obliquè directa, hilo obversa, polyphylla; foliolis imbricatis subulatis, apices versus deflexis, exterioribus longioribus magisque subulatis, interioribus brevioribus bases versus dilatatis, intimis folia perfectiora omninò referentibus: color præsertim interiorum viridis; apices brunnei, quasi sphacelati.

Of this genus Roxburgh has described and figured (under *Ambrosinia*) four species, *C. ciliata, spiralis, retrospiralis,* and *unilocularis.* This author describes the stigmata as glands, the naked filiform part of the spadix as style, and the conical apex of the spadix as the stigma. He still however places the genus in *Monœcia Monandria.* According to the same author, glands exist below the anthers in *C. retrospiralis.* I have observed an occasional dislocation of the anthers in *C. ciliata,* the lowermost ones being sometimes found attached at various points between the enlarged antheriferous part and the middle of the naked filiform portion of the spadix. *C. unilocularis* is, as stated by Roxburgh, remarkable for the non-existence of capsular dissepiments, the fruit being unilocular and the placenta central, attached only by its base and apex.

In his MS. Synopsis Roxburgh says of the seeds of *C. ciliata*:—"The seed generally vegetates in the capsule, and is as completely polycotyledonous as any *Pinus*, or even *Dombeya*, the Norfolk Island Pine, itself." In his 'Flora Indica*' he describes the embryo as erect, furnished with a perisperm, and many subulate cotyledons as in *Pinus*.

I subjoin the character of the genus taken from the 'Meletemata Botanica':—

"Spatha tubo brevissimo, limbo elongato. Spadix spathæ plicâ tubum claudente (appendiculâ) conjunctus. Antheræ confertæ, loculis amplis cellulæformibus, marginatis, septo valdè distincto separatis; poro (?) dehiscentibus. Ovarium pluri- (6) loculare, ovulis diversâ altitudine axi affixis, peritropis. Styli plures (?); stigmata radiata. Semina albuminosa, testa spongiosa (?). Embryo cotyledonibus (protophyllis ?) pluribus.—Asiaticæ; rhizomate stolonifero; foliis vaginâ petiolari dilatatâ, laminâ integrâ uninervi; floribus suaveolentibus."

M. Schott has referred *Caladium ovatum* of Ventenat, *Karin-Pola* of Rheede's 'Hortus Malabaricus,' vol. xi. p. 45. t. 23, to this genus. The structure of the fruit as described and figured by Rheede appears however to be somewhat different†. With this, *Arum aquaticum* of Rumph's 'Herbarium Amboinense,' vol. v. p. 312. t. 108, has no apparent affinity.

The roots are cellular and vascular in the centre, cellular towards the circumference; the intermediate part being occupied by a number of cavities (containing aëriform fluid), the walls of which are formed of a single series of cells, and which radiate from the centre. This structure seems not uncommon among *Monocotyledoneæ*. The petioles and the membraniform sheaths are arranged alternately, but corresponding in direction with each other, the

* Vol. iii. p. 492.

† In Rheede's plant there would seem to be an increased number of ovaria. From some degree of subdivision existing in the tissue of the spadix between and within the apices of the ovaria in *C. ciliata*, and in a higher degree in *C. spiralis*, as represented by Dr. Wallich's artists, I shall not be surprised if species be found to exist with ovaria disposed in two or more series; in such case their direction will most probably become more horizontal.

peduncles when present being interposed. The rudimentary stolones always correspond to the axils of every alternate sheath. In the young spadices the antheriferous portion is as it were sessile on the top of the ovaria, the filiform portion being a subsequent development. The inner surface of the convolute limb is at the same period smooth and shining. The septum is perfectly developed at a very early period, and then closes up the tube completely; it already covers, but does not adhere to the apex of the spadix, and hence the subsequent slight obliquity of the upper portion of this body. At an intermediate period the apex of the spadix adheres strongly to the septum, but subsequently regains its original free state. The septum appears to originate in a production downwards from the commencement of the division of the limb, to which part it always corresponds. The antheriferous portion is well supplied with vessels, fascicles of which pass off from the central bundles to the anthers, corresponding to the central cellular part or septum that exists between the thecæ. The anthers may from a very early period be compared to two cups joined together by their contiguous margins; the wide and open mouth which they present in their mature state being closed up originally by an extremely fine membrane, lining the cavity of the cup and forming a convexity where it closes in the opening. Within the cavity thus formed the pollen is developed. As the anther increases in size this membrane gradually assumes the form of a cone, which projects in proportion as it increases beyond the margins of the cups or thecæ. At the same time it assumes a yellow tint, by which, chiefly, I am led to think that it lines the entire cavities of the thecæ. The cellular tissue of the thecæ consists of a cutis, which is papillose on the margins of the cup, and an inner series of ovate cells arranged with their long diameters pointing from the axis. On the membrane of these cells very distinct fibres are developed, which almost always have the same direction with the cells. These fibres cross each other at very acute angles, and appear to be incomplete at either end of the cell, in which they are developed. The cone soon becomes more subulate, it remains closed, and is of a yellowish tint. The anthers appear to be fully formed at a time when the spadix is only half-developed. At a later period the apex of the cone is open, and through this opening the contents of the thecæ may be squeezed, assuming, from the comparatively small diameter of the apex of the cone, a more or less elongated form. In the instance figured, the length to which they attained was immense. The matter squeezed out resembles exactly the process which originates from most globules of pollen, when acted on by water, and the very great length above noticed arose probably from the coalition of the processes of several granules occasioned by the pressure exerted. The opening in the cone appears to be of secondary importance; it is evident from the direction of the anthers, from the small size of the aperture, and from the relative diameters of the opening and globules of pollen, that it is not sufficient to allow of a free exit to the latter. The necessary free exit of the pollen is secured by the separation of the membrane from the inner margins of the thecæ, and at the time of fecundation the globules of pollen will be found uncovered. Although from this adaptation and the situation of the stigmata, a mere falling out of the pollen globules would apparently be sufficient to ensure their application to the female organ, yet the agency of insects appears to be very generally resorted to as an additional insurance of the completion of this important function. The lower portion of the cavity of the spatha is during impregnation found to contain many small flies, which do not appear to be able to effect their escape after having done their duty, and are after impregnation found dead within the tube.

At the earliest period at which I have examined the ovula, I have found them to be oblong bodies, projecting from the surface of the placenta, with which in structure they have a great similitude. A little below their points there is a slight constriction, the part above this being papilliform and much less grumous than that below it. At a somewhat later period, the base of the papilliform body, which is the rudiment of the nucleus, is surrounded by an annulus, a growth from that part of the ovulum situated below the constriction. This annulus is the rudiment of the integument of the ovulum; it soon increases and forms a sort of cup, beyond the edges of which the nucleus projects considerably. As the development proceeds the ovula become ovate-oblong, narrowed towards their bases and points, which are directed upwards. The nucleus soon becomes entirely inclosed in the cup, the mouth of which is then considerably narrowed: it is solid, papillose at its apex, which corresponds to the opening of the integument; its tissue appears to be more dense towards its base than at any other part. No change of any importance occurs until after impregnation and after the withering of the spatha. The central portion of the nucleus is then much more transparent, and is evidently excavated. The shape of the cavity is clavate, the narrow extremity being contiguous to the hilum, the broader pointing to the apex of the nucleus. The opening in the integument is still conspicuous. The next step that I examined presented a considerable enlargement of the integument or testa, which had become cellular, and its cavity had assumed an irregular form. The foramen was indistinct. The nucleus had become much firmer, and its cavity much enlarged and considerably altered in shape. This cavity, which is due to excavation, as I believe is most commonly, perhaps invariably the case, extended upwards to within a very short distance of the extreme apex of the nucleus, which was apiculate; and downwards towards the hilum, the diameter being greater at its base than elsewhere. The lower portion was occupied by cellular tissue assuming the form of a sac and quite free from adhesion inferiorly. The upper third of the excavation was occupied by an oblong cellular body, the apex of which is conical. This is the young embryo; it is at the period mentioned entirely cellular, and its attachment to the nucleus is, if any, extremely slight.

When rather more advanced, the embryo is still entirely inclosed within the nucleus. It is subclavate, the conical, originally rectilinear apex has become somewhat oblique, and on one side of what may be called the head of the embryo, a depressed areola is visible. The next change presents an enlargement upwards of the excavation, which is now continued *through* the apex of the nucleus. At the same time its base has become enlarged and roundish. At this period the nucleus with its cavity resembles, not very inaptly, a Florence flask. The conical and rather oblique apex of the embryo now projects through the perforated apex of the nucleus, the inclosed part being firmly embraced by the *neck* of the nucleus, the tissue of which has become more and more callous or indurated. The next important change consists in a still greater projection of the conical apex and head of the embryo, and in the production of minute, oblong, obtuse, cellular bodies from the margins of the depressed areola. These bodies are the rudiments of the outer processes of the plumula. A little later, these marginal papillæ will be found enlarged, and at the same time additional ones will be seen developed from the centre or disc of the areola. The obliquity of the conical apex is now considerable. The chief bulk and inclosed part of the embryo occupies at this period about the upper two-thirds of the excavation, but does not as yet extend into its lower globular portion.

As the development proceeds, the testa becomes more enlarged and more cellular, and the originally conspicuous foramen becomes more indistinct. The nucleus becomes more dense and callous, and its globular base as well as the cavity become more enlarged, and hence the more apparent constriction of its neck. The embryo as it enlarges extends downwards into the globular portion of the cavity of the nucleus, which it subsequently fills entirely. The sacciform cellular tissue previously noticed is pushed further down into the excavation as this downward growth of the embryo advances, and subsequently it forms a thin lining interposed between the globular base of the embryo and the corresponding wall of the cavity of the nucleus. The upper cylindrical portion of the inclosed part of the embryo becomes, if possible, more firmly embraced by the neck of the nucleus.

The exserted portion soon ceases to elongate, but increases much transversely. The rudimentary processes of the plumula become more and more elongated, and the extent of surface from which they are produced more and more increased. They are developed from within outwards, and subsequently become so numerous as to occupy the chief part of the periphery of the exserted and much-enlarged portion. Their growth is very rapid, and does not correspond with that of the testa, which becomes more and more thin and membranous as the processes increase in size. Owing to their greater ratio of growth, these processes subsequently become recurved towards their apices. This curvature will however be seen to commence before the processes have equalled the testa in length. The radicle keeps up a very slight corresponding ratio of growth, but its obliquity becomes increased. It always remains conical, and as from its direction it soon comes into contact with the lax, cellular, basilar portion of the testa, it becomes imbedded in it, and ends by perforating it altogether.

The fully-developed seed is oblong, somewhat compressed, depressed on its inner, convex on its outer surface, constricted towards the hilum; this portion being of a brownish tint and hard to the touch. The testa closely embraces the plumula; it is cellular towards its base and where it surrounds the dense internal globular body, membranous throughout the rest of its extent, and so thin that the processes of the plumula are visible through it, and give to it a greenish tint. The nucleus is dense, indurated, nearly globular, the original neck having nearly disappeared. It is of a brownish tint, and contains and firmly embraces the inclosed descending portion of the embryo, which is the cotyledon. There is however partially interposed between them the lining cellular membrane, which occupies only the fundus of the cavity.

The embryo is of a singular shape. Its descending portion or cotyledon is clavate and nearly entirely inclosed within the nucleus; the inclosed part separating with that body exceedingly readily, and subsequently, about the time of dehiscence of the fruit, spontaneously. The tissue of the inclosed part is firm and more dense than the short uninclosed part. The exserted portion of the embryo consists, exclusively of the base of the cotyledon, of a fleshy, firm, plano-convex body. The plane part is depressed towards the centre, to which the base of the cotyledon is attached. From one side of this the radicle projects, which is still conical and acute, and is always directed from the placenta, and generally outwards, but often laterally, and always more or less downwards. The circumference of the convex part is entirely occupied by the processes, constituting an enormously-developed plumula. These are densely imbricated, intermixed with abortive and rudimentary ones, and of immense length, especially the outermost, which are about one inch long. They are all subulate with the exception of the two or three innermost ones, which resemble rudimentary leaves, and are divided into a limb, which is convolute, and a petiole, which is likewise convolute, the innermost inclosing in its fold an extremely minute rudimentary leaf. The outermost are the narrowest, the bases as we proceed inwards becoming gradually dilated. They are all deflexed and tortuous, especially the outer ones. Their extreme apices are invariably brown, and as it were sphacelated. The colour is green, increasing in depth as we proceed inwards, the convolute laminæ of the innermost being of a rather deep tint. These processes are furnished with vessels, but their chief bulk is cellular, the cells containing a considerable number of green globules. They are, with the exception perhaps of the outermost, furnished with stomata. These bodies however appear to be perfect in the interior processes only. They are most abundant towards the apices of these, especially on the portion which corresponds to the lamina of the perfect leaf, and are perhaps altogether wanting towards or near their dilated bases. The cells of the cotyledon as well as of the processes of the plumula, in an early stage of their development, abound in active molecules, which have both in and out of the containing cells an exceedingly rapid oscillatory motion. It is obvious, from the universal presence of these corpuscles during the formation of tissue, that they play an important part in this most obscure process.

The processes of the plumula remain for some time entirely cellular; at an early period they have a close resemblance to the very minute leaves which exist in the axillæ of the convolute unexpanded leaves.

With regard to the elongated cellular tissue or hairs of the surface of the placentæ, which exist in such abundance in the ovarium at the time of impregnation, I have merely to add that their formation appears to be subsequent to the first appearance of the testa. They have attained a considerable size in those placentæ the ovula of which have the nucleus half-exserted. They contain active molecules, but I have not been able to detect any motion of ascent or descent. They do not disappear in the mature fruit, but are visible, arranged irregularly about the bases of the seeds.

About the time of dehiscence, or before this, on immersing the seeds in water for a short time, spontaneous separation of the cotyledon will have generally taken place about the apex of the nucleus. The truncated base of the cotyledon, after this has separated, will be seen occupying the depressed centre of the plane inferior surface of the axis. The testa will frequently be found ruptured. Yet this can scarcely be, as Roxburgh seems to think, called germination, which in this singular plant cannot be said to take place until the radicle has elongated and the innermost convolute processes have become expanded. The axis contains the rudiments of additional radicles, which, from their mode of development, may truly be said to be exserted. This I have never seen to take place before germination, as I conceive it to be limited.

I shall now pass to the consideration of the anomalous points of structure of the ovulum, particularly of those of which explanations have suggested themselves during the course of my inquiry.

With regard to the earlier stages of development I may observe, that I was aware some time before the date of these examinations of Mr. Robert Brown's opinion as to the comparatively late origin of the integuments of most ovula, and I consider the present instance as a good example of the correctness of the views of this illustrious botanist.

I have nothing to state regarding the reduction of one envelope, or the limited extent of the tegument resulting from the original nucleus; nor have I yet positively determined the nature of the cellular membrane occupying the fundus of its cavity. I am led however to think it to consist of the remains of the sac of the amnios, which so frequently line the cavity of the nucleus of other plants.

The whole of the anomalies existing in the structure of the embryo may, I think, be referred to the density of the texture of the nucleus and to the shape of its cavity.

The direction of the radicle is an instance of an exception to a very general, and, within certain limits, perhaps universal rule. I allude to the correspondence of the apex of the radicle to the same part of the nucleus, and consequently to the situation of the original opening through the coat or coats of the ovule. This exception however appears to me to be highly corroborative of the validity of the law, since in the earlier periods of development the direction is not only rectilinear, but the apex corresponds exactly with the apex of the nucleus and with the foramen*. Another circumstance is likewise to be kept in view, viz. that the law just stated is applicable only to the direction of radicles of embryos, which remain inclosed in the original nucleus, or in some modification of its original form. The perforation of the testa depends upon this anomalous direction of the radicle, and somewhat perhaps on the compressed situation of the seeds themselves.

The separation of the chief part of that portion, which is evidently from its direction the cotyledon, is most remarkable, and forms another exception to a general law. I allude to the very general *absolute* necessity of the cotyledons. I am however inclined to think from this and some other instances, that the presence of a highly developed plumula occasionally obviates this

* I would limit the expression of the above law to "radicle pointing or corresponding to the apex of the nucleus;" since there are exceptions to its correspondence with the foramen.

necessity. The separation in question appears to depend upon some constriction exerted upon the cotyledon by the apex of the nucleus.

The immense development of the plumula is the cause of the obliquity of the radicle, and appears to be intended to obviate the effect of the separation of the cotyledon: it is one among many instances of adaptation to correct what would otherwise be a destructive or fatal anomaly.

The fact of the presence of stomata on the processes of this body is extraordinary enough, particularly when it is recollected that they exist in fruits which have ripened under water.

Nothing can prove more satisfactorily than the present instance the absolute necessity of tracing anomalous forms back to the earliest periods of their development. In this case the process is attended with the desired effect, viz. of reducing the anomalies to the ordinary type of formation. It is very evident that the form of the embryo, immediately before its conical apex projects through that of the nucleus, closely resembles the usual form of these organs in other *Aroideæ,* since we have a superior radicle, a cotyledon, and a tendency to the formation of a lateral slit, as indicated by the depressed areola.

EXPLANATION OF THE PLATES.

Tab. X.

Fig. 1. Spatha of *Cryptocoryne ciliata,* cut through longitudinally, representing the spadix *in situ* and half of the septum.

Fig. 2. Spadix about the time of impregnation, and after the disappearance of the coniform membrane of the anthers.

Fig. 3. Vertical view of a pair of anthers.

Fig. 4. Theca of anther fully formed, viewed obliquely. The opening in the apex of the projecting membrane is very distinct, and through it is seen passing a grumous *boyau*-looking body of great length.

Fig. 5. Longitudinal section of one theca, showing the arrangement of its fibrous cells, and the perforation of the apex of the projecting portion of the lining membrane.

Fig. 6. Vertical view of a theca, about the period of impregnation, and after the disappearance of the coniform projection. The pollen is seen exposed.

Tab. XI.

Fig. 7. Ovule at a very early period, and before hairs are developed from the surface of the placenta: *a.* marks the site of the constriction; *b.* papilliform nucleus.

Fig. 8. Ditto, more advanced. The nucleus projects considerably beyond the margins of the cup formed by the enlargement of the annulus. The cellular hairs are now developed; some even exceeding the ovulum in length. A fascicle of vascular tissue is seen passing to the base of the ovulum.

Fig. 9. Longitudinal section of the integument of a more advanced ovulum, leaving the nucleus exposed.

Fig. 10. Ovule more advanced; the tegument is cut away as well as part of the short funicle longitudinally. The nucleus is exposed, and seen to be entirely inclosed within the tegument. It has undergone no alteration in form. Along its centre and throughout its upper half, there is an evident excavation formed.

Fig. 11. Longitudinal section of an ovule still more advanced. The irregular form of the cavity of the testa and the dilated inferior portion of that of the nucleus are distinctly visible. The embryo is still inclosed within the upper half of the cavity.

Fig. 12. Embryo, from about the same period; it is now clavate, its conical apex has become rather oblique, and on one side a depressed areola surrounded with a rather thickened margin is visible.

Fig. 13. Longitudinal section of the nucleus of a more advanced ovulum, a portion of the base of the testa remaining. The apex of the nucleus is now perforated, and the lower portion of the cavity is still more enlarged, and is seen to be occupied by cellular membrane. The conical apex of the embryo is seen projecting beyond the apex of the nucleus.

Fig. 14. Nucleus, with portion of the base of the testa, still further advanced. The now enlarged apex of the embryo is seen projecting beyond the nucleus, and the original conical apex has become more oblique. From the areola two teeth are seen to project; these are the rudiments of the outer processes of the plumula. The apex of the inclosed portion has now reached to the dilated part of the cavity.

Fig. 15. Embryo from the same placenta but from another ovule. The radicle is more oblique, and the rudimentary processes, of which there are six, are more enlarged; none are developed from the centre of the areola.

Fig. 16. A much more advanced ovule. The greater part of the testa is cut away; the nucleus and enlarged apex of the embryo are exposed; the radicle still preserves its obliquely ascending direction, and there is still some degree of obliquity in the plumula.

TAB. XII.

Fig. 17. Ovule nearly perfectly developed, outer face.

Fig. 18. Ditto, longitudinal section. The testa is seen to be cellular where it surrounds the nucleus, almost membranous and diaphanous where it is in apposition with the plumula. The nucleus is seen closely embracing the cotyledon. The section of the exserted portion of the embryo presents a fleshy mass; the plumulary processes are already highly developed, and have already assumed a greenish tint, especially the innermost: they are longer than the testa.

Fig. 19. Capsule shortly after dehiscence and before the valves have become revolute. The dissepiments are attached to the free central placenta. Several ovula are visible lying on the inner faces of the valves.

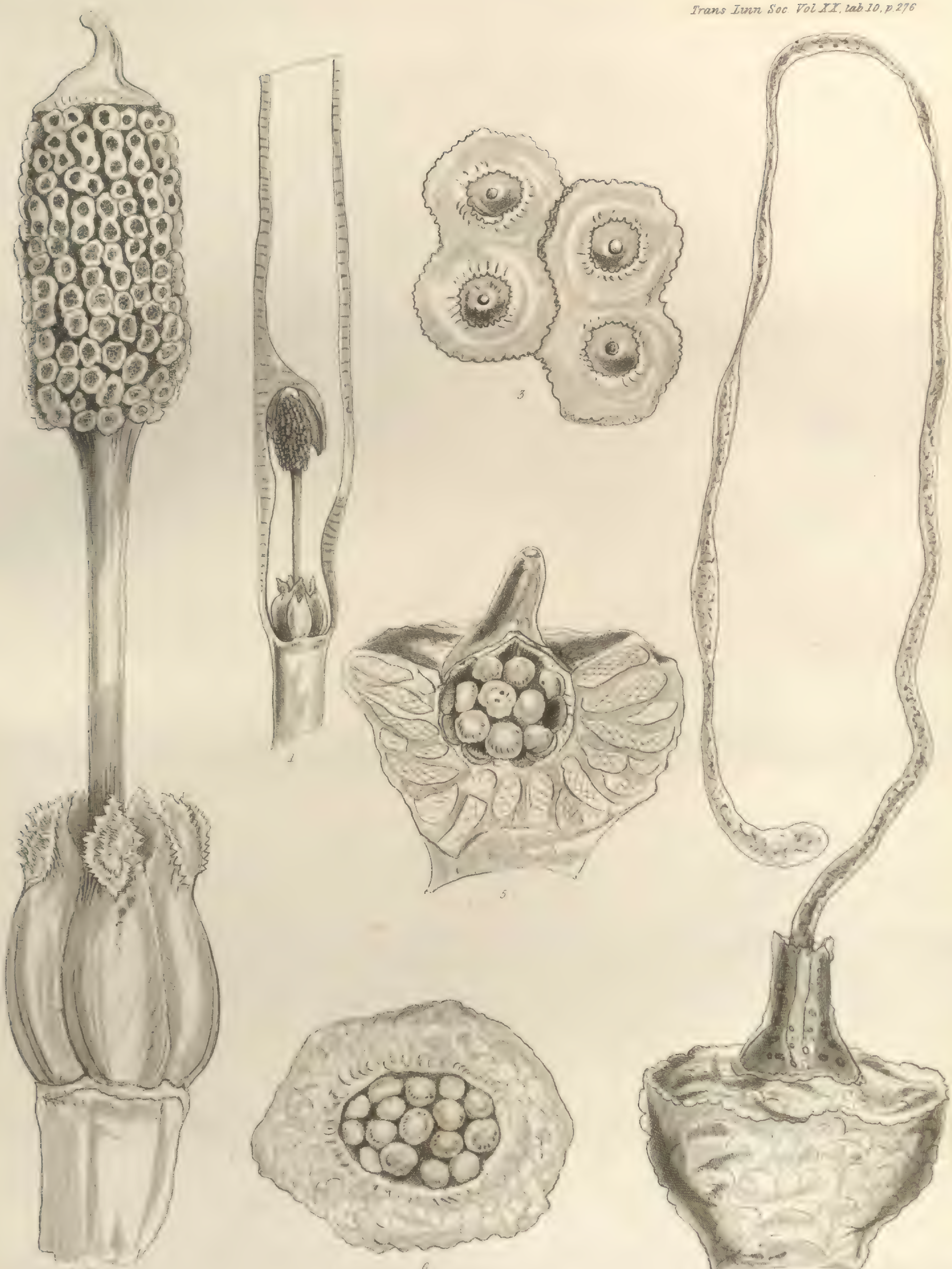
Fig. 20. Transverse section of a capsule before dehiscence:—natural size.

Fig. 21. Fully developed embryo, detached. This must be done with care, as the cotyledon separates very readily: *a.* the subglobular pisiform cotyledon; *b.* the radicle; *c.* the enormous plumula.

Fig. 22. Seed, the testa of which has become ruptured, and in which the separation of the cotyledon has taken place. The nucleus is seen forming a globular brownish body near the hilum.

Fig. 23. Longitudinal section of the testa and nucleus of a seed after the separation of the cotyledon has taken place. The cavity of the nucleus is seen to be filled with the separated portion of the fleshy firm cotyledon.

Fig. 24. Embryo, a short time after the separation of the cotyledon; the inner processes have begun to be expanded, and an accessory radicle is formed. This represents the first period of germination.



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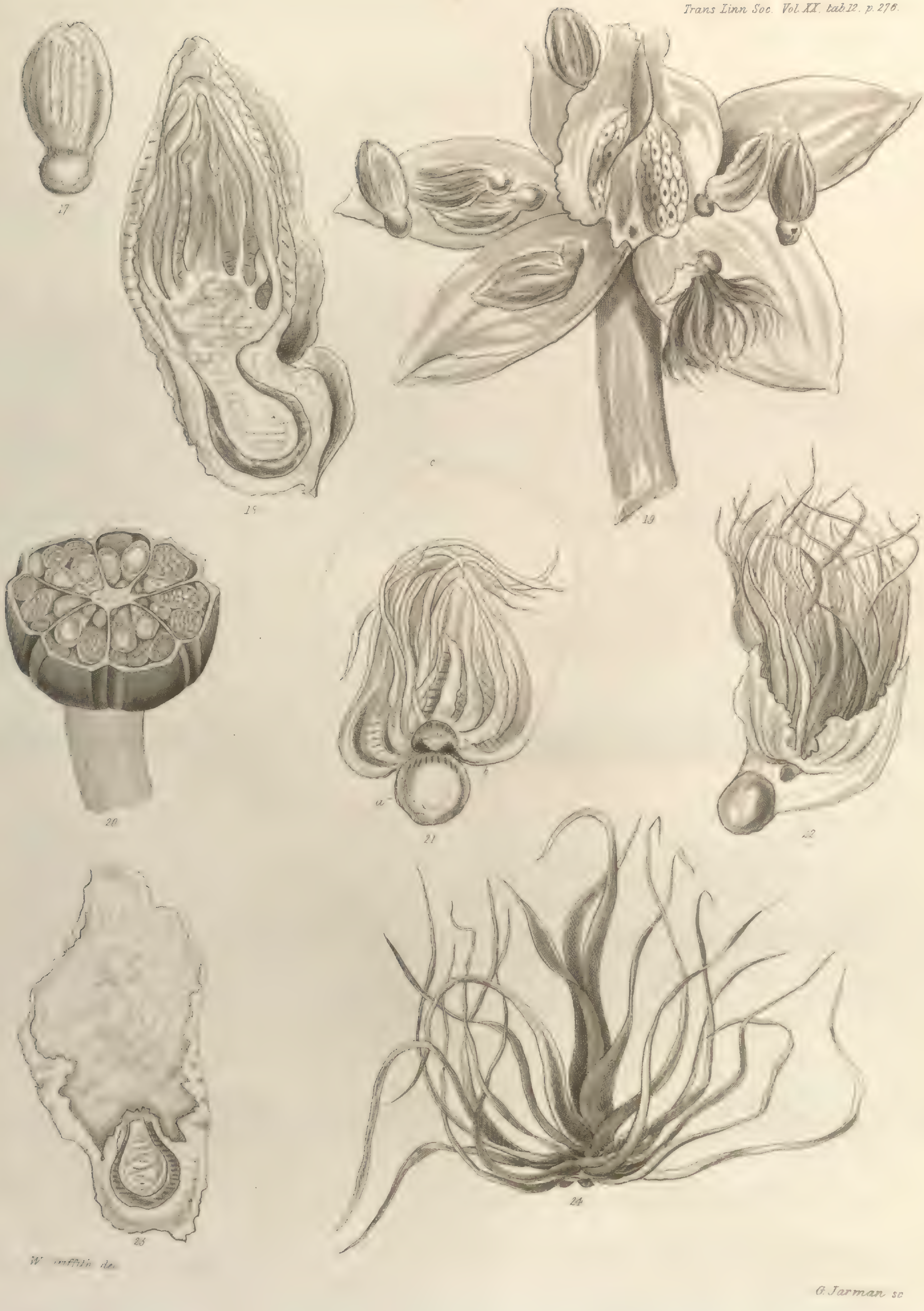

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XII. *On the Aqueous Vapour expelled from Bee-hives. By* GEORGE NEWPORT, *Esq., F.R.S., Fellow of the Royal College of Surgeons, &c. Communicated by the Secretary.*

Read March 3rd, 1846.

THERE is one circumstance connected with the economy of the Bee-hive which does not appear to have engaged the attention of naturalists. It is the transpiration of vapour from the interior of the hive, at certain seasons, during the act of ventilation. Every bee-keeper must have noticed that at the latter part of the summer there is often a deposit of blackish carbonaceous matter on the footstool of straw hives, which is extended a few inches from the entrance-hole. This deposit is accumulated there in the course of a few months. When it first attracted my attention, I supposed that it was occasioned by the bees alighting at that spot and accidentally shattering some of their loads of pollen; or that, perhaps, it might be rejected excrementitious matter; but I afterwards satisfied myself that it does not arise from either of these causes. The pollen conveyed by the bee is rarely or ever shattered in its transit, while the bees are always particularly careful to remove obnoxious materials from the interior of their dwelling or its immediate vicinity. Other circumstances have since led me to believe that it results from the accumulation of small quantities of wax that had adhered to the feet of the bees that have just left the combs and are passing outwards, and that its dark appearance may perhaps be due to the same cause as that which discolours the combs in the interior, and changes them in the course of a few months from a delicate yellow to a dark brown, and even to a blackish hue.

When a hive is examined very early in the morning, at the end of summer, after a fine cool night, we usually observe at the entrance-hole a stream of moisture passing from it, sometimes in drops. This is more or less abundant at different periods according to the temperature of the preceding day, the activity of the bees, and the coolness of the night. There seems reason to believe that this fluid results in part from the respiration of the bees, and the extraneous transpiration from their bodies, generated during the night in the form of vapour, which is condensed and deposited as it comes into contact with the cold night air during the ventilation of the hive. It has already been stated by Huber, that the vitiated air of the hive is removed by the fanning of the bees, and that by this process a double current of air is established. The respired air is removed by the one, while fresh air enters by the other. My own observations have fully satisfied me of the correctness of these statements; and I have little doubt that it is to the contact of these two currents that the deposition of moisture at the entrance of the hive is due. In order to ascertain the quantity of fluid that is expelled from a hive in one night, I made an experiment, which, although not free from objections with reference to the hygrometric condition of the air during the night, satisfied me that the quantity is often very considerable. I cut off the bottom of a glass phial, and then ground the edges carefully so as to fit accurately to the front of one of my wooden hives: the phial was then affixed to the entrance-hole, with its contracted neck left open, so that all the air which escaped from and entered the hive passed through it. By this means a part of the vapour that was expelled from the hive was condensed in the phial, and the experiment, to a certain extent, was successful. During eleven and a half hours of the night of the 1st and 2nd of September, from half-past six in the evening till six in the morning, there was condensed in the phial about a dram and a half of fluid, besides what had escaped from the open mouth of the phial in the form of vapour. The temperature of the vapour, within the phial, as it issued from the entrance-hole of the hive, at half-past six o'clock in the morning, was 69° Fahr.; that of the external atmosphere was then only 59°·5 Fahr. The temperature of the vapour within the phial was ascertained at a distance of four inches from the hive, the thermometer being held free within the neck and not in contact. At eight o'clock on the following morning, when the temperature of the external atmosphere was 61° Fahr., the vapour in the phial was 71°·5 Fahr., while a thermometer inserted through the top of the hive, and which had remained untouched for several days, showed that the interior of the upper part of the hive was then only 69° Fahr. The bees at that time were perfectly quiet. Thus the expelled atmosphere of the phial, as on the preceding morning, was 10°·5 Fahr. above that of the open atmosphere, and 2°·5 above that of the top of the hive. At six o'clock of the evening of the same day, when the temperature was sinking, and was then only 53°·9 Fahr., that of the vapour in the phial, taken as before, was only 59°. The hive had then become quiet for the night, and its temperature was reduced. The temperature of the expelled air was thus shown to depend much on the degree of activity or quiescence of the bees, and consequently on the greater or smaller amount of their respiration. The bees were now in a state of rest, and respired but little; while in the morning they were becoming active, and preparing to enter upon their labours. During this night the temperature of the atmosphere sunk down to 32° Fahr.; and when I again examined it in the morning, September 4th, at six o'clock, it had risen only to 41°·5 Fahr. The hive was then quiet, the bees had been reposing all night, and were disposed to pass into their state of semi-hybernation. The temperature of the interior, at the top of the hive, was then only 54° Fahr., and that of the vapour in the phial, even at the entrance-hole of the hive, was but 59° Fahr.; and the quantity of vapour condensed within the phial scarcely amounted to so much as three minims. These concordant circumstances seem to prove that the vapour expelled from the hive results in chief part from the respiration of the bees, and the extraneous transpiration from their bodies; that this is most abundant when the bees are most active and are respiring freely, and when the greatest amount of heat is evolved by them. On the contrary, as the activity of the bees is diminished, the temperature of the hive becomes reduced and the quantity of air deteriorated, and the vapour expelled is lessened. And may we not also conclude from the fact, that the vapour, which thus seems to be the result of respiration by the bees, and which is condensed and deposited as it issues forth, holds in solution a superabundance of carbonaceous matter, which is deposited with it, and occasions the discoloration of the combs and of the entrance to the hive?

XIII. *Note on the Generation of* Aphides. *By* GEORGE NEWPORT, *Esq., F.R.S., Fellow of the Royal College of Surgeons, &c. &c. Communicated by the Secretary.*

Read April 7th, 1846.

THE history of the Plant-louse, as ascertained by Leeuwenhoek, Bonnet, Reaumur, and others, is so generally known to naturalists, that it is almost an act of supererogation for any one merely to repeat the observations of those authorities; and we cannot expect to add much to the very ample details they have given. Yet the facts they have recorded respecting the generation of *Aphides* are in themselves so exceedingly curious, and at the same time are so unexplained by any hitherto received theory of generation deduced from observations on vertebrated animals, that I have been desirous of verifying these facts by direct experiment, preparatory to attempting hereafter to show their accordance with some universal law of reproduction. I trust therefore that I may now be permitted in this short note to bear testimony to the correctness of the observations of Leeuwenhoek, Bonnet, and Reaumur, on the mode of generation in the *Aphides*, although at present I can add but little to what has already been observed by those naturalists. The facts I have more particularly endeavoured to investigate, are: first, whether the *Aphis* is in reality viviparous at one season, and oviparous at another? and next, whether the supposed ova are deposited as true eggs; or whether, as imagined by some observers, they are only capsules designed to protect the already formed embryos during the winter season?

With these objects in view, I selected the *Aphis* of the Rose, as best fitted for the inquiry. In the beginning of November 1842, the young shoots of a rose-tree, that had remained in the open air during the whole of the preceding summer, were thickly covered with *Aphides*, amongst which I had not yet seen any winged specimens; neither had any of the females yet deposited ova. The rose-tree was placed in the window of an apartment in which there was no fire, and where the temperature ranged from about 45° Fahr. to 50° Fahr. In the second week of November, as the temperature of the season became cooler, I first noticed several specimens with rudiments of wings, and a few days afterwards these cast their skins and became fully developed. Most of these individuals were males. At this time there were also a great many very young specimens. On the 30th of November the number of winged individuals had greatly increased; there were many with only the rudiments of wings; and there was also a great abundance of black oval eggs distributed everywhere on the young shoots of the plant, not only on the leaf-buds, but on the stems of the leaves and branches. I saw an *Aphis* at that moment bearing two eggs at the extremity of her body. On placing one of these beneath the microscope, I was quickly assured of its real nature: it was not a capsule that included a ready-formed embryo, but a true egg. When first deposited the egg is of an orange-yellow colour, but it soon acquires a much darker hue, and ultimately becomes of a deep shining black. The colour is entirely dependent on the pigment of the shell, and is much darker in some specimens than in others. The eggs are firmly glued to the plant, and are not easily removed. The egg of the *Aphis* is similar to that of other insects: it is composed of an orange-coloured yelk, formed of yellow nucleated cells, and surrounded by a very slight quantity of transparent vitelline fluid. It contains also a very large *germinal vesicle* with a distinct *macula* or *nucleus*. This vesicle is three or four times as large as the cells that compose the yelk, and, unlike that of most other impregnated eggs of insects, does not disappear until some time after the egg is deposited. The vesicle is so persistent, that in one instance, in which I examined an egg shortly after it came from the body of the *Aphis*, it did not disappear for several seconds after the egg was crushed under the microscope.

Wishing to observe the deposition of more eggs, I selected four specimens of the *Aphis* for experiment: two of these were males, which as yet were in the pupa state, and had only the rudiments of wings; the other two were large apterous females; these were placed on a detached branch of the rose, inclosed in a stoppered glass vessel, and removed to an apartment, in which the temperature ranged from 55° Fahr. to about 60° Fahr. On the 2nd of December, when the temperature of the air of the room was 58° Fahr., I was surprised to find that these specimens were again producing living young. One of the large apterous females had already produced its living offspring, and the other was at that very moment in the act of parturition. The posterior part of the body of a young *Aphis* was then protruding from that of the parent, and was quickly followed by the remainder of the body, the thorax and the legs. When these parts had passed, there was a slight cessation of parturient action, the head being still retained in the vaginal passage. The disengagement of the head seemed to be the slowest part of the process. The manner in which the parent rid herself of the new-born *Aphis* was deserving of notice. When the little insect was almost entirely extruded from her body, it clung with its feet to the plant; while the female *Aphis*, at short intervals, gradually elevated her body, and with a slight jerk seemed to labour to remove it. The young *Aphis* repeatedly missed its hold, but quickly regained it, and was thus as it were partially dragged forth. The head, with its small black eyes, parts of the mouth, and the antennæ, were thus gradually withdrawn, but I could not detect any fœtal coverings removed with them. The whole process of birth occupied about five minutes. Immediately after the young had escaped from the parent, it turned about on the leaf and moved very slowly, while the female plunged her proboscis into the plant to take food after her exertion.

These brief observations confirm the statements of former naturalists, that the *Aphides* deposit at one period true ova, and at others produce living young; and they lead us hereafter to inquire more particularly respecting the circumstances which accelerate the one, or retard the other form of development.

XIV. *Description of the* Asafœtida *Plant of Central Asia. By* Hugh Falconer, *M.D., F.L.S. &c.*

Read November 3rd, 1846.

Ord. Nat. Umbelliferæ.

Trib. Peucedaneæ, *DeC.*

Narthex.

Char. Gen. *Calycis* margo obsoletus. *Petala* ——? *Stylopodium* plicato-urceolatum. *Styli* filiformes demùm reflexi. *Fructus* a dorso plano-compressus, margine dilatato cinctus. *Mericarpia* jugis primariis 5, 3 intermediis filiformibus, 2 lateralibus obsoletioribus margini contiguis immersis. *Vittæ* in valleculis dorsalibus plerumque solitariæ (valleculis lateralibus nunc sesqui- vel bivittatis); commissurales 4–6 variæ inæquales, exterioribus sæpè reticulatim interruptis. *Semen* complanatum. *Carpophorum* bipartitum. *Umbellæ* pedunculatæ, compositæ. *Involucrum* utrumque nullum.

Genus inter *Peucedaneas,* calycis margine edentato, fructûs vittis magnis, commissuralibusque inæqualibus, et involucro utroque nullo, distinctum. *Narthex* nuncupatum a vocabulo *νάρθηξ,* apud Dioscoridem *Ferulæ* attributo.

N. Asafœtida, caule tereti simplici petiolis dilatatis aphyllis instructo, foliis radicalibus fasciculatis; petiolis trisectis segmentis bipinnatisectis: laciniis lineari-lingulatis obtusis inæquilateralibus integris vel variè sinuatis decurrentibus.

Asafœtida Disgunensis, Kæmpf. Amœnit. Exot. p. 535.

Ferula Asafœtida, Linn. Mater. Med. p. 79; DeCand. Prodr. iv. 173; Lindl. Flor. Med. p. 45.

Hab. in apricis inter saxa in valle "Astore" vel "Hussorah" dictâ prope Indum, ultra Cashmeer; indigenis Daradris "Sip" vel "Sŭp." Legi fructigerum prope Boosthōn 21° die Septembris 1838.

Descr. A tall perennial plant, 5 to 8 feet high. Root fusiform, simple or divided, a foot or upwards in length, about 3 inches in diameter at the top, with a dark-greyish transversely corrugated surface: the summit invested above the soil with dark hair-like fibrous tegmenta, the persistent exuviæ of former years: cortical layer thick and tough, white or ash-coloured in the section, readily separable from the central core, and like the latter abounding in a white, milky, opake, excessively fœtid, alliaceous juice. Leaves collected into a fascicle above the root, numerous, large and spreading, about 18 inches in length in the adult plant, of a light-green colour above, paler underneath, and of a dry leathery texture: the petioles terete, amplexicaul and channeled at the base, trifurcated a little above it, the divisions emitted at an angle with each other like the legs of a tripod and bipinnately sected: the leaf-segments linear-lingulate, more or less obtuse, entire or sinuately lobed, variable in their offset, being either alternate or opposite, for the most part unequal-sided, and decurrent along the divisions of the petiole, forming a narrow winged channel upon the latter. Midrib prominent on the under side; veins slender and anastomosing by numerous reticulations. The leaves observed on a young growing plant were about 9 inches in length, the leaf-segments being from 2 to 4 inches long by 4 to 6 lines in width. Stem erect, terete, simple, striated, about 2 inches in diameter at the base, solid throughout, the spongy medulla being traversed by scattered, tough, fibrous bundles of vessels; invested with alternate, vaginating, dilated aphyllous petioles, and terminating in a luxuriant head of compound umbels. General as well as partial involucra entirely wanting. Umbels 10- to 20-rayed, emitted from the dilated spherical head of a common peduncle, the rays 2–4 inches in length. Partial umbels with very short rays aggregated into round capitula varying from 10 to 20 rays in the fertile, and from 25 to 30 in the barren umbellulæ. Flowers small; barren generally mixed up with the fertile flowers (?). Border of the calyx obsolete, being reduced to very minute denticular points. (Petals in the barren flowers small, oblique, unequal-sided, acute, without an elongated acumen (?).) Stylopodia urceolate and plicated, with a sinuous margin. Styles filiform, reflected on the ripe fruit, rather short and slender, attached by a broad base. Fruit: from 7 to 15 ripening on the partial umbels, supported on short stalks. Mericarps varying from broad elliptical to elliptical obovate, 5–6 lines long by 3 to 4 lines broad, flat, thin, foliaceous, but somewhat convex in the middle, with a dilated border, generally unequal-sided, of a dark reddish brown towards the centre, lighter towards the margin, perfectly smooth, with somewhat of a glossy surface. Dorsal primary ridges 5; the 3 middle ridges filiform, slightly crested towards their confluence at the apex; the lateral ridges more obsolete, situated close to the margin, immersed in the substance of the border, but distinctly seen on the surface of the commissure, and confluent with the middle nerve of the latter. The dilated borders as wide as the space occupied by the three middle ridges. Vittæ in the dorsal furrows large and broad, occupying the entire width of the valleculæ, stretching from base to apex, usually solitary, but sometimes double in one or other of the middle furrows, and generally double or dichotomous with a small branch in the broadest side of the margin, turgid with a fœtid juice: vittæ of the commissure ranging from 4 to 6, very unequal and variable: one very slender vitta, which is frequently dichotomous in two fine threads confluent at the apex, being placed close on either side of the middle nerve; another of the size of the dorsal vittæ situated more outwards, and a third at the inner side of the dilated border, over the edge of the seed, more slender, but frequently subdivided and interrupted so as to cover the border with a beautiful network of anastomosing ramifications. Seed flattened, with plane albumen. Carpophores bipartite, persistent, twice the length of the pedicels. Flowers white?

The plant above described I believe to be the true "*Asafœtida Disgunensis*" or "*Hingisch*" of Kæmpfer. It does not appear to have been met with by any other botanist since it was examined *in situ* by that excellent and careful observer upwards of a century and a half ago.

I have compared my materials with Kæmpfer's description and figures (Amœn. Exot. p. 537), and with his original specimens contained in the collection in the British Museum, and found them, so far as a comparison could be instituted, to agree in every essential respect. The leaves, "instar Pæoniæ ramosa," as represented in his figures, have the segments more obtuse and sinuated, and more alternate in their offset than they are represented in my drawing; but he describes them as being very variable in form, and some of the numerous leaf-specimens in his herbarium correspond with the figures which I have given. Kæmpfer mentions the umbellulæ as having only 5 or 6 rays, whereas I found them as numerous as 25 or 30 in the sterile capitula, and from 10 to 20 in the fertile ones. But he states that he never saw the plant in flower, and his description was probably drawn from the ripe state, in which the partial umbels occasionally present no more than 7 fruit-bearing stalks. There are two mericarps in his herbarium, agreeing exactly in form and in the development of the dorsal juga with those met with by me in the Astore plant: but Kæmpfer's specimens are glued down on paper, and they seem to have undergone some decay or alteration by which the vittæ have been emptied, so that their number and size cannot be distinctly made out. But they appear to be solitary in the dorsal valleculæ, and there is no indication of the numerous striæ represented in the figures of the fruit given in the 'Amœnitates,' which may have confirmed authors in the belief that Kæmpfer's Asafœtida plant belonged to a species of *Ferula*. These mericarps are perfectly smooth, and exhibit nothing of the "quadamtenus pilosum sive asperum" described in the 'Amœnitates,' p. 538. Dr. Lindley in his 'Flora Medica,' p. 45, after an abridgement of Kæmpfer's description, states, it is not mentioned upon what evidence, the vittæ of the back to be "about 20 or 22, interrupted, anastomosing, and turgid with Asafœtida; of the commissure 10." This account will apply to the fruit of a species of *Ferula*, but is entirely at variance with the characters presented by the fruits of the plants observed by Kæmpfer in Persia, and by myself in Astore.

Kæmpfer in his description says: "Folia serò autumno ex vertice progerminant, sex, septem, et pro radicis magnitudine plura vel pauciora: quæ per brumam luxuriosè vigent adultoque vere exarescunt." From the information which I gathered on the spot, confirmed by subsequent observation upon the growing plants introduced into the Botanic Garden at Saharunpoor, the leaves of the Astore Asafœtida plant make their appearance in spring, and not in autumn surviving through the winter, as stated by Kæmpfer respecting the Persian form. With these slight discrepancies, his description might serve for the Astore plant.

Narthex, both in the characters of the flower and fruit, and in its "pæony-leaved" habit, differs widely from any known species of *Ferula*, and appears to constitute a well-marked genus distinct from any hitherto described. I have not been able to find it described in Boissier's 'Diagnoses Plantarum Orientalium,' and it does not occur among the sets of Persian *Umbelliferæ* from Aucher-Eloy's collection in the British Museum, or in the herbarium of Sir W. Hooker, although that traveller appears to have collected in or near the Asafœtida region.

I met with the plant growing wild in the valley of Astore, one of the subordinate valleys of the Indus behind Cashmeer, about the middle of September 1838, when returning from an exploratory journey into the Thibetan region of Central Asia. On showing the specimens to Jubbar Khan, the Dardoh Rajah of the country, he at once named it as the plant which yields the "Heeng," or Asafœtida of commerce. In the Dardoh or Dangree language (the Dardohs being the Daradri of Arrian), the plant is called "Sip" or "Sŭp;" and the young shoots of the stem in spring are highly prized as an excellent and delicate vegetable. Jubbar Khan was well-versed in the Persian language, and referred to the medicinal accounts of the plant given by the Persian and Arabic authors. The Dardohs, who are a wild and rude race, do not collect the gum-resin for exportation. The plant does not occur in great abundance in Astore, which appears to be the extreme point of the north-eastern range of the species. At different elevations of the same valley, or its branches, I found *Prangos pabularia*, two species of *Pyrola*, *Pinus Gerardiana*, together with species of *Bupleurum*, *Statice*, *Ribes*, *Podophyllum*, *Epipactis*, *Sambucus*, &c.

Like Kæmpfer, I have never seen the plant in flower; when I met with it, it was dried up and in ripe fruit, the leaves withered, and the stems damaged by cattle. I secured a quantity of the fruit-bearing umbels, and the withered stalks and leaves, among which there were some partial umbels of barren flowers with an occasional petal remaining. The account of the petals is in consequence given in the description with doubt. Some young roots were carefully removed and introduced, in the first instance into the Botanic Garden at Saharunpoor, and afterwards transferred to the subsidiary Hill Garden at the Himalayan Station of Mussooree. Some of these roots succeeded well, without however flowering, up to the period when I left India; one of them having furnished a small quantity of Asafœtida, which differed in no respect from the ordinary condition of the gum-resin as it occurs in commerce. This circumstance is mentioned in Dr. Royle's 'Productive Resources of India,' p. 223. These materials combined have furnished the description given above. I left a commission with Ahud Meerza, a native friend in Cashmeer, to procure for me the following season from Astore specimens of the plant in flower; this he was unable to accomplish, but he forwarded to me a large quantity of fresh seeds from the same locality, which reached me in December 1839, and were transmitted to the India House, whence they were distributed to several gardens by Dr. Royle. Some of these seeds, I have been informed, have been grown in the Botanical Garden at Edinburgh.

The evidence here adduced I believe to be conclusive as to the true plant which produces the "Heeng," or Asafœtida of commerce, the "Laser" of Pliny as distinguished from the ὀπὸς Κυρηναϊκὸς of the Greeks from Cyrene. The species would appear to occur in the greatest abundance in the provinces of Khorassan and Laar in Persia, and thence to extend, on the one hand, into the plains of Toorkestan upon the Oxus, north of the Hindoo Koosh mountains, where it seems to have been met with by Sir Alexander Burnes*; and on the other, to stretch across from Beloochistan, through Candahar and other provinces of Affghanistan, to the eastern side of the valley of the Indus, where it stops in Astore, and does not occur in great abundance. The whole of this region, which constitutes the head-quarters of the gum-bearing *Umbelliferæ*, possesses the common character of an excessively dry climate, indicated in Berghaus's Hygrometric map in Johnstone's 'Physical Atlas' by a belt of white. According to my observation, it does not extend into Cashmeer, although *Prangos pabularia*, which is associated with it in Astore, grows abundantly in that valley.

Besides the gum-resin, the fruit of *Narthex Asafœtida* is imported into India from Persia and Affghanistan, under the name of "Anjoodan," being extensively employed by the native physicians in India; Anjoodan being the epithet applied to the seed of the "Heengseh," or "Hulteet," by Avicenna, also quoted by Kæmpfer, and used by the Indo-Persian and Arabic writers generally in describing the Asafœtida plant. Another umbelliferous fruit is also imported with it, and sold under the name of "Doogoo," (a word evidently connected with the δαῦκος of the Greeks,) being recommended as an excellent substitute for "Anjoodan," which it closely resembles in its general appearance. This I found to be the fruit of a species of true *Ferula*; it is one of the two Asafœtida-like fruits mentioned by Dr. Royle as occurring in the bazaars of northern India, and may be that which furnished the account which Dr. Lindley, in the passage above quoted, has mixed up with his description of the Asafœtida plant of Kæmpfer. The following are the characters of this "Doogoo" seed, extracted from a description of bazaar specimens drawn up by me in the north of India:—"Mericarps broad elliptical or elliptical-obovate, somewhat convex in the middle, thin, with a dilated border, $3\frac{1}{2}$ to 5 lines long by $2\frac{1}{2}$ to 3 lines broad. Dorsal ridges 3, filiform, but slightly elevated, the lateral ridges less apparent, giving a thickened edge to the border. Dorsal vittæ about 4 in each channel, interrupted, branched and

* Burnes mentions the plant as an annual, probably in consequence of the annual decay of the stems. He states that sheep browse on the young shoots, which are considered to be very nutritious.—*Trav.* vol. ii. p. 243.

anastomosing; commissural vittæ about 10, more apart than those of the dorsum, the whole fruit turgid with milky juice, having a fœtid alliaceous odour resembling Asafœtida." The species of *Ferula* yielding this fruit may furnish some one of the obscurely-known gum-resins resembling Asafœtida produced in Persia: the observed odour in this instance is not conclusive, as the "Dooqoo" seed is imported from Affghanistan in the same packages with Asafœtida, the rank fœtor of which (hence quoted, among other synonyms, by Kæmpfer as a translation from the German, under the name of "Stercus Diaboli,") kills every less potent odour, and adheres with great tenacity to all light and spongy medicinal substances.

I have examined another kind of umbelliferous fruit in the collection of Dr. Royle, labelled as "the seed of the wild Asafœtida plant, collected and brought to England by Sir J. Macneill from Persia," which differs widely from the fruit both of *Narthex* and of *Ferula*, and belongs to another tribe of the order.

Having had no opportunity of observing the manner in which Asafœtida is procured from the roots of *Narthex,* I have nothing to remark upon the excellent and very copious account of the process given by Kæmpfer, which bears the strongest character of careful observation and fidelity of record. The small sample which I got at Saharunpoor was exuded from the top of the root without an incision.

XV. *Account of* Gamoplexis, *an undescribed Genus of Orchideous Plants.* *By* Hugh Falconer, *M.D., F.L.S. &c.*

Read February 2nd, 1847.

Ord. Nat. Orchideæ.

Trib. Gastrodiæ, *R. Br.*

Gamoplexis.

Char. Gen. *Perianthium* monophyllum, tubulosum, basi ventricosum, limbi breviter 6-lobi segmenta rotundata; exteriora æqualia; interiorum posticum, pedicelli torsione anticum, (labellare) lateralibus paulò majus cæteroquin consimile. *Columna* elongata, erecta, semiteres, marginato-dilatata, apice tridentata cava, basi anticè incrassata stigmatifera. *Anthera* terminalis, mobilis, decidua, carnosa, bilocularis, loculis parallelis contiguis. *Massæ pollinis* in utroque loculo solitariæ, e lobulis majusculis granulatis laxè cohærentibus conflatæ. *Glandula* aut *caudicula* nulla.

Herba *parasitica* (?), *aphylla, vaginata, rufescens, habitu* Orobanchem *quamdam omninò referens.* Rhizoma *hypogæum, tuberosum, annulatum, spongiosum.* Racemus *elongatus, multiflorus, primò nutans, demum erectus.* Flores *mediocres, erecti, pallidè stramineo-virides vel ochroleuci.*

Gamoplexis Orobanchoides (Falc. MSS. cit. in Royle, Illustrat. p. 364, et in Lindley, Genera and Spec. of Orchid. Plant. p. 384, absque charactere aut definitione.

Hab. In umbrosis humidis inter montes Emodenses ad altitudinem circiter 7000 pedum supra mare; *Dhunaultee, Tyne-Teeba, Simla,* &c. Floret Julio et Augusto.

Descr. Herba terrestris, tripedalis, omninò lævis, erecta, rigida, aphylla, vaginato-squamata, rufescens, ad arborum radices inter folia putrida passim obvia. Rhizoma hypogæum, tuberosum, ovoideo-oblongum, depressum, crebrè annulatum, annularum marginibus membranâ scariosâ lacerâ adpressâ (vaginarum rudimento) instructis, nunc fibrillis radicum alienarum suprà reticulatis et superficialiter accretis utrinque tectum, ideoque ut videtur parasiticum, longitudinaliter in humo stratum, ab alterâ extremitate gemmam scapigeram, ab alterâ viviparam (rhizomatiferam) proximâ messe in plantam evolvendam, proferens: fabricâ penitiore carnoso-spongiosum, medio laxissimè cellulosum, rimis et fissuris crebris a centro versus peripheriam tendentibus et e distentione inæquali orientibus, percursum, cellulis exterioribus materiâ amylaceâ infarctis; longitudine triunciale, crassitie sesquiunciam emetiens, anthesi peractâ marcescens; fibris radicalibus propriis omninò destitutum. Scapus solitarius, erectus, indivisus, cylindricus, glaberrimus, ferrugineus, solidus, basi digitum minimum, apice pennam cygneam crassus, basi vaginis 3–4 imbricatis obtectus. Squamæ vaginatæ adpressæ, ferrugineæ, raræ, limbo obtuso abbreviato scarioso in lacinias 2–3 lacerato, $\frac{3}{4}$–1 pollicem longæ, intervallis 6–8 pollicum segregatæ. Racemus cylindricus, rigidus, glaberrimus, multiflorus, primò recurvato-nutans, demum erectus, sub anthesi condensatus apice imbricatus, tandem fructifer elongatus, 8–12 pollices longus, $1\frac{1}{2}$ unciam crassus. Flores mediocres, ochroleuci, vel pallidè stramineo-virentes, suberecti, parum odori, pedicellati, bracteis solitariis suffulti. Bracteæ oblongo-spathulatæ, apice acutatæ, latâ basi sessiles, membranaceæ, ferrugineæ, patulæ, demum (marcescentes) involutæ, circiter 9 lineas emetientes et ovarium multò superantes. Pedicelli breves, crassi, glabri, torti, colorati, 2–3 lineas longi. Perianthium pedicellorum torsione resupinatum, cum ovario subcontinuum, et in ejusdem apice non contracto erectum, monophyllum, tubulosum, nudum, glabrum, persistens, marcescens, circiter 6 lineas longum 2–3 crassum; tubus cylindricus, basi a latere postico (vel labellari) leviter ventricosus, obscurè et inæquidistanter 12-striatus, limbi abbreviati 6-lobi patuli segmenta biserialia, inæqualia, antrorsum subsecunda; tria exteriora æqualia rotundata, colore et fabricâ tubo consimilia, diametro $1\frac{1}{2}$–2 lineas emetientia, basi contigua, sinu inter lateralia duplò profundiore; tria interiora antè et in sinus exteriorum inserta, tenuissimè membranacea, albicantia, inæqualia: lateralia minuta, orbiculata, undulata, diametro lineam vix attingentia, basi constricta, hinc per fasciam ligulatam haud elevatam et vix manifestam deorsum secus tubum decurrentia; segmentum posticum (vel labellare) duplò ferè majus, oblongo-rotundatum, demissius in tubo (ante sinum exteriorum lateralium profundiorem) insertum, circiter 2 lineas longum $1\frac{1}{2}$ latum, cæteroquin consimile: æstivatio imbricata, exteriorum lateralibus antico superimpositis. Columna in ovarii apice erecta, elongata, semiteres, medio leviter arcuata, ad latera marginato-dilatata, anticè longitudinaliter canaliculata, posticè convexa (salvis marginibus) clavata, apice tridentata, obliqua infundibuliformi-cava, dentibus inæqualibus: lateralibus (e marginibus productis excurrentibus) minoribus bidentatis, postico integro; basi incrassata stigmatifera, medio canali aperto percursa, 4 lineas longa, albida. Anthera terminalis, mobilis, decidua, carnosa, obliquè hemisphærica, anticè truncata, denti columnæ posteriori infra ejusdem apicem sulco dorsali affixa, sessilis, rostello obliquè decumbens et apice columnæ cavo semi-immersa, bilocularis: loculis subparallelis, distinctis, longitudinaliter dehiscentibus, valvulis exterioribus duplò majoribus. Massæ pollinis 2 (in utroque loculo solitariæ) granulatæ, e lobulis majusculis compositis angulatis laxè cohærentibus segregatim supra stigma dilabentibus conflatæ, pallidè stramineæ; granulæ ultimæ 4-ternatim aggregatæ. Ovarium obovato-turbinatum, angulis rotundatis obsoletè triquetrum, facie labellari subcomplanatum, crassum, pedicello duplò longius, ferrugineo-fuscum, circiter 4 lineas longum, constans segmentis 6 in serie unicâ collateralibus marginibus ad commissuram attenuatis: segmentis costalibus placentiferis duplò angustioribus; placentæ incrassatæ, extùs fasciâ olivaceâ manifestæ, multiovulatæ. Stigma basin columnæ occupans, ejusdemque faciei parallelum, constans superficie secernente viscidâ convexâ prominulâ circumscriptione ovatâ, medio verticaliter lineâ obscurâ bipartiente percursâ, basi marginibus columnæ confluentibus cinctâ, pallidè ferrugineâ, sursùm in fasciam discolorem ligulatam nec viscidam inter margines columnæ in rostellum excurrentem productâ: rostellum transversè oblongum, truncatum, prominulum, simplex, inter dentes columnæ laterales obliquè porrectum, subtùs callo incrassatum. Capsula coriacea, oblongo-ovoidea, turgida, circiter 8 lineas longa, 4–5 crassa, perianthii et columnæ reliquiis marcidis coronata, trivalvis, rimis 6 verticalibus fenestratim, ut solitò, dehiscens, costis segmentis placentiferis duplò angustioribus. Semina scobiformia, minutissima, numerosissima, integumento alato utrinque attenuato reticulato laxo obtecta.

This genus, named *Gamoplexis* from the cohesion of the perianth-segments, is casually noticed, from a communication in a letter, in Dr. Royle's 'Illustrations,' p. 364, and is thence inserted in Dr. Lindley's monograph on the order without a detailed character. It is allied both in habit and structure to the *Gastrodia* of Brown from New Holland, and to the *Epiphanes Javanica* of Blume, as described by that botanist; but it is sufficiently distinct from both in the cohesion of the labellar segment with the tube of the perianth; and constitutes the only example hitherto ascertained in the order, so far as I am aware, of the union of all the divisions of both whorls of the floral envelope into a monophyllous perianthium.

Gamoplexis appears to be a true parasite, but after a peculiar fashion, which disguises the habit. The tuberous rhizoma emits no root-fibres by which to fix itself on other plants, but is itself matted over by their slender rootlets, which ramify upon it in every direction, slightly imbedded in its surface, to which they adhere with great tenacity, especially to the scarious margins of the abortive sheath-annuli, giving rise to the appearance of the plant being the subject of a parasitical growth rather than a parasite itself. This I observed in numerous instances; but other cases occurred to me in which the surface of the tubers presented no appearance of the kind; and Unger, in his memoir on parasitical plants, affirms that no true instance of parasitical growth occurs among the Monocotyledones.

I have described the ovarium as consisting of six pieces, such being the apparent condition of the organ, without reference to any theoretical views regarding its numerical composition. Ordinarily, in the *Orchideæ* the placentiferous portions of the valves are brought more or less into apposition by their margins, which are overlapped by the costæ. In *Gamoplexis* the costal segments do not overlap, but are interposed between the placentiferous pieces, and in form they differ from the latter only in being narrower, and this in a less degree than is usual in the order.

Dr. Lindley, the latest systematic writer on the *Orchideæ*, comprises the genera allied to *Gastrodia* in a section of the tribe *Arethuseæ*; but the characters of the pollen-masses composed of largish angular lobules, and the basal stigma, together with the habit, seem sufficient to entitle them to the rank of a distinct tribe, as first suggested by Mr. R. Brown in his 'Prodromus.' The *Arethuseæ*, as now constituted by Dr. Lindley, appear to include a very heterogeneous assemblage of genera.

EXPLANATION OF TAB. XIII.

Fig. 1. A plant of *Gamoplexis orobanchoides,* reduced to half its natural size.

Fig. 2. A flower of the same.

Fig. 3. The tube of the perianthium slit open, and showing, *a.* the labellum; *b. b.* the lateral segments of the inner series; and *c. c. c.* the three segments of the outer series; all cohering.

Fig. 4. The column seen on its labellar face, showing the stigma and fallen pollen-grains.

Fig. 5. The column, seen laterally.

G. Jarman, Sc.

XVI. *On the Natural History, Anatomy and Development of the Oil Beetle,* Meloë, *more especially of* Meloë cicatricosus, *Leach. By* GEORGE NEWPORT, *F.R.S., F.L.S., Fellow of the Royal College of Surgeons, &c.*

FIRST MEMOIR.

The Natural History of MELOË.

Read November 18th, 1845.

THE babits and economy of the genus *Meloë* of Linnæus have constituted one of the most curious and difficult problems in the natural history of the *Articulata* that have remained unsolved to the present day. Although many most zealous naturalists have devoted much attention to these insects, which are of large size, and are found in abundance in our meadows throughout the spring and summer, no one has hitherto succeeded in tracing out the whole of their metamorphoses, or in gaining any satisfactory information respecting their general economy. Some of the older naturalists, Mouffet, Gœdart, Frisch, Geoffroy, DeGeer and Linnæus, and all modern observers, have described the perfect insects very accurately; and some of the former, Gœdart, Frisch and DeGeer, have even given detailed observations on the oviposition of the female, on the eggs, and on the early stage of the larva; but beyond this they have been unable to pursue their inquiries. No account whatever has been given of the adult larva, of the nymph, or of the first appearance of the perfect insect.

This blank in the natural history of an entire genus of our most common insects has arisen in part from the anomalous habits of the species, which seem to exist in the early periods of their life as parasites, and in the later as purely vegetable feeders. It has also in part arisen from the doubts that have repeatedly been expressed of the accuracy of the statements made by the three distinguished naturalists just mentioned respecting the earliest stage of the larva, and of the probability of the conclusions to which they seemed to lead, respecting so extraordinary a change in the economy of an insect as that of its passing from a life of parasitism to one of a totally opposite condition. But such indeed appears to be the fact; and the details of the observations I am about to communicate ought perhaps to teach us not to treat with contumely or doubt that which we are unable positively to disprove, however strange or anomalous any statements of direct observations may appear, or however incongruous they may seem to be with established facts, when such statements are made by observers of otherwise acknowledged credit.

It is now more than fifteen years ago since I first endeavoured to trace the changes of *Meloë*; but although I succeeded at that time, and through several following years, in observing the deposition of the eggs, and in obtaining the larvæ from them, and also in procuring the adult larva, the nymph, and the perfect insect before it left the cell in which it had undergone its metamorphoses, I have been unable to obtain the means, so satisfactorily as I could have wished, of showing the transitional forms which the larva assumes in passing from its earliest to its full-grown state. On this account I have forborne to make known the facts I have been for many years acquainted with respecting these insects. Fearing however that I may not again have an opportunity of pursuing this inquiry, I now propose to communicate these facts to the Linnean Society, in the hope that some naturalist, more fortunate than myself, may complete the investigation.

1. Of the Perfect Insect.

The species of *Meloë* that have been the subjects of my inquiry, are *Meloë proscarabæus*, *M. violaceus*, and *M. cicatricosus*, but more especially the latter, although the whole very closely resemble each other in form as well as in their habits and economy.

My observations have been made at intervals since the year 1830, on specimens obtained from a vertical bank of clay and sand that forms the south-eastern boundary of the ruins of the Roman castle at Richborough, near Sandwich in Kent, where these insects, at their proper season, are most abundant. The perfect insects come forth at that place very early in the spring, and sometimes, when the temperature of the atmosphere has become suddenly elevated for a few days, even long before the plants on which they feed are in flower. *Meloë proscarabœus* and *M. violaceus* usually make their first appearance at the end of March, but I have occasionally found the latter as early as the 8th of that month. They are in greatest abundance during the last ten days of March and the beginning of April. *M. cicatricosus* is from ten days to a fortnight later than the other species. In other localities I have not met with these insects quite so early, and there is reason to believe that the time of their coming forth is much influenced by the temperature of the atmosphere, and of the locality in which they undergo their transformations. Goedart* speaks of *M. proscarabœus* as occurring in the beginning of May; and this also is the period stated by DeGeer†, so that in the northern parts of Europe they come forth later than in this country.

When the Meloës first leave their cells they are feeble, move slowly, and have their bodies very small, shrivelled, and contracted. But when they have been feeding for a few days their bodies are greatly enlarged, and the abdomen of the female is expanded to more than twice its original length and diameter, owing to the immense quantity of ova within it in course of development. In *Meloë cicatricosus* it often measures nearly an inch and a half in length, and seems to be dragged along with much difficulty.

The favourite food of *Meloë* is the wild ranunculus, or buttercup, *Ranunculus acris*, more especially the blossoms, which it devours with avidity. *M. cicatricosus* feeds also on the leaves and flowers of the dandelion, *Taraxacum*. Goedart says they feed on the wood anemone. DeGeer found them eat the leaves of dandelion with eagerness, but they would not touch strawberry-leaves, grass, cow-cress, alchemilla, or wild chervil. When deprived for a few days of their proper food, and urged by hunger, they will sometimes nibble blades of grass, but they cannot subsist on it, and soon perish.

The Meloës are extremely fond of basking in the hot sunshine, and it is during the early and middle part of the day that they come most abroad and are most active. When confined in boxes, for the purpose of observing their habits, it is necessary to expose them much to the sun, and to supply them with an abundance of food. They then become as active as when abroad in the fields, and their proceedings are easily watched. They drink freely of water,

* Métamorphoses Naturelles, ou Histoire des Insectes. À la Haye, 1700, 12mo, tom. ii. p. 180.

† Mémoires pour l'Histoire des Insectes, tom. v. Mém. i. p. 3 *et seq.*

and not only require their food to be fresh-gathered, but also that it should be frequently wetted, otherwise they will not thrive. They pair during the forenoon and middle part of a very fine day, a few days after they have left their hybernacula. The males are exceedingly salacious, and traverse the fields with great rapidity in search of their partners. When the object of solicitude is discovered, the male salutes her on the thorax and body with his antennæ, and vibrating his palpi rapidly with delight, repeatedly touches her lightly on the upper part of the head and front with these organs, as if caressing her with great earnestness. The connubial intercourse often lasts from two to three hours, during which the antennæ of the female are clasped by those of her partner, and she continues to feed as if almost unconscious of his presence.

When the two sexes of different species of *Meloë* are confined together, an intercourse sometimes takes place between them; the male of *M. violaceus* with the female of *M. proscarabœus,* and *vice versâ*; and sometimes the male of one of these species with the female of *M. cicatricosus.* But I have never observed this aberration of instinct when the insects are at large in their native haunts, although it is well-known to occur between different species of another family, the *Telephoridæ.* The males are exceedingly pugnacious, and often fight and deprive each other of one of the antennæ.

The eggs are deposited a few days after impregnation; but when this has been retarded, oviposition may take place within a very few hours. An impregnated female, captured by Goedart on the 5th of May, did not deposit her eggs until the 12th, a period of seven days. But even this period may be greatly extended, as it is in part subject to the will of the insect. If there is no place in which the parent can deposit her eggs in safety, she will sometimes die without depositing them at all. Goedart* and DeGeer† have stated that the *Meloë* deposits her eggs in the earth, and the accuracy of this statement I have repeatedly confirmed. In the afternoon of the 6th of April 1830, I first observed a female *M. violaceus* busily employed in digging a hole beneath a turf of grass at the side of a dry footpath. At the time I discovered her she had penetrated to the depth of an inch in an inclined direction. In less than half an hour she had finished her excavation, and having

* Goed. Métamor., tome ii.

† DeGeer, Mém., tome v. pp. 8–12.

turned round, projected her body into it, and remained with her head just perceptible at the entrance. In this state she continued undisturbed for several hours; and when I again visited the spot I found the entrance closed up with earth, and the *Meloë* gone. On examining the hole I discovered within it a small packet of eggs. I then placed some earth and a turf of grass in my breeding-cage, in which I had confined several impregnated females. On the following day I observed a female *M. violaceus* in the act of digging a hole beneath the turf sufficiently large to admit of her turning round. The depth of the hole when finished was about two inches. When she had completed her labour, she projected her body into the hole as far as possible, and remained within it, with her head only exposed, for about two hours. During this time, as in the previous observation, the *Meloë* was in the act of oviposition. When she had completely disburthened herself she came forth, and raked the earth with her feet into the hole, until she had entirely closed the entrance. While thus employed she scratched with her claws, and moved backwards like a rabbit in its burrow, and frequently pulled down with the earth small fibres of the roots of grass, which I then supposed were intended to serve as food for the future larvæ, a supposition which was afterwards proved to be erroneous.

When the *Meloë* had completed her labour, I removed the turf, and found the eggs deposited beneath it in a large closely-packed heap. I then placed them in a tin box and covered them lightly with earth to watch their development. This was on the afternoon of the 8th of April 1830. Since that period I have had many opportunities of observing different species of *Meloë* deposit their eggs, which they always conceal in little burrows, excavated for the purpose among the roots of a turf of grass, in a dry soil, and seldom at a greater depth than two inches. Those specimens which I have seen at liberty in their native haunts have usually made their burrows near a dry footpath, or in some situation exposed to the sun.

Thus, by confining the sexes in a large box, partly filled with earth and a turf of grass, placed in the sun and well-supplied with food and water, I have been enabled to obtain an abundance of ova from every species for investigation, and from all of them little hexapod larvæ have invariably been developed in from three to five or six weeks, according to circumstances, which I shall presently explain.

When an unimpregnated female *Meloë* is confined without her partner, and is well-supplied with food, the ova are developed within her, and her body becomes more than usually enlarged, owing to the maturation of other ova besides those which are ready for fecundation. If this is still withheld, she will not deposit her eggs, but soon evinces symptoms of great anxiety, and ceases to feed. If the pairing of the sexes is not then consummated, she traverses her prison in a state of great excitement, examining every side of it, and trying to effect her escape. After a few days she becomes more quiet, and excavates her burrow, and like some Lepidoptera, deposits her eggs unimpregnated; but her instinct is then affected, and she leaves the burrow open, without covering the eggs with earth, after which she very soon dies.

When a female has been fecundated at the proper period, she always deposits two, and sometimes even three or four separate layings of eggs, at intervals of from one to two or three weeks. The first laying of eggs is always the most abundant. The number of eggs then deposited is at least three or four thousand. In order to ascertain the exact number produced by *M. proscarabæus* at her first laying, I removed the ovaries from a specimen that had been impregnated, and having divided one of these into several portions beneath the microscope, I counted the number of eggs in each portion separately, and found that the total number in one ovary amounted to two thousand one hundred and nine perfectly-formed eggs, all ready for exclusion; so that the two ovaries contained the astonishing number of four thousand two hundred and eighteen eggs. Perhaps it may be well here to state, that the eggs of *Meloë* are developed each in a separate ovisac, on the exterior of two uterus-like ovaries, or enlarged oviducts, into which they descend before they are impregnated. Nearly the whole of these are deposited at the first laying, their impregnation being effected from the orifice of the spermatheca, as they pass along the common oviduct near its outlet. When the matured egg has descended from its ovisac into the ovary, the mouth of the ovisac is again closed, and a new egg-germ immediately passes into the sac from the ovarial capsule attached to it; and this germ, when fully developed, constitutes the egg of the second laying. When this egg has passed into the ovary, another germ takes its place, and is the egg of the third laying, and so on with each development of ova. This explains the fact of the extreme enlargement of the body of the unimpregnated female, in which the first set of eggs have passed into the ovaries and are ready for fecundation while a second set are in the course of development in the ovisacs.

The number of eggs deposited at the second laying is always smaller than at the first, and at the third and subsequent ones smaller than at the second; since the great object of nature, the continuation of the species, being fulfilled in the first instance, the vital and functional powers of the animal begin immediately to decline. This occurs with both the sexes. The males soon disappear, and the females alone survive for a few weeks after pairing, which I believe takes place only once with each female. Those Meloës which are seen abroad after the end of April are almost always females, scattered solitarily over the fields, wandering in quest of food, or of a proper locality for the deposition of their eggs, after which they also perish.

The fecundity of *Meloë* is sometimes greater than that which I have already stated. On the 1st of May 1836 I captured a *M. proscarabæus* in the act of digging her burrow beneath grass at the side of a footpath. I placed her alone in a glass vessel filled with mould and a turf, and she soon began to excavate beneath it. Early on the morning of the 5th of May she deposited a moderate-sized packet of eggs, and at eleven o'clock came forth again to feed, with her body reduced to less than half its previous dimensions. She ate voraciously; and in less than four days her abdomen had again attained its former size, and she appeared as though she had not deposited any ova. On the 12th of May she deposited the second laying, and a few days afterwards a third, and on the 25th of May a fourth packet. On each occasion she formed her burrow beneath the grass, and always before leaving it covered her eggs completely with earth. This fact of four packets of eggs being deposited by the same individual within the short space of twenty-one days is exceedingly interesting, and most distinctly proves that one impregnation only is necessary to fecundate all the eggs a female may produce during her entire life, as in this instance there was no intercourse between the sexes. It is interesting also with reference to the rapid development of the germ. After each deposition of eggs the body of the insect was reduced to a small size, and she took food with great eagerness; but within a very few days it was enlarged again by the development of fresh ova, and was again reduced on the deposition of these preparatory to the maturation of others.

These observations coincide with those formerly made by Goedart *, who found that a specimen of *M. proscarabæus* confined in a vessel alone deposited a second packet of eggs at the end of twenty-one days, but the number produced on the second occasion was not so great as on the first. Goedart says that he counted in his first packet two thousand and six, but that he had reason to believe there were more than three thousand. On the second occasion he counted nine hundred and six larvæ, but he remarks that there were a vast many more which he was unable to reckon.

2. Of the Egg and Larva.

The eggs of all the species are similar in form and colour, and only differ a little in size. When first deposited they are about one-twentieth of an inch in length, very slightly conical, but obtuse at both ends, and of a bright orange. The shell is transparent, coriaceous, flexible, and exceedingly delicate. Although it is not my intention at the present moment to enter on a lengthened account of the internal structure of the ovum, and the evolution of the embryo, which I shall leave for a future part of this paper, I may here state that the contents of the egg are an orange-coloured yelk, composed as usual of distinct cells, and surrounded by a very small quantity of transparent, colourless albumen-like fluid. Near the middle of the unimpregnated egg, on the surface of the yelk, and projecting slightly from it, a small rounded body, the germinal vesicle, is distinctly visible. When the egg is impregnated, and is deposited in the earth, this vesicle has disappeared, preparatory to the commencement of organization. I am not certain whether the manner in which the eggs are arranged in the burrow may have any special reference to the development of the young, but it is worthy of remark, that they always lie parallel to each other, and adhere together at their sides, with one end directed to the entrance of the burrow.

The length of time that intervenes between the deposition of the egg and the appearance of the larva is subject to much variation. It seems to differ a little in different species, but in each depends much on the temperature of the

* Mém., tome ii. p. 180.

season. Goedart found the eggs of *M. proscarabæus*, deposited on the 12th of May, produce larvæ on the 23rd of June, a period of forty-three days; while DeGeer shows that eggs deposited by this species on the 18th of May produced young on the 19th of June, a period of only thirty-three days. In the packets of eggs watched by myself, I have found a much greater difference in the time of evolution. The first packet of eggs, obtained on the 8th of April 1830, and inclosed in a tin box on the window-sill of my chamber, were developed early on the morning of the 25th of May, a period of forty-seven days; while another packet, deposited by the same species, *M. violaceus*, on the 26th of April 1842, produced young on the 2nd of June, a period of thirty-three days. From other eggs deposited by *M. proscarabæus* on the 29th of April, the larvæ came forth on the 3rd of June, a period of only thirty-six days. In another instance, from a packet of eggs deposited on the evening of the 1st of May, some of the larvæ came forth on the 3rd of June, or at thirty-four days; while the greater number of them did not come forth until the 5th, and a few remained until the 6th. Those of another brood, deposited on the 30th of April, and placed under precisely the same circumstances in regard to locality and temperature as the last, also made their appearance on the 6th of June. On the other hand, larvæ were produced on the 14th of June from a packet of eggs that were deposited on the 24th of May, an interval of only twenty-one days. During this latter period the temperature of the atmosphere was very much higher than in the earlier part of May and April, and ranged from 70° Fahr. upwards. On the 13th of June, the day before the larvæ came forth, it was as high as 81° Fahr.

From these facts we may conclude that the average period of the egg is from four to five weeks; but that the evolution of the embryo is accelerated or retarded by the higher or lower temperature of the season.

When the embryo is fully developed, the egg-shell is burst at its largest extremity, and a little hexapod larva, an active, diminutive creature, that has long been the subject of discussion, gradually withdrawing from its fœtal envelopes, presents itself to view as the progeny of *Meloë*.

So exceedingly dissimilar in every respect is this microscopic and agile little being to its heavy-bodied, slow-moving parent, that we can hardly be surprised that those who have not actually witnessed its evolution from the egg of *Meloë*, should have somewhat doubted the accounts that have been given of it as the young of that insect. As I have many times witnessed the actual bursting of the egg-shell, and the coming forth of this little hexapod, perhaps it may be well, while adding my testimony to the fact, as already announced by other naturalists, to state the manner in which this is effected.

When the embryo larva is ready for its change, the egg-shell becomes thinned and concave on that side which covers the ventral surface of the body, but is much enlarged, and more convex on the dorsal, especially towards the head. The shell is then burst longitudinally along the middle of the thoracic segments, and the fissure is extended forwards to the head, which then, together with the thoracic segments, is partially forced through the opening, but is not at once entirely withdrawn. The antennæ, parts of the mouth, and legs, are still inclosed within separate envelopes, and retain the larva in this covering in the shell. Efforts are then made to detach the posterior segments of the body, which are gradually released, and with them the antennæ, palpi and legs, and the larva removes itself entirely from the shell and membranes. In this process of evolution the young *Meloë* throws off two distinct coverings:—first, the shell with its lining membrane, the analogue of the membrane in which, as I have elsewhere shown*, the young Myriapod is inclosed, and retained for several days, after the bursting of the ovum, and which represents in the Articulata, not the allantois, but apparently the amnion, of Vertebrata: next, the first, or fœtal deciduation of the tegument; analogous probably to the first change of skin in the Myriapod, after it has escaped from the amnion, and also to the first change which the young Arachnidan invariably undergoes a few days after it has left the egg, and before it can take food. This tegument, which, perhaps, may be analogous to the *vernix caseosa* of Vertebrata, thrown off at the instant of birth, is left by the young *Meloë* with the amnion in the shell; and its separation from the body at this early period seems necessary to fit the insect for the active life it has commenced.

The shell and membranes are so delicate, when the larva has removed from them, that their existence can hardly be detected by the naked eye, and even with a lens of low power they may readily be overlooked, and the ovum seem

* Phil. Trans., part 2, 1841, p. 111.

as if it were transformed directly into a larva, as was supposed by Zier* in regard to the eggs of the blister-fly, *Cantharis vesicatoria.*

The time occupied by the larva in escaping from the egg depends much on the degree of light to which it is exposed. If placed in a strong light it is much hastened; but if in perfect darkness it is greatly retarded. Soon after the larva is rid of its coverings it becomes very active. It is then of a bright yellow colour. It has a slender elongated body, composed of fourteen distinct segments, including the head and anal segment. Four of these constitute the head and trunk, and ten the abdomen. The head is short, broad and depressed, with its front rounded, and marked on its upper surface with a triangular suture, which terminates on each side at the insertion of the antennæ, anterior to the eyes. The antennæ are composed each of five joints; the first and second of which are broad and dilated, and the third, fourth and fifth very small and setaceous. The eyes are large, black, and rounded, and project from the sides of the head. The mouth is formed by a pair of very slender, pointed, and slightly-curved mandibles; a pair of short, thick maxillæ, each bearing an elongated three-jointed palpus, with the terminal joint slightly enlarged; and a narrow, elongated labium, slightly divided in the middle line, and bearing at each side a three-jointed palpus, shorter than that of the maxilla. The three segments that constitute the trunk or thorax are strong and powerful, for the attachment of the legs. The prothorax is wide, with its anterior margin nearly straight, and with its posterior angles rounded. The meso- and meta-thorax also are very large and nearly quadrate. The abdomen, composed of ten segments, is elongated, narrow, and slightly fusiform, with a short stiff hair at the lateral margin of each segment, and with the præanal segment terminated on each side with two elongated setæ. The anal segment, on its under surface, is developed into a pair of short prolegs, which are occasionally employed in walking or climbing, as in some other insects. The true legs of the insect are somewhat elongated. They are formed of a short strong coxa, which gives attachment to a broad femur, that articulates with a long, slender tibia. The tarsus is formed of three distinct, sharp-pointed claws, slightly curved at their apex, and especially adapted for clinging securely to any object.

* Bull. Sc. Nat., Jan. 1830.

This larva is extremely active in all its movements. It runs with great celerity, and then uses only its six true legs. But it can also climb up a nearly smooth and vertical surface, as for instance on glass, or can walk in a reversed position. In these movements it makes use of its anal prolegs. When walking in a reversed position it invariably uses these parts, which are employed in exactly the same way as by the *Iulidæ* and the larvæ of other insects. The body is moved along in the manner of the Geometridous caterpillars; the segments of the abdomen are first shortened and moved forward as far as possible, the prolegs are then attached, and the whole body is projected onwards by a measured step, or as it were a leap.

Such is the larva of *Meloë* immediately after it has left the egg. It then measures about one-twelfth of an inch in length. Thus my own observations, in so far as they relate to the evolution of this larva from the egg of *Meloë*, entirely agree with those originally made by Goedart*, and by DeGeer†, both of whom obtained this little hexapod from eggs deposited by *Meloë*, and both have given very precise details of the fact. Similar observations have since been made by Mr. E. Doubleday‡, Saint Fargeau and Serville§, Brandt and Erichson‖, and still more recently by the Rev. L. Jenyns¶; and yet in face of the direct statements of all these authorities, an acute entomologist of the present day, Mr. Westwood**, conceives himself "warranted" in coming to the conclusion, that this hexapod "cannot be the larva of *Meloë*." In support of this conclusion Mr. Westwood quotes some remarks on *Meloë* by Geoffroy††. But Geoffroy's remarks, respecting the larva of *Meloë*, are incorrect. They appear to have been made on the larva of *Timarcha tenebricosa*, which he seems to have mistaken for that of *Meloë*. Geoffroy says of the full-grown larva of *Meloë*, that it "ressemble beaucoup à l'animal parfait. Elle est de même couleur, grosse, lourde, n'ayant que la tête écailleuse et tout le reste du corps mol. On la trouve enfoncée dans la terre, où elle fait sa métamorphose." This is totally incorrect, in so far as it refers to *Meloë*, but is most accurate as regards the larva of *Timarcha*. Yet not only is this insisted on by Mr. Westwood, in

* Mém. tome ii. p. 181. † Mémoires, tome v. p. 8. ‡ Entom. Mag. vol. ii. p. 453.
§ Encyclop. vol. x. ‖ Nova Acta Acad. Nat. Curios. vol. xvi.
¶ Westwood's Introd. Mod. Classification of Insects, vol. i. p. 302. ** *Loc. cit.*
†† Hist. Nat. Ins. tome i. p. 377.

opposition to the views of three of the most distinguished naturalists, Latreille, Erichson and Brandt, but, entirely misunderstanding a communication made to him by myself respecting the full-grown larva, Mr. Westwood has stated that I have confirmed to him the observation of Geoffroy,—a statement that is quite erroneous. The full-grown larva, as I shall show, is utterly dissimilar to the perfect insect; it has not the scaly head, and it never acquires a black or dark colour, but is always, like the young larva, of a yellow or light orange. The dissimilarity of appearance of the adult larva and imago is as great as that of the full-grown larva and the very young.

It must be acknowledged however, that the very young insect is in every respect calculated to mislead those who have not watched its development from the egg. The structure of its organs of manducation, its prehensile tarsi, and its great activity of body, all seem to point it out as especially fitted, at this stage of its existence, for some peculiar mode of life, very different from that of its parent,—namely, a life of precarious parasitism.

3. Habits of the Larva.

The extreme interest attached to this inquiry has led me to endeavour to ascertain something respecting the habits of this insect. The eggs obtained in my earliest observations in April 1830 were hatched, as I have already stated, on the 25th of May. I saw most of the larvæ leave the egg as early as five o'clock in the morning. They were confined in the tin box for several days, during which time, the light being entirely excluded from them, they remained quiet, and seemed but little disposed to escape. But after remaining in confinement for ten or eleven days, during which the weather had become much warmer, many of them crept out from beneath the lid of the box and moved about with rapidity, agitating their palpi as they ran, as if in search of food. Within a day or two longer nearly the whole of them had removed from the interior of the box, and were distributed thickly over its exterior, and also on the sill of the window, on the side most exposed to the light. I then secured from three to four hundred of them in a phial, into which I put several living *Curculiones,* and a single specimen of *Malachius bipustulatus.* The Curculios remained in the phial undisturbed, but the young Meloës instantly attached themselves in such numbers to the *Malachius* as almost completely to cover it and deprive it of the power of moving, and most of them remained attached to it for many hours. It was thus evident that their habits are parasitical; but I was unable at that time to ascertain anything further respecting them, as most of them died at the end of a fortnight or three weeks. On the 13th of June, in the same year (1830), I captured a specimen of *Volucella mystacea*, on which I found a parasite that agreed in every respect of form, size, colour and activity with the hexapods I had then lately reared from the eggs of *Meloë*. On the 10th of July, in the preceding year (1829), I had taken a specimen of *Osmia spinulosa*, on which also I found a parasite precisely similar in form, size and activity to the larvæ from the eggs of *Meloë*, and also to that found on *Volucella*, and like which, it attached itself more especially to the posterior part of the thorax of its victim. It inserted its head deeply between the thorax and abdomen, and when removed with the point of a pin, returned with avidity to the same spot. But the specimen found on *Osmia spinulosa* differed entirely from the others in colour. It was deep black, with brown eyes. In this respect it closely agreed with the parasite found by the Rev. Mr. Kirby on *Andrena fuscata**, and regarded by him as distinct from the yellow larva described by Linnæus† and Fabricius as *Pediculus Apis*, and also by M. Leon Dufour‡, as lately as 1828, as a distinct genus of apterous insects, by the name of *Triungulinus Andrenetarum*. I have no doubt of the correctness of Mr. Kirby's opinion, that the larva found by him on *Andrena* was distinct from the yellow larva of *Meloë*, the *Pediculus Apis* of Fabricius; and I have little doubt also of its identity with that taken by myself on *Osmia spinulosa* §. These certainly are not the larvæ of either

* Monog. Ap. Ang. vol. ii. p. 168.

† Systema Naturæ, vol. ii. edit. 12, Holmiæ, 1767, no. 40. p. 1020. Linnæus refers to Frisch's (Ins. fasc. 8. tab. 16) species, the colour of which is the same as that of the larvæ bred from the eggs of *Meloë*.

‡ Annales des Sc. Nat. 1828.

§ Mr. Frederick Smith, who has paid much attention to the Hymenoptera, and has given several valuable papers on the British Bees (Zoologist, 1843, 1844 and 1845), informs me that he has frequently met with these hexapods on the *Andrenidæ* and on the *Nomadæ*, as well as on the dipterous genus *Volucella*. All the specimens he has found on the *Andrenidæ* have been black, like Mr. Kirby's species, and he has not met with a single yellow one on any species of that family. On the contrary, all the specimens he has found on the *Nomadæ* and *Volucellæ* have been yellow, like the larvæ of *Meloë*. This was the colour of the specimens described by Reaumur, Fabricius, Olivier, &c. Baron Walckenaer of the Meloës I have examined, although I am equally satisfied that they are the larvæ of some genus of the same family*. The larvæ I have reared from the eggs of *Meloë violaceus, M. proscarabæus* and *M. cicatricosus* have always so exactly resembled each other in their yellow colour and in form, that I have been unable to distinguish them, excepting by a slight difference in size. The larvæ of *M. cicatricosus* are a little larger than those of the other species. I may also state, that these larvæ always retain their yellow colour, and only become a little darker after they have been several days from the egg. These facts seem to identify the true larvæ of *Meloë* with the yellow hexapods taken on dipterous and hymenopterous insects. DeGeer† found them on a specimen of *Musca intricaria,* L., and on comparing those which he had reared from the egg with those taken on the fly, he could perceive no difference between them. Reaumur also captured one on the body of an Apiform *Musca,* which he has figured and described‡, and which agrees precisely in every respect with the young *Meloë*; and Mr. Kirby § remarks that these hexapods are not uncommon upon the bodies of the *Andrenidæ,* that he has found fourteen or fifteen upon the same individual, and that he has also met with them on the genuine *Apidæ.* I have fully satisfied myself of the correctness of this statement by experiment with specimens reared in 1836. I placed a female *Eucera longicornis* in a small phial with a brood of these larvæ, and it was instantly attacked by them. This identical specimen, preserved in spirit, with the larvæ attached to it, I have now the pleasure of exhibiting to the Society. It is astonishing to observe with what celerity they attach themselves to their victim the instant any part of its body is within reach; and with what tenacity they adhere to it, seizing it by the leg, the wing, or the

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also (Mémoires pour serv. à l'Hist. nat. des Abeilles solitaires qui composent le genre Halicte, Paris, 1817, pp. 85–87) describes a specimen of a yellow colour found on *Halictus Elephas*; and he remarks, that it differs from that of Mr. Kirby in having the exterior of the caudal setæ on each side longer than the interior, in which respect his species seems to differ also from the larvæ of *M. violaceus* and *M. proscarabæus.*

* The larva of *Cantharis vesicatoria* is described by M. Zier as very like that of *Meloë.* He says that it is of a yellow colour when it leaves the egg, but soon afterwards changes to deep black. Perhaps the larvæ described by Mr. Kirby, and that found by myself on *Osmia,* may be more nearly allied to this insect.

† *Loc. cit.* ‡ Mémoires, tome iv. Mém. ii. p. 490. tab. 31. fig. 17. § *Loc. cit.* p. 168.

under surface of the thorax, or by the hairs of its body; mounting in crowds upon its thorax, and adhering thickly around the insertion of its legs, between the head and corselet, the thorax and abdomen, and on its under surface; evidently exciting the greatest possible uneasiness to the fated insect, as indicated by its constant but fruitless endeavours to detach them from its body. Indeed, as DeGeer naively remarks*, "On peut bien s'imaginer, qu'une mouche, chargée de tant d'ennemis, ne devoit pas être à son aise; aussi fit-elle tout son possible pour s'en débarrasser, frottant sans cesse les pattes tantôt contre le corps et tantôt les unes contre les autres; mais tous ses efforts furent inutiles, aucune de ces larves ne voulant lacher prise." But when the death of the victim occurred, these larvæ, like all other parasites, immediately left it.

The parasitic habit of *Meloë*, in its earliest stage, being thus established, we have now to ascertain what is its immediate object. Whether, is it to procure food at once from the body of its victim; or is it that the larva may be conveyed to a proper locality, in which it is to find means of support and development? I am greatly inclined to this latter view, which the details I have presently to communicate respecting the full-grown larva and the pupa will not only show is most consistent with the known habits of the imago, but will also tend to reconcile the facts respecting the parasitism of the larva with the imperfect accounts that have been given by Frisch and Geoffroy.

We have seen that the eggs of *Meloë* are deposited at the roots of grass in situations exposed to the sun; and that the larvæ are often found on the bodies of those hymenopterous insects which burrow into the earth, or perforate hard banks of clay or sand to form nidi for their young; and that they are also found on dipterous insects which frequent the nests of those very Hymenoptera as parasites. In this way the young *Meloë* may be carried, either by the parent bee, or by its parasitic enemy, into the nest where it is to be nourished, either with food prepared for, or on the bee-larva itself. This seems proved by the fact, that I have discovered the full-grown larva in the nest of *Anthophora retusa*. All the Hymenoptera on which the Meloës have been found burrow in sandy or clayey soils; and I believe all the Diptera on which they have been taken are parasitic in the nests of the Hymenoptera. Of the former, there are the *Andrenidæ*, the *Euceræ*, the *Osmiæ*, *Anthophoræ* and

* Mém. tome v. p. 11.

Bombi; and among the latter the bee-formed *Volucellæ*. Now it is easy to conceive that the young Meloës, attracted as they always are by light, ascend the stems, and repose in the calyces of flowers, and attach themselves to the bee when it alights to collect honey or pollen, or to its dipterous parasite. I am strongly inclined to believe that this is in reality the way in which they get access to the bees, as I remember to have once observed, on a hot sunny day, a vast number of minute yellow hexapods, very similar to those of *Meloë*, lying quietly between the petals of the flower of the dandelion, but which were instantly in motion as soon as the flower was touched.

I have stated that the young Meloës are quickly aroused to activity by exposure to light. When first developed from the egg in the earth, they remain for a time collected together in a heap, and, as already shown, if entirely excluded from light, they will remain undisturbed for several days. But they are aroused to immediate activity the instant they have escaped from the egg, by the presence of light, and begin to separate and disperse in a direction towards it. Light indeed seems to be their great stimulus to active existence, as there is reason to believe it is the great awakener of the first instinctive act of volition in the newly-born young of all the *Articulata*, and probably also of the whole animal creation. A marked instance of its direct influence in arousing the voluntary powers of a young *Iulus*, that had just escaped from its fœtal coverings, was formerly pointed out by myself in a paper in the 'Transactions of the Royal Society*,' and similar effects are produced by it in the young *Meloë*. The marked influence of light on these diminutive beings has constantly excited my admiration whenever I have succeeded in obtaining them from the egg; and on every occasion it has produced similar effects. I have usually confined my young Meloës in a corked phial placed in the window of my apartment. In the morning and through the early part of the day they are in a state of constant activity, distributed over the whole interior of the upper part of the phial; but in the afternoon, in proportion as the light is diminished, they become more and more inactive, and at length perfectly quiet, collected together in a heap, clustering like bees at that side of the upper part of the phial that is most exposed to light. In order fully to satisfy myself that it is indeed the stimulus of light which

* Phil. Trans. part ii. 1841, p. 118.

seems so completely to influence their movements, I have frequently inverted the phial that contained them, so that they were then at the bottom. Instantly the whole were in motion, travelling in haste perpendicularly up the sides of the phial to that part which was then the top, and most exposed to light. I have then placed the phial in a horizontal position, with that end of it in which the larvæ were collected furthest removed from the light, and again the whole were travelling rapidly towards it at the opposite end of the phial. In this way they can at any time be aroused to a state of great activity, especially if the light to which they are exposed is intense, whether it be artificial or bright sunlight. That it is light which acts thus powerfully upon them seems to be proved by the circumstance that, if the stopper be removed from the mouth of the phial when they are collected around it, and the phial be then placed in a horizontal position with its closed end to the light, the larvæ do not attempt to escape through the opened mouth, although nearest to it, but instantly travel in the opposite direction towards the light. Thus the unerring influence of a great physical cause, that arouses the instinct of the newly-developed being, seems to be clearly indicated in the effects of light upon these Meloës. These effects I may perhaps be allowed to designate, —the polarization of Instinct.

The influence which light produces on the instinct of the young Meloës accords with their presumed ascent on the bright-coloured flowers of the dandelion and buttercup, preparatory to their attaching themselves to the Hymenoptera that visit these flowers to collect pollen. Every circumstance we are acquainted with respecting the Meloës seems to confirm us in this view of their habits. Their extremely diminutive form, their lightness and activity of body, the celerity with which they attach themselves, and the pertinacity with which they adhere to the objects within their reach, and their extreme susceptibility of external influences,—all coincide to prove their parasitic nature. They seem indeed in every respect most fitted and designed, by the Great Author of their being, to attach themselves securely to their victims, and be wafted about from flower to flower on the bodies of other insects, in the full joyousness of open daylight, while being conveyed to the proper locality for their development. This, doubtless, is the instinct that urges them to attach themselves to the *Hymenoptera*, to be carried to the nests that are stored with food; and a similar impulse leads them to cling to those *Diptera* which frequent the nests of the bees as parasites.

But although every circumstance has tended to prove the correctness of this view, which seems confirmed by the fact, that I have repeatedly obtained the adult larva, and the nymph or pupa of one species, *Meloë cicatricosus*, from among the nests of *Anthophora retusa,* I have endeavoured to ascertain whether the young Meloë is a parasite on the bee-maggot itself, or whether it is nourished with the pollen stored up as food for the young bee? With this object in view, in June 1842 I took with me to Richborough, where I had obtained the full-grown larva and nymph, an abundance of larvæ recently developed from the eggs of *Meloë violaceus* and *Meloë proscarabœus.* Previously to making any trial with these specimens in the nests of *Anthophora*, I had placed a few in the cells of a piece of old honeycomb, and found that, contrary to their usual habit of wandering, they remained perfectly quiet at the bottom of the cells. From this circumstance I hoped to succeed with them in the cells of *Anthophora.*

The specimens taken with me to Richborough came from the egg on the 14th of June. On the 23rd of the same month, at midday, when the temperature of the atmosphere was 69° Fahr., I placed some of these young Meloës in nests of *Anthophora retusa*, which contained each a bee-maggot, and a large quantity of pollen paste, its proper food. The Meloës at that time had been nine days from the egg, but were perfectly healthy and active, although they had not taken any nourishment. At first I believed that the experiment had succeeded, as one of the specimens began immediately to attempt to pierce the skin of the bee-larva with its mandibles, and, as I then supposed, was feeding on its juices. But closer examination soon occasioned me to doubt that the larvæ of *Anthophora* are the proper food of the species with which I was making the experiment. In order further to assure myself of the truth, I put several larvæ of *Meloë* into the cells of *Anthophora*, and left them for further examination. On the following day I again visited the spot, but could not discover a single larva of *Meloë* in the nests in which I had placed them. The larvæ of *Anthophora* were still there, with their cells stored with food, but the Meloës were gone.

To ascertain more decidedly whether the young *Meloë* is parasitic on the body of the bee-larva, I selected three specimens of larvæ of *Anthophora* of different sizes and ages, and having placed each in a separate glass tube, included with them in each tube five or six of the larvæ of *Meloë*. At first the Meloës collected on the body of the bee-larva, and appeared as if inclined to feed upon it; but having left the tubes undisturbed for the night, I found at the expiration of eighteen hours that the Meloës were removed from the larva, and collected together as usual at the upper part of the tube. At the expiration of forty-two hours they remained in the same state, so that the only conclusion I was enabled to arrive at was, that the larvæ of *Meloë violaceus* and *Meloë proscarabœus* are not parasitic on the half- or full-grown larva of *Anthophora retusa*. Yet from the circumstance of their always attacking the larvæ in these experiments, there seems reason to suspect that they may prey on the very young of some species of bee, soon after it has left the egg, although not in its advanced growth. It was unfortunate, that at the time of making these observations I had not any young larvæ of *Meloë cicatricosus*, the species which I have constantly found in the full-grown larva state, as well as in that of the nymph, and of the recently-developed perfect insect, in the same bank with, and amongst the nests of *Anthophora*, and I have not since had any opportunity of pursuing my researches with the young of that species. I ought here to state, that although I have for several years past obtained *Meloë cicatricosus* in all its stages from localities crowded with the nests of *Anthophora*, I have never obtained either *M. violaceus* or *M. proscarabœus* from the same spot, although the whole of these species are very common in their perfect state in the meadows immediately adjoining the bank in which I have found *M. cicatricosus* and the *Anthophoræ*. The conclusion therefore which seems to be indicated is, that although the whole of the species of *Meloë* reside as parasites in their larva state in the nests of *Hymenoptera*, only *M. cicatricosus* is parasitic on *Anthophora retusa*. The great length of time which the larvæ of all the species can live without taking food after they have left the egg, is indicative of a precarious mode of existence. Most of the specimens I have reared have lived from fifteen to twenty days after coming from the egg, and during that period have not much increased in size, but have died, apparently from want of proper nourishment.

Although I have not traced the young larva of *Meloë cicatricosus* directly into the nest of *Anthophora*, I will now endeavour to prove that that is the locality in which it resides as a parasite, and where it undergoes its development; and also, that its rate of growth is as rapid as its change of form is extraordinary. I have already stated that the perfect insect is most abundant about the middle of April, and deposits its eggs towards the latter end of that month, or in the beginning of May; that the eggs are hatched in from three to five weeks, according to the temperature of the season; and that the larvæ come forth at the end of May, or in the beginning of June. This is the period when the *Anthophoræ* are most busily employed in constructing and storing their nests, in places that are constantly exposed to the sun, and when many of their eggs are already hatched. I have little doubt that it is at this period that the *Meloë* attaches itself to the parent bee when she alights on the flowers for pollen, and is conveyed by her into her nest while storing it with food, as suggested by Latreille. The growth of the bee-maggot itself at this period of the year is exceedingly rapid; and this rapidity is owing as much to the very high temperature of its cell—(which I have elsewhere* shown sometimes exceeds 80° Fahr.), and also to the powerful influence of the light of the morning and midday sun, to which the banks where the nests are constructed are exposed,—as to its nutritious food. Like circumstances appear to hasten the growth of the larvæ of *Meloë*. The full-grown bee-larvæ are found in abundance in the month of July, and many of them have already changed to nymphs by the beginning of August. It is at this period that I have obtained many full-grown larvæ of *Meloë* in cells surrounded by those of *Anthophora*. From these facts it is fair to conclude that those Meloës which are developed from the first laying of eggs arrive at their full growth within a very few weeks, as I have invariably found the full-grown larvæ by the middle of August, at which time also, like the *Anthophoræ*, many have already changed to the state of nymphs. The shortness of the period which seems thus to be occupied in the larva state, and the consequent rapidity of the almost total change of form which it undergoes, may in part account for the circumstance that the full-grown larva has hitherto so entirely escaped the observations of naturalists.

After many fruitless attempts, through twelve years, to find specimens of the larva of *Meloë* in a stage intermediate between the very young and the adult form, I had almost despaired of success, until, in the present autumn, in October last, on visiting the same bank at Richborough from which I have

* Phil. Trans. part 2, 1837, tab. 3. p. 279.

repeatedly obtained the adult larva, I discovered three specimens of the larva of a coleopterous insect in a cell that contained also the living nymph of *Anthophora retusa.* These specimens differ so much in their general appearance from the adult form of the larva of *Meloë*, that I have doubted whether they are not the young of some other insect. On close inspection however they present certain marked peculiarities which seem to identify them with the other stages of *Meloë.* These specimens are still living, and I have now the pleasure of exhibiting one of them to the Society. They are short, fat, but rather active larvæ, of a yellowish-white colour, with the head and organs of nutrition corneous, and of a brownish hue. They resemble the earlier state of *Meloë* in the general contour of the head, and in the peculiar form of the antennæ, the middle joint of which is enlarged and club-shaped, while the two terminal joints are very slender, and end in an acute point. The parts of the mouth also present great similitudes. The mandibles are acute, but are much shortened, and more resemble those of a vegetable-feeding insect. The maxillæ and palpi are very like those of the young *Meloë*, while the labium presents the same deep emargination as in the earliest stage of that insect. The caudal appendages also exist, but are shortened, and are evidently about to disappear. On the other hand, the whole general form of the larva is different, and more resembles that which the *Meloë* assumes when full-grown. The thorax is rounded in front and dilated at its sides, and there is no division of the body into trunk and abdomen, the whole of the segments having assumed one general appearance, those of the posterior part of the body being most enlarged. The legs are considerably shortened, and have not the tarsal spines, the two lateral portions of the claw.

As I have not yet reared the adult larva of *Meloë* from this state, I will not describe it positively as the young of that insect, although I suspect that such is the fact. I am quite satisfied that *these* larvæ, although found in a cell with the nymph of *Anthophora*, are not parasitic on the insect itself. In the short time I have yet had to notice their habits, I have convinced myself that they do not attack the bee-nymph, but only conceal themselves beneath it. They seem now to feed on the debris that the larva had passed from its body before changing to a nymph. I have no doubt that their proper food is the pollen-paste stored up for the bee-larva. If these specimens should ultimately prove to be the young of *Meloë*, this will explain what has hitherto been regarded as a singular anomaly in the supposed parasitic habits of the insect, and show that, although it resides as a parasite in the nest of another insect, its food is constantly of a vegetable nature*. *Meloë cicatricosus* is most certainly parasitic in the nest of *Anthophora retusa*; as the Rev. Lansdown Guilding† has already shown that the larva of another genus, *Horia maculata*, is on the carpenter-bee of the West Indies, *Xylocopa Teredo*.

I have now only to show the remaining states of *Meloë*. Geoffroy‡, as I have already shown, has stated, that the larva of *Meloë* resembles the perfect insect; that it is of the same colour, is fat, sluggish, has the head scaly, and the rest of the body soft, and that it is buried in the earth, where it undergoes its metamorphoses. This description of the larva so little agrees with the specimens I have obtained, and know to be the larvæ of *Meloë cicatricosus*, that I am satisfied Geoffroy must have confounded this with some other species. Frisch § was better informed. He represents the larva as undergoing "several changes of skin, in the last of which it acquires its wing-shaped cases." He also states, "that it remains during the winter in clayey earth, where no humidity can reach it, and that it comes forth in the month of May." This account of the latter changes of *Meloë* is correct. The larva of *Meloë cicatricosus* certainly undergoes several changes of skin, in the last of which, previously to entering the nymph state, it is a thick, fat, heavy, inanimate, and almost completely apodal maggot, of a light orange colour, pent up in its cell in the dry bank of clay or sand amongst the nests of *Anthophora*. It has entirely thrown off its caudal appendages, its setæform antennæ, and its elongated legs. In place of the latter it retains only six short tubercles on the under surface of the anterior segments. I have found it in this state in considerable numbers in the clay-bank at Richborough, in the months of August and September, in the years 1832, 1834, 1842, and during the present autumn. It is always concealed in a closed cell, in those parts of the bank in which the bees' nests are most numerous and crowded together. Although its cell is nearly of the same size as that of *Anthophora*, and seems to have been originally formed by that insect, it is not then a smooth oval

* These larvæ proved afterwards to be those of *Cryptophagus cellaris*, Payk.—See next memoir.

† Trans. Linn. Soc. vol. xiv. p. 316.

‡ Hist. Ins. tome i. p. 377.

§ Insect. fasc. 8. tab. 16; 1728? and as quoted in Swainson and Shuckard's 'History and Natural Arrangement of Insects,' Cabinet Cyclopæd. 1840, p. 328.

cavity, like the cell of the bee; but it is somewhat more elongated, and is a little irregular in its interior, as if altered by the larva before its previous change of skin. The larva then measures three-quarters of an inch in length. It is composed, as in each of its preceding stages, of fourteen segments, and has ten pairs of spiracles. It is of a semilunar form, with the sides of its body thinned and dilated. It has a small head, with short tuberculiform antennæ, palpi and legs. The tegument thrown off at its previous change of skin, —up to which time it seems to continue in an active state,—always remains partially adhering to the inferior and posterior surface of its body. On removing this tegument and relaxing it in water, and then examining it with the microscope, I have obtained good evidence that the larva in all its preceding states is an active creature, furnished, as in the state in which I have found the larva just described, in the cell of the bee-nymph, with strong, toothed, and slightly obtuse mandibles. Up to the period of change to the almost apodal larva it retains its three pairs of short scaly feet, each formed of a coxa, femur, tibia, and tarsus, terminated by a single, short, but strong claw, the lateral divisions, or tarsal spines, having been entirely lost. These circumstances lead us to further inquiry respecting the early habits of this anomalous creature. Does it remain constantly in the same nest of *Anthophora*? or is it erratic, and accustomed to penetrate into different nests for food, and at last remain in one to undergo its transformations? The hard structure of its mandibles and claws seems to indicate some such habit.

Such is the larva of *Meloë*. The length of time it remains in its helpless and apodal state is not many days. It then changes to a nymph, without entirely throwing off the larva-skin, which is simply fissured along the dorsal surface of the thoracic segments, and detached from the body. It remains inclosed in this skin, like a corpse in its shroud, up to the time when it assumes the imago state, by throwing off a very thin pellicle. This takes place within ten days or a fortnight after the larva has become a nymph; but if the season is unfavourable, the period of this completion of its changes is retarded. It remains in its cell through the autumn and succeeding winter as a perfect insect, in a state of hybernation, until it is aroused into activity by the gradually increasing influence of the season, and leaves its nidus early in the following spring.

XVII. *The Natural History, Anatomy, and Development of* Meloë (*continued*).

By George Newport, *Esq., F.R.S., F.L.S. &c. &c.*

Second Memoir.

The History and General Anatomy of Meloë, *and its Affinities, compared with those of the* Strepsiptera *and* Anoplura, *with reference to the connexion which exists between Structure, Function, and Instinct.*

Read January 19th, 1847.

In the memoir on *Meloë* which I had the honour of communicating to this Society in November 1845, I endeavoured to trace the natural history of the genus. Hereafter I propose to enter fully on the anatomy of the species, in the larva, nymph, and imago states, and to compare it, so far as we are able, with that of allied genera.

On the present occasion, before entering on the details of special structure, I shall endeavour to show that structure and instinct are closely associated; that the whole of those groups of insects which are most nearly allied to the Meloës in general organization are also very similar to them in their habits and economy; and that, in their larva state, they have many analogies with the *Anoplura*, and with the *Strepsiptera*, the history of which I shall trace, to compare with that of *Meloë*. In those insects in which the general form of body, or of any important organ, is markedly different from the type we are considering, we always find that there are corresponding differences in the economy of the species. When the entire organism of a structure is modified, then the functions of that structure, and the habits of the species associated with it, are in some respects completely changed. But when a structure is simply hypertrophied, or atrophied, then that particular instinct, of which it is the agent, continues to be more or less strongly characteristic of the animal.

This law of accordance between structure and function is universal throughout the organized world; and it is especially marked in the whole of the hexapod *Articulata*. I shall attempt to exemplify its prevalence, and to show the connexion of particular instincts with peculiarities of structure, by comparing the general anatomy of the Meloës with the facts of their natural history, and these with corresponding facts of structure and habit in other insects.

In this way applied, the truths of natural history may be rendered invaluable to science, as data on which a correct knowledge of the laws of creation and life may be established. I would thus attempt to bring our acquaintance with the habits of species, when compared with their organization, to help us to understand the nature of Instinct; as I have heretofore* endeavoured to apply the laws of physiology to aid us in understanding the comparative anatomy of the nervous system of the *Articulata*, and, through this, to assist in explaining that of our own bodies. Natural history, which has often been regarded as little other than merely a pleasing pursuit, may thus be made to occupy its proper position as an important branch of useful knowledge, and mainly help to demonstrate the connexion which subsists between structure and function, and function and the instincts of animals.

Of the Larva.

We have seen in the former memoir that the larvæ of the Meloës are active little hexapods, of very diminutive size, and that they attach themselves parasitically to the bodies of other insects, chiefly *Hymenoptera*. This remarkable fact in the economy of the tribe is one of the greatest importance, not only with reference to the development of these insects, but also to that of the whole of the *Articulata*, in connexion with the general laws of organization; since there are still naturalists who cling to the opinion, that the diminutive hexapods found on the bodies of the *Hymenoptera* are not the young of *Meloë*, but are adult parasitic forms. Leon Dufour, as we have seen, in 1828, even described them as a distinct genus, by the name of *Triungulinus*, and arranged them with the *Pediculi*†. Mr. Westwood ‡, ten years afterwards, adopted the same view, which he has not hitherto repudiated; and the same has again

* Phil. Trans. 1832, 1834, 1843. Todd's Cyclop. Anatom. and Physiology, Art. "Insecta," 1839.

† Annales des Scien. Nat. 1828.

‡ Introduction, &c. vol. i. 1839, p. 303.

been advanced, so recently as 1844, by M. Gervais*. This error has arisen from these able naturalists entirely overlooking the principles of development, and from their being misled by the great similarity of structure which exists between these young Meloës and the adult parasites of vertebrated animals, the *Pediculi* and *Nirmi*. These parasitic *Aptera*, properly regarded, are inferior or larval types of *Articulata*, in which organization is not carried beyond that stage at which the *Meloë* escapes from the egg, and are not essential, or true imago insect forms.

It is necessary therefore that we should first show to what species and genera of true insects this parasitic type of organization in the larva state belongs, and then endeavour to ascertain what general relations its peculiarities of structure bear, in whole or in part, to the habits of the individual species. This form of larva is not restricted to the genus *Meloë*. The larva of the common blister-fly, *Lytta vesicatoria*, as most accurately figured by Brandt†, is almost identical in form with that of *Meloë*, the chief structural difference being that *Lytta* has only one instead of two pairs of caudal setæ. *Lytta* however differs in colour. When it comes from the egg it is at first yellow, like *Meloë*, but quickly assumes a darker hue, and soon afterwards a deep black, excepting only on the first abdominal, and the meso- and metathoracic segments, which are yellow, with a dark patch on each side of the two latter. The larvæ of *Meloë cicatricosus*, *M. proscarabœus* and *M. violaceus* never acquire this darkened colour, but are always of a yellow or light orange. The larva found by Mr. Kirby on *Andrena fuscata*, and described by him as *Pediculus Melittæ*‡, and by myself on *Osmia spinulosa*, resembled the yellow larvæ of *Meloë* in almost every particular excepting in colour; and Mr. F. Smith, to whom I have referred in my former paper, has, as I have there stated, taken similar black larvæ in great profusion on the *Andrenidæ*, especially on *Andrena fuscata*, captured in the spring on Hampstead Heath, where different species of the adult Meloës are often abundant. In April 1841 he found similar black larvæ in such profusion within the flowers of the buttercup

* Nouv. Suites à Buffon, Aptères, tome iii. 1844, p. 360.

† Brandt und Ratzeburg, Darstell. und Beschr. der Thiere, Berlin, p. 129, pl. 19.

‡ Monographia Apum Angl. vol. ii. p. 168.

(*Ranunculus acris*, L.), in a damp field at Bishop's wood, Hampstead, that he might have collected thousands of them, there being often as many as twenty specimens in the corolla of a single flower*. But he never found a yellow-coloured specimen on any of the *Andrenidæ*. Like myself, he has taken the yellow-coloured ones on *Volucella*, the dipterous parasite of the nests of *Bombi*; on the *Nomadæ*, themselves parasitic on other bees, chiefly *Eucera*, *Andrena* and *Colletes*†, and also on the *Halicti*. It was on these genera that yellow-coloured larvæ were found by Gœdart‡, Frisch§, Reaumur‖, DeGeer¶, Walckenaer** and De Tigny††. Latreille‡‡, when speaking of those described by DeGeer, says, that he has himself many times met with these larvæ crowded together on grass; at the roots of which, as I have already shown, the *Meloë* always deposits her eggs, and the young, quickly after they are hatched, ascend from thence into the flowers of the *Ranunculus* and *Taraxacum*, in which I have myself detected them.

On examining the *black-coloured* specimens, which Mr. Smith obtained from the *Andrenidæ*, I have found that they are perfectly distinct from those which I know are produced from the eggs of the three species of *Meloë* already mentioned. They are of larger size, and are of a deep jet-black colour, excepting only the legs, which are dark testaceous. Thus they are identical in character with the supposed *Pediculus Melittæ*, taken by Mr. Kirby also on *Andrena*. They approach closely in general appearance to the yellow specimens found on *Nomada*, which I am satisfied are the young of some species of *Meloë*. They have a similar general form of body, and the same number of segments and of caudal setæ, the exterior pair of which are the shortest. They both have large and powerful thighs, long convex tibiæ, and long claw-like tarsi, each formed of three digitations, of which the middle digitation only

* Trans. Ent. Soc. Lond. vol. iii. p. 294.

† Trans. Ent. Soc. vol. iii. part 4. p. 294. I have taken *Nomada Sheppardana* in the nest of *Colletes*, and Mr. Smith has taken other *Nomadæ* in those of *Eucera*, *Andrena* and *Colletes* (see Trans. Ent. Soc. vol. iii. p. 293, 1843; and Zoologist, June 1844, pp. 587–606).

‡ Mémoires Nat. Hist. Ins. t. ii. p. 180.

§ Insecten, fasc. vi. p. 15.

‖ Mémoires, tome iv. p. 490.

¶ Mémoires, tome v. p. 8.

** Mém. sur le gen. Halictus, 1817, p. 85.

†† Hist. Ins. tome vii. p. 647.

‡‡ Hist. Nat. des Crust. et des Ins. t. x. p. 380.

represents the true tarsus, and the lateral elongated tarsal spines, the whole being equally strong, very acute, and spear-shaped. But they differ in the head being more produced anteriorly, and in the prothorax being more elongated and quadrangular in the specimens from the *Nomadæ* than in those from the *Andrenidæ*. Both also differ slightly from specimens which I have reared from the eggs of *Meloë cicatricosus* and *Meloë violaceus*. In the latter species the head is almost semicircular, the prothorax is rounded behind, broader than long, and much wider than the meso- and meta-thoracic segments; while the abdominal segments are more pubescent, and have each a pair of short hairs at the sides, corresponding to the caudal setæ of the præ-anal segment. In all other respects of structure, the specimens found on *Nomadæ* are similar to those bred from the eggs of *M. violaceus*, so that they may fairly be regarded as the young of a species of *Meloë*. They occur of two sizes on the *Nomadæ*, but these are identical in structure. This leads me to the conclusion, in opposition to the opinion often advanced by others, that the larvæ grow slightly while on the bodies of the bees, before they are conveyed to the nests. Most certainly I have noticed a slight increase in size in specimens bred by myself from the eggs of *Meloë cicatricosus*.

Baron Walckenaer*, who doubted that the parasites found on *Hymenoptera* are the young of *Meloë*, obtained a yellow-coloured specimen from *Halictus Elephas*, which differed from all others hitherto described in having the caudal setæ only of a black colour, with the exterior pair instead of the interior the longest. These characters convince me that this was a distinct species, although that learned naturalist regarded it only as a variety of the species already described. Whether the specimen found by Leon Dufour† on *Andrena* was similar to Mr. Kirby's species is not certain. From the statement that it was furnished with *one* pair of caudal setæ, there is reason to believe that it was different. The second pair of setæ might perhaps, however, have been overlooked, as in those found by Mr. Smith, which are identical with Mr. Kirby's, the exterior pair of setæ are exceedingly short and slender. Whether the black-coloured larvæ are in reality the young of any species of *Meloë*, or

* Mémoires pour servir à l'Histoire naturelle des Abeilles solitaires qui composent le genre Halicte, 1817, 8vo, pp. 85, 86.

† Ann. des Sci. Nat. 1828.

whether they belong to some other allied genus, remains for future investigation. I have no doubt that the whole of the hitherto-described yellow specimens found on *Hymenoptera* and *Diptera* are the young of true Meloës. The different species of *Meloë* probably are peculiar to distinct species of *Hymenoptera*; as it will be remembered that, in the experiments detailed in my former memoir*, I could not succeed in rearing the larvæ of *Meloë proscarabæus* or *Meloë violaceus* in the nests of *Anthophora retusa,* although I obtained numerous full-grown larvæ, nymphs and imagos of *Meloë cicatricosus* from the nests of *Anthophora* in its natural haunts.

Since the reading of that memoir, Mr. Smith has obtained a specimen of *Meloë abdominalis,* Kirby, MSS.†, in the immature imago state, from the nest of *Saropoda* or of *Colletes,* in a bank thickly crowded with the nidi of these bees. The specimen had very recently changed from the nymph to the imago, and was still almost colourless, soft, and exceedingly delicate. In the course of a few weeks it gradually acquired the natural intense blue-black hue of the species, and its teguments became hardened. In the month of March it was capable of locomotion, and moved about vigorously. It was a male individual, and is now in Mr. Smith's cabinet.

Thus then there is good reason to believe that all the Meloës are parasitic on the *Hymenoptera.* The genera allied to them appear also to have similar habits. M. Gondot‡ found both sexes of *Tetraonyx flavipennis,* a species recently described by M. Guerin Meneville, *in coitu,* crawling slowly on the ground, near large stones, in the temperate region of the Cordilleras in Columbia, in places frequented by *Bombi,* in the nests of which he believes the larvæ of *Tetraonyx* reside. *Mylabris,* according to Dr. Gebler§, deposits its eggs in the earth in the western parts of Siberia, on the borders of Tartary, where scarcely any trees, and very few shrubs exist. The larvæ,

* Pages 315, 316.

† On examining Mr. Kirby's specimens in the Cabinet of the Entomological Society, both Mr. Smith and myself are of opinion that the two specimens under this name are only very diminutive varieties of *M. proscarabæus.*

‡ Magazin de Zool. 1844, Ins. tab. 141.

§ Des Mylabrides de la Sibérie occidentale des confins de la Tartarie; Nouv. Mém. de la Soc. Imp. des Nat. de Moscou, tome vii. 1829.

Dr. Gebler states, reside in the ground, probably in the nests of some *Hymenoptera.* M. Gené* has shown that the eggs and larvæ of *Apalus bimaculatus* closely resemble those of *Meloë*, and that they are precisely similar in form and habit to the so-called *Triungulinus Andrenetarum* of Dufour. M. Gené however was unable to trace the growth of these larvæ, probably from causes similar to those which have hitherto prevented our tracing the early stages of growth in *Meloë.* The larva of *Sitaris* also, according to the figure given by Mr. Westwood†, resembles that of *Meloë* in some of its characters, and apparently also in its kind of parasitism. MM. Audouin and Pecchioli‡ found the eggs of *Sitaris Solieri*, with the larvæ within them almost ready to burst their envelopes, deposited in great abundance, in a white glutinous material, on the flowers of the rosemary, in the neighbourhood of Pisa; besides a great number of larvæ on the ground, which had recently come forth, but which they were unable to follow through their changes. The eggs closely resembled those of *Sitaris humeralis*, which insect M. Audouin had seen deposit her ova, and from which ova the larvæ delineated by the naturalist above-mentioned were obtained. M. Audouin also had found the perfect insect in the nest of an *Anthophora. Sitaris humeralis* seems to have been taken in this country formerly by Mr. Kirby, as there are three specimens in the Kirbian collection. A few years since it was found by the Rev. Mr. Badger§ in some abundance on a wall at Chelsea in the month of September. In that month also, in 1841, it was taken by Mr. S. Stevens‖, on the wall of his garden at Hammersmith; and it was at that period of the year that M. Pecchioli¶ found both sexes of *Sitaris Solieri* at Pisa, *in coitu*, in great abundance on the wild rosemary. M. Pecchioli met with this species at two distant periods, and in different localities, but always on the same kind of plant. M. Rambuhr** also found many specimens of *Sitaris* in the cells of *Hymenoptera*, in dry ground, exposed to a northern rather than to a southern aspect. From these facts it appears cer-

* Westwood's Introduction, vol. i. p. 299.

† *Ibid*, p. 294. fig. 34. No. 4, 5.

‡ Annales de la Soc. Entomologique de France, Dec. 4, 1839, p. xlvii. tome viii.

§ Westwood's Introduction, vol. i. p. 298.

‖ Minute-Book Entom. Soc. Lond., Sept. 5, 1841.

¶ *Loc. cit.* p. xlvii.

** *Ibid.*

tain not only that the larvæ of *Sitaris* resemble those of *Meloë* in general form, but also that they are similar to them in their economy and parasitism.

Other families of *Coleoptera* allied to *Meloë* in the structure of the imago, resemble them also in the habits of the larvæ. This is the case, as formerly stated, with *Horia**, which in the larva state resides in the cell of the carpenter-bee, *Xylocopa Teredo.* The precise form of body in which *Horia* comes from the egg is unknown; and it is also unknown whether the egg is deposited in the nest of *Xylocopa*, or whether, as I strongly suspect, it is conveyed to it on the body of the female *Xylocopa* as an agile larva, like *Meloë*, *Lytta* and *Sitaris.* In that stage of growth in which it has been delineated and described by Lansdown Guilding, it is a short-legged hexapod, very like the larva of *Meloë* towards the close of its period of feeding, when it has been long located in the nest of its foster-parent, *Anthophora. Cissites maxillosa* and *C. testacea*, Javanese species allied to *Horia*, are said to reside as larvæ in deep burrows in the woodwork of houses†, probably formed by larvæ on which these are parasites. Of the larva of *Cerocoma* and its habits we are at present entirely ignorant.

Some other genera, less closely allied to *Meloë* than those we have noticed, differ from it somewhat in the form of the larva, and in the particular habits both of that and of the imago, but resemble it in its general economy of parasitism. *Rhipiphorus paradoxus*, the pest of the wasp's nest, is believed to deposit her eggs either in the larvæ‡ or in the cells§ of that insect. Another species, *Symbius Blattarum*, the female of which is apterous, is parasitic on *Blatta Americana*‖, and its form, as well as that of its larva, resembles that of *Sitaris.* A more rare species, *Rhipiphorus finnicus* of Paykull (*Pelecotoma Latreillei*, Fischer), which is peculiar to Finland, is stated by Count Mannerheim¶ to be parasitic on the genus *Chrysis.* It is often seen to issue from little holes in the doors of old wooden buildings, frequented by the *Chrysididæ* in their parasitism on other insects. This parasitism on parasites is of frequent occurrence amongst insects. Mr. Curtis

* Linn. Trans. vol. xiv. p. 316.

† Westermann in Silbermann, Rev. Entom. No. 3.

‡ Hope, Proceed. Ent. Soc.

§ Westwood, Introduction, vol. i. p. 294.

‖ Sundevall, in *Isis*, 1831.

¶ Rev. Zool. Feb. 1844, p. 64.

long ago* showed that one of the *Ichneumonidæ*, a new species, which he figured and described as *Anomalon vesparum*, Curt., is parasitic on the larva of the wasp in its cell. Since then, *Rhipiphorus paradoxus*, the usual parasite of the wasp's nest, has been stated by Mr. Hope to be itself attacked by an *Anomalon*, probably Mr. Curtis's species, and this to become the prey of one of the minute *Chalcididæ*†. Whether any of the true *Mordellæ* are parasitic is not yet ascertained. The aculeated form of body, so admirably fitted for piercing hard substances and introducing ova into the cells of other insects,—as the parasitic *Cœlyoxys*‡, among bees, introduces its egg into the nest of *Saropoda*,—leads us to suspect the *Mordellæ* of these habits, although the contrary has been stated of some of them.

From this comparison of species, we find that those which most nearly approach to *Meloë* in the form of the imago, also most closely resemble it in the larva state, both in general structure and habit; while those which differ most in the form of the imago, do so likewise in the anatomy and economy of the larva.

This view of the relation which the habits of species bear to their peculiarities of organization, leads us to an examination of that anomalous order of insects, the *Strepsiptera*. These have many analogies with *Meloë*, both in their organization in the larva state and in their habits. They compose a very distinct group, members of which have been found in almost all parts of the world, and every one of which is a parasite. As I shall have occasion, in my attempts to point out the analogies of form and peculiarities of structure connected with special habits, to compare the form and economy of the early stages of the *Strepsiptera* and the *Meloë*, and to identify these with corresponding associations of form and habit in the truly parasitic *Anoplura*, it may be well first to give some general view of the facts known of the habits and structure of the *Strepsiptera*, more especially of their larva state, preparatory to a future examination of the special anatomy of *Meloë*.

* British Entomology, fol. 198, Jan. 1, 1828.

† Trans. Ent. Soc. Lond. vol. iii. part 1. (Proceed. p. iii. June 4, 1838.)

‡ Newport, Proceedings Entom. Soc. Lond. p. 109, July 1st, 1844; and President's Anniversary Address 1845, 8vo, p. 12.

The Strepsiptera *.

The whole of the *Strepsiptera* yet discovered, like *Meloë* and most of its affinities, are parasitic on the *Hymenoptera*. They are all of diminutive size. One

* *Bibliography of* Strepsiptera.

Rossi.—Fauna Etrusca, Mantissa, Append. p. 114. (*Xenos vesparum.*)

Kirby.—Monographia Apum Angliæ, vol. i. tab. 14. fig. 11. p. 257; vol. ii. p. 112, 1802. (*Stylops Melittæ.*)

Kirby.—Sowerby's British Miscellany, No. ix. pl. 45. fig. 94.

Jurine.—Mem. Acad. Turin, tom. xxiii., Observ. sur *Xenos vesparum*, 1805? (*X. Rossii*, Jur.)

Peck.—Kirby's Monog. of *Strepsiptera*, Linn. Trans. vol. xi. Sept. 1809–11. (*Xenos.*)

Klug.—Magazin der Gesellschaft Naturforschender Freunde zu Berlin, p. 266, 1810. (Supposed parasites of *Stylops.*) (*Strepsiptera.*)

Kirby.—Monograph of *Strepsiptera*, Linn. Trans. vol. xi. 1811–15. (*Xenos Peckii.*)

Latreille.—In Cuvier's Règne Animal. (*Rhipiptera.*)

Kirby.—Linn. Trans. vol. xi. p. 233, Feb. 16, 1813. (*Stylops tenuicornis.*)

Leach.—Zoological Miscellany, vol. iii. 1814? (*Stylops Kirbii.*)

Curtis.—British Entomology, folio 226, Aug. 1828. (*Stylops Dalii.*)

Stephens.—Nomenclature of British Insects, p. 37 (MS. name), 1829. (*Stylops Haworthii?* MS.)

Curtis.—British Entomology, folio 385, Dec. 1831. (*Elenchus Walkeri.*)

Dale.—Curtis's British Entomology, folio 433, Dec. 1832. (*Halictophagus Curtisii.*)

Jurine.—Isis, taf. xiii. 1832.

G. R. Gray.—Griffith's Cuvier's Anim. Kingd. vol. xv. (Ins. vol. ii. pl. 59. p. 633, 1832.) (*Stylops Childreni.*)

Stephens.—Trans. Ent. Soc. Lond. vol. i. pt. 3 (Proceed. p. lxv.), Aug. 1835. (*Elenchus* (*Stylops*) *tenuicornis.*)

Van Heyden.—Congress of Germ. Naturalists, Bonn, Sept. 1835, *vivá voce.* (Supposed *acari* (larvæ) of *Xenos.*)

Van Heyden.—Trans. Ent. Soc. Lond. (Proceed. p. lxxiii.), Oct. 1835, vol. i. part 3. (*Id.*)

Pickering.—Trans. Ent. Soc. Lond. vol. i. part 3. p. 163, Jan. 1835–1836. (*Stylops Spencii.*)

Dufour.—Annales des Sci. Nat. tome vii. p. 19, Jan. 1837. (*Xenos sphecidarum.*)

Newport.—Art. Insecta, in Cyclop. Anat. and Physiol. pt. xvii. vol. ii. 1838.

Westwood.—Observations on *Strepsiptera*, Trans. Ent. Soc. Lond. vol. i. part 3. p. 169, 1835–1836.

Westwood.—Trans. Ent. Soc. Lond. vol. i. part 3, 1835–1836. (*Elenchus Templetonii.*)

Westwood.—Trans. Ent. Soc. Lond. vol. ii. p. 3, 1836–39. (Supposed parasites of *Stylops.*)

Siebold.—Ueber *Xenos sphecidarum* und dessen Schmarotzer, in Beiträge zur Naturgeschichte der Wirbellosen Thiere. Danzig (September), 1839. (*Xenos sphecidarum*, supposed parasites, *larva, pupa, imago.*)

Westwood.—Introduction, part xiv. p. 302, Nov. 1839. (Supposed parasites of *Stylops.*)

Guerin & Percheron.—Insectes. (*Rhipiptera.*)

Thwaites.—Notes on *Stylops*, Trans. Ent. Soc. Lond. vol. iii. pt. 1. p. 67. (Proceedings, June 1838–41.)

Thwaites.—In Westwood's Introduction, p. 300. part xiv., Nov. 1839.

of the giants of the species, *Stylops Spencii,* is scarcely one-fourth of an inch in length ; while the pigmy genus, *Elenchus,* is scarcely more than one-fourth even of this dimension. But size in the material world, like space or time in the ethereal or immaterial, is merely a relative condition, and is of little moment to the philosophical inquirer, while engaged in investigating the laws by which the Deity has ordained the development of structure,—the evocation of life,—or the evolution of function and instinct. The organization and habits of the tiny *Stylops* are as much proper subjects of investigation, of wonder and admiration, to the right-thinking mind, as are those of the Leviathan of the deep, or of the Elephant of the forest; whilst their very diminutiveness and isolation, like all microscopic analyses of organism, or singleness of action, tend greatly to facilitate our investigation of principles, and lead us more easily to understand those on which structure is formed, and function and instinct are unfolded.

Like the Meloës, the *Strepsiptera* are parasites on the *Aculeata,* the sand-wasps, wasps and bees, which nidificate in banks of dry earth or sand exposed to the sun; localities as essential to the development of the parasites themselves as to that of the species which they infest.

The first discovered of these singular insects, the *Xenos vesparum* of Rossi, was regarded by him as constituting a new genus of *Hymenoptera* allied to *Ichneumon.* Another species was discovered soon afterwards by our countryman the Rev. William Kirby, who at once perceived, without being aware of Rossi's discovery, that his insect, a new species, belonged not only to a new genus, which he designated, from the form of its eyes and the bee it was found on, *Stylops Melittæ,* but that it constituted the type even of a new Order of Insects. When a second species of *Xenos, X. Peckii,* was discovered some time afterwards by Professor Peck of Boston, and communicated to Mr. Kirby, this gentleman then formed the species into an Order, which he

Lewis.—In ditto, p. 305. part xiv., Nov. 1839, new species? Van Diemen's Land.
Templeton.—Trans. Ent. Soc. Lond. vol. iii. part 1. p. 51, 1838–1841. (*Xenos Westwoodii.*)
Siebold.—Wiegmann's Archiv, 1843. (*Metamorphosis of Strepsiptera, larva, nymph, imago.*)
Guerin.—Revue Zoologique (abstract of the preceding, with notes), March 1844, p. 111–118.
Newport.—Anniversary Address Ent. Soc. Lond., Feb. 1845, pp. 19, 20. (*Larva, nymph, imago.*)
F. Smith.—In 'The Zoologist,' No. xxiii., Sept. 1845, p. 1092–93. (*Larvæ of Stylops.*)

characterized in the Transactions of this Society as the "Strepsiptera," from the twisted form of the rudimentary elytra with which the male individuals are furnished. Rossi's insect had in the meantime been examined by Professor Jurine, who distinguished it from another species, also found in the wasps. Mr. Kirby and Dr. Leach afterwards each described additional species, *Stylops tenuicornis* and *Stylops Kirbii*; and Mr. Curtis and Mr. Dale each characterized a new genus, *Elenchus* and *Halictophagus*. These were followed by new species by Mr. G. R. Gray, *Stylops Childreni*; by Mr. Pickering, *Stylops Spencii*; by Messrs. Templeton and Westwood, *Elenchus Templetonii*; and by Leon Dufour, *Xenos sphecidarum*,—the whole of which were found to be parasitical in their habits. Yet none of these naturalists were able to ascertain anything perfectly conclusive respecting the sex of the species they had captured. Professor Peck had however suspected that the four specimens of *Xenos* obtained by himself were males; although Rossi imagined that the winged specimens which he obtained were of both sexes. From what is now known we are satisfied that this was an error. It has been well ascertained by Dr. Siebold that the male sex only is winged. This fact established, raised at once a difficulty in understanding in what way these insects are propagated, and by what means the females are brought into communication with the species of bee or wasp on which they are parasites. M. Klug, in 1810*, appears to have been the first to observe a fact that has since led the way to an explanation of this problem in their natural history. He remarked that the *Strepsiptera* are sometimes covered with little hexapods, which he regarded as parasites.

In December 1834, Mr. Pickering, in this country, obtained from its nidus† in a sand-bank a living specimen of *Andrena tibialis*, which had recently assumed the imago state, and had never left its cell. In this specimen he "observed some protuberances between the abdominal segments, and thinking the bee might be stylopized, endeavoured to remove one of these swellings," out of which he obtained a living (male) *Stylops* (*Stylops Spencii*), which, like the insect it infested, had recently become perfect. This fact, as

* Nachricht von einen neuen Schmarotzer insekt auf einer Andrene. Magazin der Gesellschaft naturforschender Freunde zu Berlin, 1810, p. 266.

† Trans. Entom. Soc. Lond. (Proceedings, Jan. 5, 1835), vol. i. p. 164.

Mr. Pickering argued, at that early period of our knowledge of the habits of *Strepsiptera*, incontestably proved that the parasite is admitted into the cell of the young bee before the cell is closed by its parent,—a view which has since been completely verified by the observations of Dr. Siebold. Two other specimens of *Stylops* in Mr. Pickering's bee appear to have been females; so that both male and female *Stylops* have been found in the same insect. Some months after this, M. Van Heyden, of Frankfort, stated at the Congress of German Naturalists, held at Bonn in September 1835, that he had met with three species of *Xenos* (previously shown by him to the Rev. F. W. Hope*), *X. Rossii*, in *Polistes gallica*, and two others, one, much smaller than *X. Rossii*, in a species of *Odynerus*; and that he had found the body of the former sometimes filled with minute living hexapods, which he also regarded as parasites, and which resembled *Acari*, but which had the abdomen articulated. Further, Mr. Pickering in the following April (1836) obtained similar hexapods from *Stylops*†. Mr. Westwood, who had been directed by Van Heyden himself to the fact of the occurrence of these little objects in *Xenos*, and who had received from Mr. Pickering some specimens of these acariform bodies obtained from *Stylops*, and preserved in spirit, afterwards, in the month of June 1836, found similar specimens on a stylopized bee, *Andrena Gwynana*, Kirb., in his own possession. These he also described in the Transactions of the Entomological Society as the *parasites* of *Stylops*‡; but questioned, in a note to his paper, whether these supposed parasites might not be the young of *Stylops*, and the supposed pupæ, seen by Rossi, Kirby, Peck, and all subsequent observers, partially projecting from beneath the margin of the abdominal segments of the stylopized insects, be the females?, as, up to that time, and even to a still more recent period, the female *Stylops* remained unknown. Mr. Westwood added, however, "*that he should be very fearful of asserting this as the fact.*" Yet such has since been shown by Dr. Siebold to be the truth. This distinguished naturalist, in 1839§, not only found similar hexapods on

* Trans. Entom. Soc. Lond. vol. i. part 2. (Proceedings, xxxix.)

† See Mr. Westwood's paper on the *Parasites of Stylops*, Trans. Ent. Soc. vol. ii. part 3. p. 184, 1836–39.

‡ *Loc. cit.*

§ Ueber *Xenos sphecidarum* und dessen Schmarotzer, in Beiträge zur Naturgeschichte der Wirbellosen Thiere, Dantzig, 4to, 1839.

Xenos sphecidarum, and which, like previous observers, he then thought were parasites, but he also discovered and described the ova in which they were produced within the body of the *Xenos.* More recently * he has shown that these are the ova and the young of *Xenos*; and that the female *Strepsiptera* are blind, apodal, larviform insects, that never leave the bodies of the *Hymenoptera* in which they have lived as parasites, but remain with only the cephalo-thoracic portion of their bodies exposed, and there produce their young and die. The males escape, and fly abroad as winged insects, and impregnate the females while these are still within the *Hymenoptera* in which they have been nourished. The larvæ, consequently, as in *Hippobosca, Aphis,* and some other of the inferior parasitic tribes, are hatched within the bodies of their parents, and pass out, to the surface of that of the wasp or bee, through the vulva, which is situated in her cephalo-thorax on the ventral surface. The larvæ thus produced (Tab. XIV. fig. 21), like those of *Meloë,* are at first distinctly hexapod, and capable of locomotion; they cling fast to the hairs on the body of the wasp or bee (Tab. XIV. fig. 22) in which they have been hatched, and are transported by the insect to its nest, where they remain, as I have already shown is the case with *Meloë.* The larvæ of *Strepsiptera* penetrate the body of the young larva of the hymenopterous insect in its cell, and locating themselves in it, shed their skins, lose their legs, become completely apodal, and there feed on its substance, through the whole period of their nutrition, as internal parasites. These facts have been fully exemplified by Dr. Siebold †. The attention of naturalists was drawn to them quickly after their publication, in France, by MM. Milne Edwards ‡ and Guerin Meneville §, and in this country by myself ||, my friend Mr. Spence having kindly apprised me of them. Since then, some of them have been confirmed by Mr. Smith's ¶ and my own observations. I have detailed Dr. Siebold's discoveries here, in their natural sequence, in order, first, more fully to confirm them, and to add something to the description and history of these singular insects; and next, to be enabled more readily to compare the anatomy and habits of the larvæ with those of *Meloë.*

* Wiegmann's Archiv, 1843.

† *Ibid.* p. 137 *et seq.*

‡ Ann. des Sci. Nat. 1844.

§ Rev. Zool., March 1844, p. 111–118.

|| Anniversary Address Ent. Soc. Lond., Feb. 1845, pp. 19, 20.

¶ Zoologist, No. xxiii., Sept. 1845, p. 1092.

On the 19th of May 1845, I received a female specimen of *Andrena Trimmerana* from Mr. W. Wing, which he had captured at Hampstead on the preceding day, with a *Stylops* projecting from beneath the fourth abdominal segment. This specimen I preserved in spirit for dissection. On examining it I found the body of the *Stylops*, which was a female, greatly enlarged, and occupying at least one-fifth of that of the interior of the bee. It extended backwards from the fourth segment of the abdomen to the base, on the dorsal surface, forcing downwards and compressing the whole of the viscera, which were more or less atrophied. The alimentary canal of the bee was almost empty, and thrust out of its usual position ; the respiratory organs were small and imperfectly developed, and retained more the tracheal condition of the bee-larva than that of the adult insect, the vesicles being few and imperfect. The secretory vessels and poison-bag of the sting also were of diminutive size, and even the ganglia of the abdominal portion of the nervous cord seemed to have been atrophied, and were smaller than usual. But the most marked effect of the parasite on its victim had been produced on her organs of reproduction. The oviducts were of ordinary length and size, but the ovaries were entirely undeveloped, and were scarcely larger than they are at the period when the bee-larva passes to the state of nymph. They contained only the germs of a few very imperfect ova.

These effects on the development of the internal organization of the bee, and of all insects which undergo a complete metamorphosis, are the usual results of the exhaustion of their vital energies by the presence of internal parasites. I have constantly observed like effects produced on the organization of the *Sphinx Ligustri* by its internal parasite, the larva of *Ichneumon Atropos* ; and these effects are equally injurious to the male as to the female victim. They seem to be produced mainly by the abstraction by the parasite, —which subsists on the adipose tissue, and not on the viscera of its victim,— of a portion of that supply of nourishment which is accumulated in its body during the feeding or larva state, to furnish materials for the growth and development of the whole organism.

In a male pupa of *Sphinx Ligustri*, which I preserve, the facts now stated are well shown. The full-grown larva of the *Ichneumon*, imbedded in the fatty tissue on the dorsal surface of the body, has compressed the alimentary canal, and retarded its changes; the tissue itself is thin and partially destroyed; the air-sacs at the sides of the abdomen, which are exceedingly large in the male imago *Sphinx*, are but little advanced in their development; the brain is smaller than in pupæ of the same age; and the male organs of reproduction, the testes,—which always become united into one mass immediately the larva *Sphinx* has changed to a pupa,—remain widely separated as in the larva, their form only being somewhat altered.

These facts show, that insects infested with internal parasites are often sterile. The *Sphinx* dies of its injuries before assuming the imago state; while the bee lives on to perpetuate the enemy of her tribe, and be herself the means of transporting it to the nidi of her own or of others' young, as she conveys thither also the parasite, *Meloë*.

Of the Female Stylops.

The structure of the female *Stylops* (Tab. XIV. fig. 20) is as full of interest as are the effects of her presence on the organization of the bee. I was anxious to examine most carefully, in the specimen I had obtained, that portion which is of a corneous texture, and protrudes between the abdominal segments of the bee (A), and which, Dr. Siebold has shown, is not merely the head, as naturalists have supposed, but the entire cephalo-thorax. This most certainly is the fact. On the concave, or *dorsal surface* of this part, I have been able to recognise the four segments which constitute the head and thorax of the young larva firmly united together into one region. In the first, the true head, there are no eyes or antennæ; and in the others, the prothorax, mesothorax and metathorax, there are not even the slightest indications of legs or other appendages. When viewed by strong transmitted light, I found the latter two segments, as in the enlarged abdomen (B), crowded with ova in various stages of development, converging towards the middle line at the anterior of the mesothorax, which corresponds to the oviduct on the ventral surface. The *ventral surface* is convex, and divisible like the dorsal into its original segments. At the sides of the anterior one are two quadrangular, flattened, corneous bodies (*a*), which, with Siebold, I regard as rudimentary mandibles. Between these is a cruciform opening, the buccal orifice, bounded posteriorly by two thin plates (*b*), probably the labial, divided by a longitudinal suture. Behind these is a free crescentic margin (*c*), the boundary of the united pro- and meso-thorax. This margin conceals the vaginal outlet of the oviduct, which is in the fold between the head and thorax, as stated by Siebold. Its situation is very analogous to that of the outlet of the female reproductive organs in the *Iulidæ* and other vermiform *Myriapoda,* in which the vulva of the female is in the mesothorax.

I regret that I was unable, through want of specimens, to make so precise an examination as I could have wished of the abdominal viscera of this insect. The abdomen (B) was soft, and divided into eight segments, and so large in comparison with the cephalo-thorax as to resemble greatly that of the pregnant female *Termites.* I had ruptured it while opening the body of the bee, so that I was unable to determine its precise form ; but noticed however that it was well-supplied with tracheal vessels, the chief of which at the sides near the base, and apparently connected with a large spiracle, as shown by Siebold, were of large dimensions, thus indicating a great extent of respiration. Like the body of the *Termites,* it seemed to constitute one immense ovary, crowded with thousands of ova of all sizes, in various stages of development, from the immature egg to the egg with the embryo almost ready to burst its envelopes.

The Egg and Embryo of Stylops.

The smallest ova which presented signs of having been fecundated and the development of the embryo commenced (fig. 23), were of a spherical form, and filled with a dark, yellow-coloured yelk, composed of masses of large nucleated cells (*a*). The yelk was surrounded by a transparent, colourless blastoderma (*b*), and on one side (*c*) was impressed with a transverse sulcus. When measured on a micrometer-plate these ova did not exceed each at most one five-hundredth of an inch in diameter. Multitudes of others, which had not acquired their full size (fig. 24), measured only one thousand five-hundredth, or one two-thousandth of an inch. Those in which the changes had advanced sufficiently far as to indicate, by the doubling of the blastodermic layer on itself (fig. 25, *d*), a shadowing out of the form of the future embryo, measured about one three-hundred-and-fiftieth of an inch. Others, a little further advanced, in which the outline of the embryo was more distinctly indicated (fig. 26), organization having been carried to that stage in which the greater portion of the yelk is included in the blastoderma, and is beginning to disappear as a separate body, measured one two-hundred-and-fiftieth of an inch. In the next stage (fig. 27), which shows that the last portion of the yelk is inclosed on the dorsal surface of the thorax of the embryo *Stylops* (B), as observed by Rathke in the *Crustacea*, the form of the ovum is altered. It is slightly flattened at its sides, is oval, and measures one two-hundredth of an inch. The body of the embryo is now seen partially coiled on itself, with its abdominal portion bent under the thoracic, and with its dorsal surface next the interior of the shell; it consists entirely of an aggregation of yelk-cells, partially inclosed in a blastodermic membrane, which completely invests the folded portion, the ventral surface of the future larva, but is open on its dorsal, being gradually closed from behind forwards to the thorax at a subsequent period. On the anterior portion of the membrane, which is to become the tegument of the thorax, three slight transverse folds (*f*), which originated in the previous stage of organization, now form on each side three broad tubercles that project slightly from the surface; these are the germs of the future legs. A distinct membrane inclosing the entire embryo in the shell is now visible (*g*). In the next stage (fig. 28), the ovum has acquired a diameter of about one-hundred and seventieth of an inch. The membrane that invests the embryo is more distinct, the pedal tubercles are elongated and pointed at their apex, and the remains of the yelk are rapidly becoming included in the thorax, which is much enlarged, but is not yet closed on its dorsal surface. At a still later period (fig. 29) the form is recognizable as that of the larva of *Stylops*. The ovum is more elongated anteriorly, and measures one hundred and fiftieth of an inch. The dorsal surface of the thorax is closed. The tubercular legs now have the rudiments of tarsal and tibial joints; the head of the embryo begins to project slightly from the thorax, the investing membranes are more distinctly marked, and the body exhibits a more organized and less celliform appearance. At a further advanced stage (fig. 30) the ovum is still more elongated, and is more flattened at its sides, the investing coverings of the embryo being put on the stretch by the growth and extension of the body. The ovum now is about one hundred and twentieth of an inch in diameter. Still later (fig. 31) it has reached to one hundredth of an inch. The legs of the embryo have acquired almost their proper length, the amnion which incloses the embryo is tensely stretched, the segments of the thorax of the future larva, as well as those of the abdomen, are distinctly marked, and traces of an alimentary canal are easily distinguished, although the whole interior of the body is still composed of cells. In the last stage of the embryo (fig. 32), immediately before rupturing its envelopes, the ovum measures about one-eightieth of an inch in its long diameter. The embryo is now completely formed. The whole of its abdominal segments, as well as its thoracic, have their armature of marginal spines. The minute head of the embryo, flattened, acute and wedge-shaped, projects forwards from the prothorax, and pressing against one portion of the envelopes whilst the caudal extremity is forced, by the growth of the body itself, in an opposite direction, the ovum is made to assume an irregular ellipsoid form, and by a continuation of the forces of growth the membranes and shell are at length burst, and the young *Stylops* comes forth in the oviduct of its parent as an active hexapod. The whole of these changes take place in the ovum within the body of the female *Stylops*, herself contained within that of the bee.

I regret that I was unable to obtain other specimens of *Stylops* for dissection at the period when the larvæ have burst their envelopes. Enough however is shown in these observations to prove, with Dr. Siebold, that the female *Stylops* is viviparous; and also, that the eggs do not all become matured at precisely the same period, but that there is a range of some days between the hatching of the earliest and of those which appear last. That this is the fact, was proved to my satisfaction in observations made on another stylopized specimen of *Andrena*.

On the 27th of May, only a few days after receiving the specimen which contained these embryos, Mr. Smith favoured me with the loan of a stylopized *Andrena Trimmerana*, which he had also captured at Hampstead about the 8th or 10th of that month, and which had been in his possession alive during the intervening sixteen or eighteen days. The bee died on the 25th of May, and on the same day one or two specimens of *Stylops* larvæ made their appearance. On the following day many more came forth; and soon after the bee was placed in my hands they issued from the vaginal fissure (fig. 20, *c*) of the *Stylops* in such abundance, that they completely covered the whole of the posterior part of the abdomen of the bee, both on the upper and under surfaces, like dust, which to the naked eye they closely resembled. They were intermingled with, and adhered very tenaciously to the hairs, and walked about on the body of the *Andrena* like the larvæ of *Meloë* on the *Anthophora*, but far more slowly. Mr. Smith* has published a few remarks on the larvæ obtained from this insect. Besides this specimen, Mr. Smith captured one other, which contained three pupæ of *Stylops*, from one of which a male *Stylops* came forth on the following day. This male he has figured as the *Stylops Melittæ* of Mr. Kirby; but there is reason to believe that, although it approaches closely to that species, it may be distinct from it, and perhaps is yet undescribed. Should this prove to be the case, I propose to describe it as *Stylops aterrimus*, from its uniform and intense black colour. It resembles Mr. Kirby's insect in size, general colour, shortness of the abdomen, and pedunculation of the eyes, and in the front of the head being obsoletely trilobed; but it differs in having the occipital border of the head deeply emarginated, whilst in the figure of *Stylops Melittæ*† given by Mr. Kirby this is entire. The antennæ, head, thorax, wings, legs and abdomen are all of a deep black. Further, it may be worthy of remark, that the species of bee on which it is a parasite is *Andrena Trimmerana*, Mr. Kirby's being *Andrena nigro-ænea*.

About the time of capturing the specimens above-mentioned, Mr. Smith informs me that he took also two or three stylopized male bees, in one of which there were two specimens of the parasite. Stylopized male *Hymenoptera* however, he remarks, are exceedingly rare. In this he coincides with Jurine and Siebold.

THE LARVA OF STYLOPS.

The larvæ of *Stylops* obtained from the specimen of *Andrena Trimmerana* I have no doubt were of the same species as the male *Stylops aterrimus* from the same insect. The length of time which elapsed between the capture of the bee on the 8th or 10th of May, and the 25th of the same month, that at which the parasite began to produce the larvæ, is an interesting matter for consideration, with reference to the period which usually elapses between the impregnation of the female and the hatching of her young. Supposing the female *Stylops*, at the moment when the bee was captured, to have been only

* *Loc. cit.*

† Kirby, Monog. vol. i. tab. 14. fig. 11. 1, *a*. (*loc. cit.* vol. i. p. 257. No. 11.)

very recently impregnated, or, at latest, on the day afterwards, when the male *Stylops* came forth, the eggs within her body were at least from sixteen to eighteen days before they gave birth to the larvæ. Having the specimen of *Andrena* at the second day after the young *Stylops* began to make their appearance, I had full opportunity of observing them issue from their parent. Their number was truly astonishing. Mr. Smith calculated that from two to three hundred came from this single specimen, but this is very far short of the real number, which, for so small an object as the female *Stylops,* was incredible. I am almost afraid to state, lest I should subject myself to doubt, that my own observations lead me to believe there were more than twice as many thousands; since, in a small collection of some of these very specimens, which I preserve between plates of talc, there are nearly two hundred and fifty, yet these do not constitute one-tenth of those produced, and there are still more than three times as many of these larvæ attached to the preserved bee now exhibited* from Mr. Smith's cabinet.

So extremely small are these little insects at their birth, as already shown in the account given of the ova, that, on measuring them on a micrometer-plate beneath a high power, I found that their average length did not exceed twenty-two thousandths, or about one forty-sixth of an inch,—one-twelfth of that of the male insect in the imago state.

When we contemplate for an instant this diminutive *Stylops* clinging to a hair of the bee in which it has been bred (fig. 22), and then glance to the *Mylodon* of old,—the gigantic Sloth of a former world,—and remember that the same primary laws of organization have regulated the production of both, we are as much lost in wonder and astonishment at the comprehensiveness of those laws, as when contemplating those which regulate the motions of the universe. The larva *Stylops* has its system of parts for motion, for the assimilation of food, and for the aëration of its fluids, like the most perfect animals. Its body is formed of fourteen segments, including the head and anal segments. It is hexapod, and is furnished with long caudal setæ.

The *head*, or first segment, is short, rounded anteriorly, and a little depressed in the middle, and on its upper surface there is a lunated row of

* The stylopized *Andrena*, together with specimens of the larvæ, were exhibited to the Society at the reading of this paper.

eight bright points, which have the appearance of ocelli. These are arranged transversely on the front of the head, so that when the larva depresses this part, which it usually does towards the ventral surface, these bright points are directed forwards. I have been unable to determine whether these are, like the ocular tubercles of the *Arachnida*, real ocelli, or whether they are merely dermal tubercles, analogous to those which are developed into spines on the thoracic and abdominal segments; or whether, as there seems reason to suspect, the ocular and dermal tubercles are not identical in their mode of origin from distinct cells in the tegument, which differ only relatively, in the extent to which the development of the primary constituents of their nuclei and nucleoli are carried. I have not been able to detect the existence of the ocelli pointed out by Dr. Siebold in the larvæ of *Xenos* and *Stylops*: probably I have overlooked them. Neither have I been able to satisfy myself that the young *Stylops* possesses even the slightest rudiments of antennæ. The parts of the mouth I have seen exactly as described by Siebold; but they are usually retracted and difficult to observe. The head also is partially withdrawn beneath the prothorax, somewhat as in the carnivorous larvæ of the *Lampyridæ*, and perhaps, as in them, the head and mandibles are extruded only at the moment of attack on the prey. This retraction of the head and mouth beneath a shield-like prothorax is common to larvæ which penetrate into other bodies, as *Silpha, Dermestes, Lampyris*, &c. amongst the *Carnivora*, and *Cerambyx* and other *Xylophaga*.

The second segment, the *prothorax*, is the largest of the whole body, and much resembles the corresponding part in other larvæ. The third and fourth, the *meso-* and *meta-thoracic* segments, are shorter than the second, but are broader than the following abdominal ones. These three segments give attachment to the legs. The remaining ten segments constitute the abdominal region. In the living insect they are each longer than the meso- and meta-thoracic segments, excepting only the anal or terminal one. Each segment is armed on its posterior margin with a row of spines. These are short on the thoracic segments, each alternate one being only half the length of the adjoining. On the abdominal segments their length is gradually increased, until those on the posterior measure one-third or nearly one-half of that of the segment. Instead of each alternate spine only being elongated, nearly the whole on each segment are of equal length, so that the appearance of the larva under the microscope strongly reminds us of the genus *Polyxenus* among the *Myriapoda*, or of the larva of *Attagenus* or *Dermestes* amongst the *Coleoptera*. The ninth segment of the abdomen, the thirteenth of the whole body, is armed with a pair of elongated caudal styles or setæ; and the inferior surface of the fourteenth or anal segment is soft, prehensile, and employed by the larva in locomotion, like the anal prolegs in other larvæ. The caudal styles are distinctly articulated to their segment by a large and a small joint, but I have not been able to detect any articulation in the remaining portion of these organs with the instrument I have employed, a triplet magnifying about 450 diameters.

The *legs* are formed of a *coxal* joint, a *femur*, a *tibia*, and a four-jointed *tarsus*. The *coxa* is a large and powerful joint; the posterior one is much larger than the others, and the whole are armed, each with four curved stiff spines. The *femur* is also a strong joint, and has two small spines at its distal, or tibial articulation. The *tibia* is elongated, slender, and somewhat clavated at its articulation with the tarsus, where it has a short spine on its internal margin. The *tarsus* is long and composed of four joints. The basilar joint is very short, but the distal one is large and spatulate. It is in fact a double joint, so that the true tarsal joint is the shortest, and the first metatarsal is the longest. The tarsi of the posterior pair of legs are much smaller and shorter than those of the first and second pairs. The third and fourth terminal joints are not spatulate, but are very narrow, weak and slender. This appears to be a character common both to *Stylops* and *Xenos*.

Locomotion of the Larva of Stylops.

When the larva attempts to walk on a smooth surface, as on glass, it moves very tardily, and its long tarsi are bent irregularly; but when attached to the hairs or body of a bee, its power of locomotion is much greater. When climbing up a hair it moves almost precisely like the larva of *Meloë*, but very much more slowly. It first shortens its segments and affixes itself firmly to the hair with its anal prolegs, and then, elongating its body, steps onwards, making use of its thoracic legs alternately in the act of progression. When left for a few hours on some hairs from a bee, on the glass object-plate of a microscope, the larva does not readily quit them. I left four or five specimens during the night, on hairs, beneath the microscope: three of the larvæ were attached to the hairs. In the morning two of them had escaped, and one only was still clinging to a hair; so that we may fairly conclude that they sometimes wander in search of the object of their parasitism.

Internal Anatomy of Stylops.

I have succeeded in tracing the alimentary canal of the larva throughout its whole course, and I believe am enabled somewhat to extend the observations of Dr. Siebold on this part of its anatomy. Dr. Siebold describes the larvæ of the species he examined, *Stylops Melittæ* and *Xenos Rossii* and *sphecidarum*, as having a simple cæcal intestine, but no anal outlet. My own observations lead me to a different conclusion. The *alimentary canal* commences in a narrow œsophagus, which is gradually enlarged as it passes backwards through the thoracic segments, until it has reached the first abdominal one, where it is dilated into a kind of crop. An abrupt constriction, the cardiac valve, separates this from the continuation of the canal, the true stomach, or *chylific ventricle*. This part is considerably enlarged, and commences within the posterior margin of the first abdominal segment, the fifth of the whole body, as in other insects. The canal then pursues nearly a direct course as far as the ninth segment, the fourth of the abdomen, in which it is folded on itself and again turns forward, that portion which passes forward being on the under surface. This gives to the anterior, the uppermost portion of the chylific ventricle, an appearance of cæcal termination. I suspect it was this appearance which led that distinguished observer Dr. Siebold to describe the canal as simple and merely cæcal. When the canal has thus passed forwards for a short distance, it is again folded backwards in the next segment, and is then indistinctly traced onwards until seen in the thirteenth segment as the *rectum*. I have no doubt that a true anal outlet exists to the canal at this period of the larva state, although it is not improbable it may become closed at a subsequent one, when the parasite is included in the abdomen of the bee larva. I have indeed noticed what seems to be a demonstration that the canal in the young larva is not closed. While observing a larva that was moving along on a plate of glass, a little fæcal mass seemed to be voided by it. The mass was brought into view precisely in the middle line, between the caudal setæ, at the instant when the larva was in the act of carrying its posterior segments forward, so that the fact could hardly be mistaken. This appears to be sufficient evidence of the existence of an anal outlet to the digestive canal. That this may become closed at a subsequent period, when the *Stylops* larva has penetrated into the interior of the body of its victim, is highly probable, although it is most certainly permeable in the male imago, which Mr. Pickering saw void a whitish fluid immediately after it came forth, analogous probably to that passed at a similar period after evolution from the pupa state by the *Lepidoptera* and other insects. The *Stylops* larva, near the end of its period of nutrition, in its apodal state, has been found by Peck, Jurine and Dufour completely inclosed in the body of the hymenopterous insect, feeding, according to Dufour's observations, on the adipose tissue only, and not on the vital structures.

Respiratory Organs of Stylops.

The complete occlusion of *Stylops* within the body of another insect renders the consideration of the manner in which the function of respiration is performed, or the aëration of the fluids in the parasite is effected,—a condition essential to life,—a matter of interest equal with that of the closure of the outlet to the digestive canal. It can hardly be imagined that an insect, the male sex of which in its perfect state is one of the most active and fully developed of the winged tribes, does not possess, in its larva state, organs in some form or other fitted for an extensive aëration of its fluids. The existence of a large spiracle in the thorax of the female *Stylops* communicating with large tracheæ extensively ramifying through its tissues, shows that while it is passing the greater portion of its existence surrounded by delicate organs in the body of another animal, and as it were bathed in its fluids, it yet maintains for itself a free and perfectly independent respiratory function of its own.

In all the larvæ I have examined there have appeared to be eight pairs of bag-shaped dark-looking bodies within the abdomen, one pair at the sides of each segment, from the *fifth*, or second abdominal segment to the eleventh inclusive, situated in the exact place of the respiratory organs of other insects. From their darkened appearance, and from their resemblance to branchial sacs, these may perhaps be regarded, at this period of the larva's existence, as imperfect respiratory organs, of the nature of branchiæ. A branchial form of respiratory organs we know exists in the aquatic larvæ of insects which, in their perfect state, respire atmospheric air, and it is not improbable that a like condition of the respiratory organs exists in the early states of this parasite. The larva of *Ichneumon atropos*, however, in which I have found that there certainly is no outlet to the alimentary canal, and which, as before stated, subsists on the adipose tissue and fluids of the caterpillar, has true, but extremely minute spiracles and air-vessels, and although completely inclosed in the body of the caterpillar, seems to respire the air directly, perhaps from the injured air-vessels of its victim.

Development of the Larva of Stylops.

When the young *Stylops* has penetrated the body of the bee-larva, shut up in its cell in the earth in the spring, it grows as rapidly as the larva itself is nourished. It certainly changes its skin once, and perhaps oftener, like other insects. Its need for organs of locomotion, and for the perception of surrounding objects, is then reduced to a minimum. Accordingly, as I shall presently show takes place also in *Meloë*, inclosed in the cell of *Anthophora*, the legs with which the young *Stylops* was provided when it issued from the body of its parent become atrophied, and their further development is so completely arrested in every part, owing, perhaps, to the excess of growth which is taking place in its other structures, that they entirely disappear, being first reduced to their merest possible rudiments, pedal papillæ, which are more and more reduced in size as the growth of the body proceeds. On the other hand the body of the *Stylops* becomes so enlarged by the nourishment ingorged from the substance of the body of the bee-larva, that its entire form and proportions are completely changed.

During the period of its growth, the parasite, as found by Dr. Peck * in *Xenos*, lies with its head in the direction of that of the insect preyed upon,—that probably in which it entered the body. But when it has arrived at its full growth, and is about to change to a nymph, its position in the body is reversed, and adapted to its future exit backwards between the rings of the abdomen of the hymenopterous insect. Its change to a nymph takes place in

* Trans. Linn. Soc. vol. xi.

the summer or autumn, and probably always subsequent to the change of the bee- or wasp-larva. This I have found most certainly the case in *Ichneumon Atropos*, in *Sphinx Ligustri*, which remains in its original position, but never changes to a nymph until long after the caterpillar in which it lives has become a chrysalis. The changes of the *Stylops* follow those of the insect on which it is a parasite in quick succession. The bee has often completed its changes in the autumn, but, as naturalists are aware, does not then leave its cell. It remains in it during the winter in a state of hybernation, and comes forth in the spring. The *Stylops*, like the bee, also appears to complete its changes in the autumn, as is proved by the fact related by Mr. Pickering*, that a living male *Stylops* issued forth from the body of an *Andrena tibialis*, which he dug out of its cell alive at the end of December. That the apodal females also undergo their slight change, and are prepared to emerge between the segment of the bee at about the same period as the males, has been proved by Dr. Siebold.

Comparison of the Sexes of Stylops.

A comparison of the sexes of *Strepsiptera* exhibits perhaps one of the most striking contrasts we are acquainted with in nature. Every structure of the body in the male which has relation with the external world exists in a condition the very opposite of that of the female. In the one sex the organs of sense and locomotion are developed to their utmost extent; in the other their development is arrested at its very commencement. Yet both sexes exist under precisely similar conditions of structure and relation at the moment of their liberation from the incubatory organ of their parent, and during their larva period of nutrition. When this period is completed, the formative energies or forces of the primary constituents of the body in the one are concentred in the production of ova,—of thousands of similar combinations of matter, each constituted to result in the formation of an organized body, identical with that in which it has itself been produced. In the other sex the powers of life are not exhausted simply in the production of new combinations, but mainly are employed in the unfolding of those which belong to the body itself, and which are to bring it into immediate communication with the external world as an independent being. The sole design of the existence of the

* Trans. Ent. Soc. vol. i. part 3, p. 164 *et seq.*

male appears to be centred in the consummation of a single object,—identical with that of the female, and of absolute need to enforce the evolution of the materials of the ova within her into new organisms. To this the functions of all the newly-expanded structures in the male are mediately subservient. For this alone the little *Stylops* enjoys its brief existence of a few hours on the wing,—a life of the utmost activity and excitement,—and perishes in less than a day. For this great intent of active being it bursts forth with its expansive organs of flight, and with its antennæ and its organs of vision more extensively developed, perhaps, than in any other insect. Vision seems to be of paramount importance to it. Each mass of eyes is placed on a footstalk, and projects widely from the head, of which the two form the greater proportion. Each constitutes from two-thirds to three-fourths of a sphere, so that the sense of vision, as in the male of the hive-bee, and in that of the glow-worm, can be employed at the same instant in every direction. May not the omniscient object of this excessive development of the eyes in *Stylops*, be the detection on the wing of those *Hymenoptera* which carry about with them through the air the apodal female that awaits impregnation? The assignment of such reason for this extraordinary development of the eyes in the male, which organs are entirely absent in the female, may not, perhaps, be inconsistent with the truth. The imago *Stylops* lives not for itself, but for the perpetuation of its kind. It takes no food, as possibly the passage to its alimentary canal is then closed. Yet all its organs of consensual function, its antennæ, its palpi, its eyes, are developed to their utmost extent, relatively to its other structures, and its transient life is one of incessant action. Dr. Peck described its ceaseless agitation as the "tremblings of eager desire*," and all the facts of its natural history support this conclusion. Peck says that his insect, *Xenos Peckii*, which he confined under a watch-glass, "coursed round its prison with surprising trepidation as long as it lived, which was but a few hours." Mr. Dale says, that a *Stylops* caught by himself on the wing (*Stylops Dalii*, Curtis), when placed under a glass in the sun, "became quite furious in its confinement, and never ceased running about for two hours. The elytra or processes were kept in quick vibration, as well as the wings; it buzzed against the sides of the glass with its head touching it, and tumbled about

* Trans. Linn. Soc. vol. xi.

on its back*." The same gentleman remarks of another species, ***Halictophagus Curtisii,*** Dale, that it died on the evening of the day on which he captured it†; and Mr. Halliday states of another, ***Elenchus Walkeri,*** Curtis, that the only specimen he could "succeed in bringing home alive he put under a watch-glass, but having left it for an hour, found it dead, though placed in a cool spot‡."

It is thus evident that the life of the imago, in all the species, is a period of the most intense but brief excitement. When on the wing, Mr. Thwaites describes the *Stylopes* as "exceedingly graceful in their flight, taking long sweeps, as if carried along by a gentle breeze," usually flying high in the air, but "occasionally hovering at a few inches distant from the ground§." Mr. Dale also says of the specimen captured by himself, that "it flew with an undulatory and vacillating motion" amongst the young shoots of a quickset-hedge in his garden, and that he "could not catch it till it settled on one, when it ran up and down, its wings in motion, and making a considerable buzz or hum, nearly as loud as a *Sesia*||." These are precisely the habits we might expect to find in an insect that required to seek the object of its solicitude on the wing. But, further than this, Mr. Dale saw another *Stylops*, confined under a glass in the sun, with a bee, *Andrena labialis*, from which it had recently been developed, mount on the body of the bee, and remain seated on it, while the latter was in motion, and using every effort to rid itself of the parasite. Further, Dr. Siebold more recently has seen a male of *Xenos Rossii* mount on the abdomen of a stylopized wasp (*Pollistes gallica*), and, agitating its wings rapidly, endeavour with much ardour to introduce the extremity of its body between the segments of the body of the wasp, which doubtless contained the female *Xenos*.

It is fair to infer, then, that this is the mode in which the apodal female *Strepsiptera* are impregnated while still within the bodies of other insects, as believed by Dr. Siebold; and that to this great intent of creation every peculiarity of structure in the body of the male is to be referred; thus apparently showing, not only the dependence of function, but even also of special instinct, on peculiarities of structure. The great development of the organs of sense,

* Curtis's British Entom. fol. 226.

† *Loc. cit.* fol. 433.

‡ *Loc. cit.* fol. 385.

§ Trans. Ent. Soc. Lond. vol. iii. part 1.

|| Curtis's British Entom. fol. 226.

the extreme activity of body, and the consequent shortness of life in the male,—the invariable result of excessive action in organized beings,—all seem to have direct relation to this peculiarity of its matured instinct, while the great object of the existence of the entire family of these insects, as a part of creation, seems to be concentred in the parasitism of the larva.

Comparison of Meloë and Stylops.

Having traced the natural history of the *Strepsiptera* in connexion with their organization, we are now able to compare the facts of both with those of *Meloë* and its affinities. Both *Meloë* and *Stylops*, at the moment of escape from the egg, are hexapod insects, and both at that period attach themselves parasitically to other insects, *Hymenoptera*. The *Stylops* hatched within its parent, in the abdomen of the bee, issues forth and clings to the hairs which cover the body of the fated insect, and thus at once has a means of conveyance on the bee to her nest, in which it is to be fed. Thus provided at the instant of its birth with safe transport to its food, the *Stylops* scarcely requires the use of organs of consensual function, and, accordingly, we find that such organs, its antennæ, its eyes, are almost entirely absent, its limbs alone being those which are then needed for its purpose. The *Meloë*, destined also to be conveyed by the active bee to its nest, is hatched at the roots of herbaceous plants, in the earth, and quickly after its evolution from the egg, climbs the stems of the flowers of *Taraxacum* and *Ranunculus* to gain the interior of their calyces, where it awaits amongst the petals to attach itself to the unwary insect the instant she alights to collect pollen for her young. But for the fulfilment of this great intent of nature, the young *Meloë* is not only furnished with powerful limbs, fitted to cling firmly to its victim, but also is endowed with amazing activity, and its consensual organs are extensively developed, more especially those of vision. These organs are formed and perfected long before it leaves the ovum; and, consequent on this early maturity of structure, the function of these parts is extremely acute and instantaneous. Yet even in these the larval type of organization is still preserved. The eye, as in the true parasitic *Anoplura*, is still but a single ocellus, on each side of the head; and although most exquisitely sensible of light, is totally unfitted in its structure for distant vision, but is admirably adapted to the microscopic examination of near objects, the function specially required for the peculiar habits of the animal.

When located in the cell, which the careful parent-bee closes in to protect her young,—unconscious of the danger she has herself introduced,—the parasites, *Meloë* and *Stylops*, are very similar in their earlier changes and habits. The *Stylops*, as we have seen, penetrates into the body of the bee-larva, feeds on its substance, loses its organs of locomotion, then become utterly useless to it, and there undergoes its transformations. The *Meloë*, I have now reason to believe, also attacks the larva, while its organs of locomotion, as in *Stylops*, gradually become atrophied, and towards the end of its larva-state (Tab. XIV. figs. 15, 16) preparatory to its assuming the condition of a nymph (figs. 17, 18), have almost disappeared, being then reduced to simple tubercles. But here the analogies between *Stylops* and *Meloë* cease. The organization and habits of the latter, in its perfect state, are widely different from those of the former. The changes which the structures in the larva of *Meloë* undergo are in some parts carried to a greater extent than in corresponding parts of *Stylops*, and to a less in others, and the habits of the perfect insect as a consequence are different. From a parasitical (figs. 4, 5) the *Meloë* becomes a vegetable feeder (figs. 1, 2). The structure of the organs of nutrition are gradually altered in form during the growth of the larva (figs. 8, 10*c*, 11); and when this has changed to the nymph, and afterwards to the imago state, the parts of its mouth are then adapted only for the prehension and comminution of vegetable food.

In my former memoir, some observations on a larva (fig. 34, *u*) that seemed to be the middle stage of growth of that of *Meloë*, and which also I had found in the nest of *Anthophora* (fig. 19), led me then to the conclusion that the young *Meloë* fed only on the food stored up for the bee-larva, and consequently, that its parasitism was on vegetable and not on animal matter*.

* Note on *Cryptophagus cellaris*. (Read April 6th, 1847.)

In my first memoir on *Meloë*, read to the Linnean Society on the 18th of November 1845, I mentioned a larva of some coleopterous insect of which I had found three specimens, in a cell that inclosed also a nymph of *Anthophora*, amidst others in the same bank of earth from which I obtained the full-grown larvæ of *Meloë cicatricosus*. The general appearance of this larva induced me then to think it highly probable that this was the young of *Meloë*, in a stage of growth more advanced than that in which *Meloë* is found parasitic on the winged insect; and that, from some cause or other,—deficiency of food, or lateness of period at which they were conveyed to the cell,—these specimens had not acquired

But a close examination of the structure of the mandibles of the young *Meloë*, and its habit of appearing to seize with them, and to thrust them into the soft parts of the tegument of the bee which it clings to, as at the junction

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their full growth before the bee-larva changed to a nymph. The general appearance of the head, antennæ and eyes in these larvæ, and the existence of what might readily be regarded as atrophied caudal styles, all conspired to lead to this view; while the form of their mandibles, and the circumstance of the larvæ being included in a cell in which a bee-larva had recently become a nymph, and, above all, that of their actually feeding on the rejectamenta voided by the young bee at its change, then led me further to think that the *Meloë* is parasitic on the food of the young bee, and not on the bee itself. But as at that time the specimens were still living, and had not undergone any change since they were taken in the preceding October, I did not describe them as actually the young of *Meloë*.

As I have now traced these larvæ to their imago state, it may be well to append a short notice of the species to my paper on *Meloë*, as of an insect which is occasionally found in the cell of *Anthophora*, the usual habitation of the larva of *Meloë cicatricosus*.

The *larvæ* (Tab. XIV. fig. 34, *u*) were nearly all of the same size, and each measured about one-third of an inch in length. They were fat, white, and very active, with the body formed of thirteen segments, besides the anal one, which was employed in locomotion as a pro-leg. Each segment was armed with a few elongated tufts of hairs. In the general form of the head and antennæ the larva resembled the early stage of *Meloë*. The antennæ were four-jointed, with the second joint the longest and somewhat clavate, and the third and fourth delicate and setaceous. The head was somewhat quadrate (fig. 35), wider than long, with a short transverse lip, and a small projecting ocellus at each of its anterior angles. The mandibles were short, thick, and a little acute at the apex, and resembled those of a vegetable-feeding larva; while the palpi were filiform and slightly elongated, and the labium was narrow and deeply emarginated. The prothorax was broad, rounded in front and dilated at its sides; and the meso- and metathoracic segments were soft, and did not present any difference in appearance from those of the abdomen. The legs were short, strong, scaly, and terminated in a single acute claw; and the præanal segment was armed with a pair of short horny styles.

I kept these larvæ in a small glass vessel, partially filled with dry clay, in the midst of which I placed them, in the cell of *Anthophora*, with the bee-nymph, which they did not attempt to injure, but usually concealed themselves beneath it, amidst the rejectamenta, on which, as I have stated, they fed. They very much resembled the larva of *Opilus mollis*, figured and described by my friend Mr. Waterhouse[1]; but on showing them to that gentleman, I found they were quite unknown to him. They seemed to prefer a very dry locality, as on moistening the soil with a few drops of water they were greatly inconvenienced. In the beginning of January 1846 each specimen had quitted the cell, and excavated for itself a little burrow in the clay, and on the 28th and 29th of January they changed to nymphs.

The *nymph* (fig. 36) closely resembled in appearance that of *Diaperis Boleti*. The first and second pairs of legs were flexed at right angles with the body, and the third pair diagonally, the extremity of the femoral joint projecting externally to the elytra. The anal and præanal segments were each

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[1] Trans. Ent. Soc. Lond. vol. i. pl. 6. fig. 1.

of the thorax with the abdomen, the articulations of the wings, and of the head with the thorax, &c., have led me now to a different opinion. The entire mouth seems quite unfitted to take the food that is stored up for the young bee, and it differs entirely from that of the bee itself. The mandibles are not short and broad organs, adapted for bruising the pollen, but are thin, falcated, sharp-pointed structures, admirably formed for piercing and cutting delicate tissues. A like structure of the mandible exists in the larva of *Lytta*, and also in that of *Sitaris*. In the larva *Meloë* the mandible is very slender, acute, and three-jointed (fig. 8), as in the inferior class *Myriapoda*, and nearly resembles that of *Cermatia* and *Lithobius*, most distinctly carnivorous genera, in which the part retains its original pedal form. But in *Sitaris*, as appears from the delineation given by Mr. Westwood, the mandible is not only acute and falcated, but is also toothed on its inner margin. *Sitaris*, like *Meloë*, we have seen is parasitic in the nests of *Anthophora*. Now this form of mandible rarely or ever exists except in carnivorous or parasitic insects, as in the truly carnivorous larvæ of *Dytiscus*, *Lampyris*, *Staphylinus*, *Coccinella*, *Sialis*, *Libellula*, and other predaceous genera. On the other hand, this form of mandible is never found in the true vegetable-feeding insects, or in their larvæ. In these the mandible is usually obtuse, and fitted for crushing and bruising; sometimes it is pointed at its apex and obtusely denticulated, but always it is short, broad, and very strong at its base. This, as we shall hereafter find, is the structure of the mandible in the perfect *Meloë* (fig. 9), which feeds entirely

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furnished with a pair of short articulated styles, and the sides of the abdomen, head and thorax with long hairs.

On the 25th of February two of these specimens had assumed the imago state, and the third was then in the act of doing so, and was throwing off its tegument. They were at first perfectly white, delicate, and unable to crawl. The antennæ, thorax and parts of the mouth quickly assumed a ferruginous hue, but the elytra and body continued white for two or three days. The strongest of the two specimens which had changed was greatly inconvenienced by exposure to light, and attempted to creep up the sides of the glass and escape from its influence, but was as yet too weak to do so.

The whole of the specimens remained in the burrows they had excavated in the dry clay until the 8th of March, when they came forth, and proved to be a species of the family *Engidæ*, *Cryptophagus cellaris* of Paykull.

It is worthy of remark, that the circumstance of these larvæ feeding on the rejectamenta of the young bee, voided at its change, invalidates a statement made by Mr. Westwood with regard to insects of this group, that they "never attack either living or dead animal matter[1]."

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[1] Introduction to the Modern Classification of Insects, vol. i. p. 144.

on the leaves and flowers of the *Ranunculi* and the *Taraxacum*, devouring them in large quantities.

The conclusion, then, to which these facts seem to lead is, that the larva of *Meloë* is truly parasitical in its habits. Whether, like *Stylops*, it penetrates into the body of the young bee, or whether it preys on its substance through the wounded tegument, while the bee is nourished with its mixture of pollen and honey, is matter for future investigation. From the fact which I formerly stated, that the last skin which the *Meloë* larva throws off, before it has acquired the full-grown apodal state,—in which I have found it in the cells of *Anthophora*,—still retains the envelopes of the claws, and of very short tarsal, tibial and femoral joints, I am inclined to believe that it does not enter the body of the bee-larva: that in all probability it wounds it, and preys on its fluids from without. This kind of parasitism resembles that of *Scolia flavifrons* on the larva of *Oryctes nasicornis*, as recently so well shown by Signor Passerini *.

The anatomy of the young *Meloë* larva shows that its attack on the bee must take place at an early period; and either, that having destroyed the recently hatched bee-larva, its first tegument is cast, its mandibles are altered, and it then subsists on the food that had been stored up for the bee in the closed cell, and there gradually changes its form to that in which I have constantly found it (fig. 15); or that, like the larva of *Clerus*, having destroyed the bee in one cell, it penetrates into another and preys on the inhabitant, until it has attained its full growth, when it remains in one of these cells and undergoes its metamorphoses. The structure of the full-grown larva, the form of its head (fig. 10) immediately before it enters that state in which I have obtained it, the very altered form of its mandibles at that period, changed from the slender acute organs (fig. 8) it possessed at its birth, to thickened, short, corneous, obtuse jaws (fig. 11), fitted for bruising or comminuting its food, and its thickened, diminutive legs (fig. 14),—facts of its organization which I have ascertained by relaxing and unfolding the skin which it throws off on entering the apodal state,—all conspire to lead me to incline to the first of these views. This may explain the supposed anomaly in the habits of the species, of a sudden transi-

* Osservazioni sulle larve, ninfe, e abitudini della *Scolia flavifrons*, del Dott. Carlo Passerini. Pisa, 1840, 4to, pp. 15. Continuazione delle osservazioni nell' anno 1841 sulle larve di *Scolia flavifrons*. Firenze, 1841, 4to, pp. 7.

tion from a carnivorous to a truly vegetable-feeding insect, the transition itself being in reality gradual, like the change which takes place in the form of its manducatory organs. The manner in which the change in the structure of these parts is effected, and the slender, jointed, unguiculated, pediform organ of the young larva, fitted only for piercing and for prehension, is altered to the short, obtuse, and powerful jaw, is by the relative shortening, consolidation, and anchylosis of the coxal, femoral, and tibial divisions of the pediform mandible, whilst the long claw-like and acute apex is deciduated and entirely thrown off as a portion of the tegument at the next change of skin. This relative shortening is continued throughout the metamorphoses, and in this way the organ is gradually more and more altered in structure (fig. 9), is fitted for a new function, and is adapted for a complete change in the habits of the imago.

A general correspondence in structure thus seems to indicate similar correspondence in habit and function. Those families of insects which are most nearly allied in organization approach the most nearly to each other in their economy. But they differ from each other in the divergence of their particular habits or instincts from one general character, according as the structures which minister to those habits or instincts depart from the common type of formation. The larva of *Sitaris*, in the general conformation of its body, resembles that of *Meloë*, and both, as we have seen, are parasitic in their habits in the nests of the same genus of insects; but they differ in their special economy as well as in particular details of structure. All we yet know of the habits of *Horia* shows that this family also is parasitic in its larva state in the nests of the carpenter-bee. The perfect insect has long been known to be allied in general structure to the perfect *Meloë*, and I have little doubt that it approaches closely to that of *Meloë* and *Sitaris* in the early stage of its larva. The drawing given by the Rev. L. Guilding of the advanced stage of the larva of *Horia*, and the fact that Mr. Guilding's specimen has six short legs, so closely agree with the advanced stage of *Meloë*, that we may fairly regard the general form of the larva in the earlier stages of these two insects as similar, and conclude that *Horia*, *Sitaris* and *Meloë* all at first are parasitic on the bee-larva.

EXPLANATION OF THE PLATE.

Tab. XIV.

Fig. 1. *Meloë cicatricosus*, male:—natural size.

Fig. 2. *Meloë cicatricosus*, female:—natural size.

Fig. 3. The egg:—natural size.

Fig. 4. Larva of *Meloë violaceus* (natural size) soon after leaving the egg.

Fig. 5. The same, magnified. Fig. 6. The antenna. Fig. 7. Anterior leg. Fig. 8. Mandible of the larva articulated like that of the predaceous *Myriapoda*.

Fig. 9. Mandible of the perfect insect, *Meloë violaceus*.

Fig. 10. Form of the head of the matured larva of *Meloë cicatricosus* (magnified), as ascertained by examination of the cast exuviæ constantly found adhering to the full-grown or pseudo-larva (fig. 16) in the cell of *Anthophora retusa*. *a.* Antenna. *b.* The ocelli, three on each side, the anterior one the smallest. *c.* The mandible. *d.* The labrum.

Fig. 11. The mandible (magnified), seen on the under surface, as in fig. 9. *e.* The inferior articulation.

Fig. 12. Maxilla of the same, magnified. *f.* Maxillary palpus. *g.* Internal lobe of the maxilla.

Fig. 13. The labium, with its palpi.

Fig. 14. Leg of the matured larva of *Meloë*, as ascertained by an examination of the cast tegument:—magnified.

Fig. 15. The adult or pseudo-larva of *Meloë cicatricosus* (natural size), as found in the cell of *Anthophora*, with its organs of manducation and locomotion reduced to mere tubercles previous to their re-development in the nymph state.

Fig. 16. Highly magnified view of the head and legs of the same.

Fig. 17. The nymph or pupa of *Meloë cicatricosus* (natural size) inclosed in its cast pseudo-larva-skin, as constantly found in the cell of *Anthophora*.

Fig. 18. Inferior surface of the nymph, magnified 2 diameters, showing the large size of the head and organs of manducation.

Fig. 19. The imago *Meloë* in one of the cells of *Anthophora*, inclosed in its pseudo-larva-skin.

Fig. 20. Adult female of *Stylops aterrimus* vel *Melittæ*, highly magnified. A. Ventral surface of thorax. B. Abdomen. *a.* Mandible. *b.* Labial plates and mouth. *c.* The vulva, or outlet of the female organs. 1, 2, 3. The three thoracic segments united.

a. The adult female:—natural size.

Fig. 21, 22. The larva of *Stylops* on the hair of *Andrena Trimmerana,* soon after birth :—magnified.

Fig. 23 to 32. The ovum in various stages of development. *a.* The yelk formed of cells. *b.* The blastodermic layer. *c.* Sulcus on the yelk. *d.* The blastoderma reflected on itself, and forming the ventral surface of the future embryo. *e.* The thorax, and entrance of the last portion of the yelk. *f.* The legs. *g.* The amnion.

Fig. 33. The male *Stylops aterrimus* :—highly magnified.

a. The same :—natural size.

Fig. 34. The larva of *Cryptophagus cellaris* :—magnified.

u. The same :—natural size.

Fig. 35. The head of ditto :—magnified.

Fig. 36. The nymph state :—magnified.

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MDCCCLI.

XVIII. *Note on* Samara læta, *Linn.* *By* G. A. Walker-Arnott, *Esq., LL.D., F.L.S. &c., Reg. Prof. of Botany in the University of Glasgow.*

Read March 16th, 1847.

Perhaps few plants described by Linnæus froms pecimens actually in his herbarium have remained so long doubtful as the one on which I am about to make the following observations.

The genus *Samara* was instituted in 1771 by Linnæus in the 'Mantissa Plantarum': and he unfortunately associated with it, as a synonym to his only species (the *S. læta*), the No. 469 of the 'Flora Zeylanica,' of which no specimen existed in Hermann's herbarium, but which was referred to the *Cornus Zeylanica sylvestris altera* of Burmann's 'Thesaurus Zeylanicus,' tab. 31. It is not easy to explain what could have induced Linnæus to quote this figure, as it bears no resemblance to the plant he himself possessed. Some foreign botanists, deceived by this reference to Burmann, appear to have supposed that Linnæus had no specimen of what he described, and that Burmann's figure must be held conclusive on the point. Accordingly we find M. de Jussieu in his 'Genera Plantarum,' p. 379, placing the genus among his *Rhamni*, quoting the Linnean generic character and description, but pointing out a discrepancy between the position of the leaves as indicated by Linnæus, and that of those figured by Burmann.

To the synonym of Burmann, Poiret in the 'Encyclopédie Méthodique,' vi. p. 485, adds that of *Samara læta* of Swartz's 'Prodromus,' p. 151; and he gives a detailed description, partly derived from the Linnean description, partly from Burmann's. DeCandolle in the second volume of the 'Prodromus,' while describing the genera and species of *Rhamneæ*, omits *Samara*, and does not even allude to it among the genera formerly referred to the order. In the 'Linnean Transactions,' xvii. p. 137, however, his son says, "*Samara*, Linn. non Sw., *Cornus Zeylanica*, Burm.! Zeyl. tab. 76, ad *Rhamneas* referenda cum celeb. Jussieu:" and this is repeated in the 'Annales des Sciences Naturelles,' (n. s.) ii. p. 301, where the quotation of *tab.* 76, instead of *page* 76. tab. 31, has given occasion to a rather unmerited criticism in Meisner's 'Plantarum Vasculosarum Genera,' ii. p. 51. In the 8th volume of the 'Prodromus,' at p. 76, this is corrected: here he says, "*Samara*, Linn. non Sw., est *Cornus Zeylanica*, Burm.! Zeyl. p. 76. tab. 31, quæ *Rhamnea*, ut dixit cel. Jussieu;" and from the mark after Burmann's name in these three places, M. Alph. DeCandolle seems to have himself seen and examined Burmann's specimens. But, what is not a little remarkable, a few pages further on (p. 103) he says, when describing *Samara læta*, Sw., "*S. læta*, Linn. Mant. p. 199, est *Memecylon umbellatum* (fide Guillemin in litt.) ex Indiâ Orientali," Guillemin's allusion being obviously also to Burmann's specimen, now in M. DeLessert's herbarium, of which he was Curator. That M. Guillemin is correct in referring Burmann's plant to *Memecylon*, an attentive comparison of the figure with specimens will convince almost any one, although by some unaccountable mistake only *four* stamens, instead of eight, are described and figured by Burmann: indeed, if the figure were to be trusted to implicitly as to the number of stamens, we must also confide in its accuracy as to their position, and then allow that they are alternate with, *not opposite* to the petals; this latter portion of the usual generic character of *Samara* being derived from Linnæus's description alone. In no respect, then, ought Burmann's plant to be associated with either *Rhamneæ* or *Myrsineæ*, from which, too, the opposite leaves separate it.

The first, so far as I am aware, who suspected that there was an error in Burmann's figure was Lamarck (Encycl. Méth. iv. p. 88), who quotes it with doubt under his *Memecylon ramiflorum*, and says: "Je ne douterois presque pas que cette espèce n'appartient à la figure citée de Burmann (figure que Linné rapporte à son *Samara læta*, bien qu'elle offre des feuilles opposées, le *Samara* les ayant alternes), si Burmann n'attribuoit aux fleurs seulement quatre étamines. En effet la forme des feuilles et la disposition des fleurs de la plante que je vais décrire y sont rendues avec assez d'exactitude pour qu'il ne soit pas facile de l'y méconnoître." This assertion is however in some measure neutralized by the descriptions attached to the 'Illustration des genres,' where he quotes Burmann's figure for the *Samara læta*, and copies it also, in tab. 74, as the typical representation of the Linnean genus, even although the stamens, after Burmann, are exhibited alternate with the petals, not opposite to them as in the description (i. p. 303). In the 'Prodromus Floræ Peninsulæ Indiæ Orientalis,' i. p. 319, Dr. Wight and I, in 1834, referred Burmann's plant to *M. ramiflorum*, Lam., or *M. umbellatum*, Gærtn., without any hesitation, and stated that "Burmann in his figures of this *and of M. capitellatum* has only noticed four stamens, thereby leading Linnæus and others to refer tab. 31 to the very different *Samara læta*," Burmann's equally faulty figure and description of *M. capitellatum* having been overlooked, while it was made of importance in *M. ramiflorum*. At that time I had not analysed the true *S. læta*, and therefore was obliged to leave it in uncertainty, although from a pen-and-ink sketch, traced for me by Dr. Wight from the Linnean specimen, I had little doubt in my own mind that it would prove a Myrsineous plant, and closely allied to *Choripetalum*, if not of the same genus. Dr. Lindley in his second edition of the 'Introduction to the Natural System,' p. 225, refers it to *Myrsineæ*, and almost next to *Choripetalum*: but I do not now remember if, amongst a few memoranda I sent him for that edition, I gave him my views of the position of the genus, and induced him to place it in an order from which he has since removed it. Meisner in his 'Plantarum Vasculosarum Genera,' ii. p. 51, adopts Dr. Wight's and my conclusions as to Burmann's plant, but refers "*Samara*, Linn. (non Sw.)" to *Rhamneæ*, "Genus non satis notum, sed verosimiliter *Rhamnaceum* genuinum." Endlicher in his 'Genera Plantarum,' p. 1104, places *Samara* of Linnæus among the "*Genera Rhamneis affinia*," and excludes the synonym of Burmann; but whilst he does so, he most unaccountably adds, "arbuscula Zeylanica," which applies solely to Burmann's plant, Linnæus nowhere saying that his was obtained from Ceylon. Lastly, following these, Dr. Lindley in his 'Vegetable Kingdom' refers the Linnean plant also to *Rhamneæ*, but with a mark of doubt.

Whilst making some observations on the *Corollifloræ* in the 'Annales du Muséum,' xv. pp. 351 and 353, Jussieu states that he had previously referred *Samara* to the *Rhamneæ* "à cause de sa corolle indiquée comme polypétale;" and he now compares it with *Myrsine*. He supposes however *Myrsine* to have a 5-celled and 5-ovuled ovary, while the *Ardisiaceæ*, its allies, had an unilocular ovary: on which account he proposes to place *Myrsine* either at the end of the *Sapoteæ* or beginning of *Ardisiaceæ*. "On désire" (he adds) "de nouvelles observations sur le *Manglilla*, le *Rapanea*, le *Samara* et l'*Atruphyllum*, pour savoir si la disposition des fleurs en faisceaux les rapproche plus de *Myrsine*, ou si le fruit monosperme les lie davantage à l'*Ardisia*. Ils paroissent, au moins, devoir occuper la place intermédiaire." This passage, containing Jussieu's later and more matured opinion on the position of *Samara*, is the more important, because *Myrsine* itself has a one-celled ovary, and therefore the only reason for not placing it in the *Ardisiaceæ* was disposed of. Jussieu may therefore be said, in 1810, to have virtually referred *Samara* to his *Ardisiaceæ*, now usually called *Myrsineæ*; but this indication appears to have been overlooked, most botanists in modern times adverting only to the early opinion expressed in 1789 in his 'Genera Plantarum.'

In 1788, Swartz published his 'Nova Genera et Species Plantarum, seu Prodromus;' and among the *addenda et corrigenda* to that volume, he gives a specific character of *S. læta*, Linn., in order to distinguish it from his own *S. coriacea*. That Swartz did not consider *S. læta* to be a West Indian plant is obvious from his inserting observations in the same place on *Cynomorium coccineum* and *Diodia virginica*. These *addenda et corrigenda* were probably written after he had seen the *S. læta*, Linn., or a specimen so called; but the specific character he has given might have been equally well drawn up from Linnæus's description. In the first volume of the 'Flora Indiæ Occidentalis,' published in 1797, he also mentions this plant, but not as a native of the West Indies or belonging to his Flora: he merely says of it, when speaking of *S. coriacea*, "Distinguitur a *Samara læta*, L., cui folia minora tenuiora obtusa, flores conferti nec glomerati sed umbellati, pedicellis sesquilinearibus, corollæ coloratiores." Now here are some particulars which he could scarcely have gleaned from any portion of the Linnean description; and which lead to the conclusion that, at least before 1797, he had access personally to a specimen so named, and which he supposed to be the Linnean plant.

Three things must therefore be kept in view as to the species noticed by Swartz: 1st, he nowhere says that it is a native of the West Indies or of America; 2ndly, he merely introduces it to enable other botanists to understand better the difference between it and his own *S. coriacea*; 3rdly, the *S. læta* of which he speaks, he intends to be that of Linnæus. These positions are the more necessary to be recollected, because M. Alphonse DeCandolle in the 'Prodromus,' viii. p. 103, assumes it as a fact, that the Swartzian plant was from America, and therefore that it must be different from the Linnean one obtained from the East.

Where Swartz saw the plant which he considered the *S. læta* of Linnæus is fortunately a point not very difficult to be conjectured. In the short sketch of the Life of Swartz published in Hooker's 'Botanical Journal,' ii. p. 384, it is stated: "At length, in 1786, he returned to Kingston in Jamaica, where, out of attachment to his native land, he declined the honour that was offered to him of being appointed Botanist to His Britannic Majesty, and embarked for England on his way to Sweden. He remained for some time in London, profiting by the opportunity thus afforded him for examining the vast treasures *in the Banksian herbarium,* and comparing the plants that he had himself brought home *with this and other collections,* and then in 1789 he returned to his own country." I am however informed by Mr. Bennett, that "there is a letter from him to Sir Joseph Banks, dated Orfordness, 23rd July, 1787, when he was just on the point of soon losing sight of England; and another from Norrkoping in Sweden, dated 29th August, 1787." As the title-page of the 'Prodromus' bears date 1788, it may be inferred that this work was printed immediately after his return to Sweden, and that the manuscript had been drawn up in the West Indies. Moreover, there is another letter from him to Sir Joseph Banks, written from Jamaica on 1st March, 1786, so that it must have been between the summers of 1786 and 1787* that Swartz examined the Banksian collections, and there made the observations on *S. læta,* which he afterwards inserted in his 'Flora Indiæ Occidentalis.' How far the plant so called, which is preserved in the Banksian herbarium, differs from the Linnean specimen, I shall notice presently. The marks given by Swartz in the 'Flora Indiæ Occidentalis' for distinguishing it from *S. coriacea,* are strictly applicable to the specimens in the Banksian collection:

* Abundance of documents no doubt exist in London to prove the exact period during which Swartz was so engaged, as also when the 'Prodromus' was written, and the *addenda and corrigenda* made. I am unwilling to refer to memoranda of my own, or to hearsay evidence; the above is sufficient to establish that Swartz must have seen the *S. læta* of the Banksian herbarium before he published the 'Flora Indiæ Occidentalis.'

they apply also to the Linnean specimens, then in England; but it is not probable that Swartz examined the latter, otherwise he must have taken notice of one of the flowers having stamens longer than the corolla.

In 1810, Mr. Brown in the 'Prodromus Floræ Novæ Hollandiæ,' p. 533, refers the *Samara coriacea* of Swartz to *Myrsine* along with the *S. floribunda*, Willd., and *S. pentandra*, Hort. Kew.; but although specimens of *S. læta* were in the Banksian herbarium, there is no indication there, or in any other of his valuable writings, so far as I can discover, what were the opinions he entertained of the species in question, or of *Samara* itself as a genus.

That it ought not to be compared with the *Rhamneæ*, at least as now restricted, must be obvious to any one who attends to the description of the *small* quadripartite calyx, which is minute in comparison of the corolla, while in the *Rhamneæ* the calyx is large, and the petals either wanting, or of so anomalous a shape that they scarcely merit the name. On the other hand, if we compare the Linnean character with *Myrsine*, the principal difference lies in *Samara* being said to have four distinct petals, *Myrsine* usually five and united at the base into a gamopetalous corolla. It was these considerations which principally induced me in 1833, whilst disposing of Burmann's 'Thesaurus Zeylanicus,' tab. 31, to suspect that *Samara* might be the same as the genus now called *Choripetalum* by M. Alph. DeCandolle. At the same time, as other species referred to *Samara* had been ascertained to have a gamopetalous corolla, an examination of the Linnean specimen was necessary.

This I was not able to accomplish before 1845, when I had an opportunity of seeing the specimen in both the Banksian and Linnean herbaria, and was permitted to analyse a flower of each. And here I may mention, that the specimens I have seen are six in all; three in the Linnean, and three in the Banksian herbarium. In no other collection have I yet met with any similar plant, or one liable to be mistaken for them. The three in the Banksian herbarium are all from China. No. 1 from H. Bradley, 1779; No. 2 from Macao, David Nelson, 1780; and No. 3 from Sir G. Staunton: probably all are from Macao or the neighbourhood of Canton. These agree in every respect with each other: all have perfect stamens not longer than the corolla, and a sterile ovary without a style. Of the three preserved in the Linnean herbarium, two have a fertile ovarium and style, and no station attached to them: one fastened on a separate sheet of paper has the following manuscript generic character written by Linnæus on the back of the sheet:—"*Calyx* 4-partitus, ovatus, acutus, parvus. *Cor.* Petala 4, ovalia, patentia, basi lacuna. *Stam.* Filamenta 4, subulata, *brevissima*; lacuna corollæ laciniis fossula singulis impressa. *Antheræ* subcordatæ, corolla duplo breviores. *Pistill.* Germen ovatum, longitudine ½ calycis, desinens in cylindrum calyce ferè longiorem. *Stigma* obtusum, infundibuliforme. *Bacca* 1-locularis, monosperma." Now, as far as regards the short stamens, and almost everything except the fruit, which is not present, this description applies to the specimen in question, as also to the other glued to the second sheet of paper. The anthers however appear solid and without pollen. With regard to the fruit, there is nothing which could be so called on either specimen; the ovary is considerably advanced, and in this state is not different from what is found in *Myrsine*: there are two ovules imbedded in the upper half of a large, globose, central, free placenta: I have no doubt that Linnæus described this central placenta for the seed.

Now in almost every published description of this genus the filaments are said to be "elongata," and the fruit a "drupa." Even Sir J. Smith, in Rees's 'Cyclopædia,' although the generic character he there gives be in other respects almost a literal translation of the above in the Linnean herbarium, says, "Filaments 4, awl-shaped, *long*," and "Drupe roundish. Seed solitary." This difference in the mode of describing the stamens is remarkable, and might lead one to suspect that if the manuscript description were correct, the published one might have been derived from the figure in Burmann's 'Thesaurus Zeylanicus,' tab. 31: and perhaps the supposition that the two were the same species might have influenced Linnæus to think that the stamens he had previously described in manuscript had been injured, for the third specimen in the Linnean herbarium presents amongst several unexpanded flowers one, and but one, with the stamens protruded and nearly twice as long as the corolla. This specimen has the word "India" written under it.

The whole six specimens agree in habit, in foliage, and nearly so in the inflorescence and calyx. They differ in some respects in the corolla and stamens. The Banksian (male) specimens approach more in the corolla and stamens to the female plants in the Linnean herbarium, than to these parts in the

Linnean sterile one. In the Banksian plants the petals are of a thicker texture than in either of the others, particularly their lower half towards the margins, as if the margin had been inflexed and become adnate to the inner surface of the petal: there is also a conspicuous canal behind the filament, and to which the latter is applied: the petals are of a much darker colour than in the Linnean sterile one, and agree better in that respect with the Linnean fertile ones. The dots or glands on the petals are oblong and very obscure; in all the three Linnean specimens these are round, and in the sterile plant are very conspicuous. In the Linnean fertile plant the petals exhibit a small lobe at the base folded up against the face of the petal, and more or less agglutinated with it, although occasionally I find it free: the space between these lobes forms the "fossula" of Linnæus. In the sterile specimen there was a similar structure.

A question now arises whether there be one, two, or even three distinct species. They all agree, as I have said, in several particulars; on the other hand, the bark of the fertile specimen exhibits numerous small, prominent, but conspicuous tubercles or lenticellæ, which are either wanting or much less conspicuous on the Linnean sterile one: I am inclined however to consider this difference as connected with the portions of the shrub from which the specimens have been taken, as I find similar differences on specimens of what I consider to be *Choripetalum aurantiacum*, Alph. DeCandolle. The principal distinctions lie between the sterile plants, those in the Banksian herbarium having short but perfect stamens, while in the Linnean one the stamens are elongated; and as the three in the Banksian collection agree with each other, although collected by different individuals and at different times, I can scarcely attribute the shortness of the filaments to the flowers not being sufficiently developed, although I consider that is the reason for only one flower on the Linnean specimen having long stamens. As to there being *three* species confused, I see no reason for such an hypothesis, the differences between the Banksian specimens and the Linnean fertile ones being scarcely greater than might be expected in flowers of different sexes. The principal difficulty lies in the Linnean sterile specimen; but, on the other hand, it agrees better, in the petals having their inflected portion confined to the base, with the fertile plants, than with the Banksian specimens.

In Carey's edition of Roxburgh's 'Flora Indica,' vol. ii. pp. 299 and 300, Dr. Wallich has described two plants, for which Alph. DeCandolle has since constituted the genus *Choripetalum*. Of the one, *Ch. undulatum*, the female only is known, and the analysis accords well with that of the female of *Samara læta*: we find the same short stamens, thickish style and stigma in both. Of the second, *Ch. aurantiacum*, Dr. Wallich only knew the male, in which the stamens were twice the length of the petals, and the ovary rudimentary without any style: but in his 'List,' No. 2299, he associates with it a specimen from Dr. Wight in fruit; and, as a corresponding one from Dr. Wight is before me, I am enabled to refer to Dr. Wallich's, and consequently to M. Alph. DeCandolle's plant with considerable certainty, although there were no specimens of either among the valuable collections I received from Dr. Wallich. Since Dr. Wight's return to India, he has met with the same at Quilon, and I believe there only; and among the specimens transmitted to me are three forms, all agreeing in habit, inflorescence and foliage, sent without any hesitation as one species. One of these shows the stamens exserted, and accords well with Dr. Wallich's description; a second has the flowers expanded, but the petals shorter, and the stamens about the length of the corolla; the third is in immature fruit. The differences are certainly not less than in the three forms of the *Samara læta* alluded to. It may be said, that the second form with expanded flowers and short stamens might, when further developed, have exhibited the stamens elongated, but in their present state they are more developed than in the Banksian specimens of the *S. læta*; and if we allow that the stamens would have been elongated when fully developed in the one case, we may in the other. I cannot satisfy myself however that such is the cause in either case; but I refer to this parallel instance to bear on the point, that there seems no reason for supposing that the six specimens of *S. læta* differ specifically*. In 1833, while examining the genus *Hedyotis*, I was much struck with the great length of the filaments on some specimens and their shortness on others of what I could not otherwise believe to be distinct species: in these the style was usually in an inverse proportion, but in both states was fertile. I am by no means certain if the structure in *Samara* or *Choripetalum* ought to be considered analogous.

* I have no doubt that the inconstancy in the length of the stamens applies to *Myrsine*; and therefore that some of the sections proposed by M. Alph. DeCandolle are of no value.

I shall now add the analysis I have made of the *Samara*, keeping distinct, when necessary, the three forms spoken of.

Flores abortu dioici. Calyx minutus, paullò ultra medium quandoque ferè ad basin quadrifidus, segmentis latè triangularibus, acutis vel obtusiusculis, ciliolatis, æstivatione remotiusculis. Masc. Corolla calyce quadruplò longior. Petala quatuor, imo calyci inserta, sessilia, separatim cadentia, ovato-oblonga, obtusa, ciliolata, æstivatione imbricata petalis duobus exterioribus duobus interioribus (*in exempl. Banks.*: fusca lineolis crassis brevibus atro-fuscis obscuris punctata, dorso sublævia, infernè versus marginem quasi introflexum et ad basin crassiuscula, medio intùs supra staminis insertionem subcanaliculata, apice plana tenuiora; *in exempl. Linn.*: viridi-brunnea, glandulis rotundis crebris conspicuè notata et dorso subasperata, ad basin intùs utrinque incrassata, sursum concava, vix ac ne vix canaliculata, apice tenuiora). Stamina quatuor, petalis opposita et paullò supra basin inserta (*in exempl. Banks.*: corollâ sub-breviora, filamentis latè subulatis ad petalorum canaliculum applicita; *in exempl. Linn.*: in alabastro corollâ dimidio breviora filamentis brevissimis, in flore explanato filamentis filiformibus corollam ferè duplò superantibus). Antheræ medio dorso affixæ, connectivo latiusculo, erectæ, introrsæ, glandulâ apicali destitutæ, biloculares, loculis longitudinaliter e basi versus apicem dehiscentibus (*in exempl. Banks.*: subrotundæ, basi apice subemarginatæ, filamento vix breviores; *in exempl. Linn.*, saltem in alabastro*, cordatæ). Pollen minimum, ellipsoideum, læve. Pistillum imperfectum, liberum, minutum, calyce brevius, ovato-conicum, fuscum. Fœm. Corolla quam in masc. major, calyce 4–5-plò longior. Petala quatuor, imo calyci inserta, sessilia, ovalia, obtusa, margine copiosè ciliolata, brunnea, ad basin lobulo inflexo intùs adnato utrinque incrassata, concava at medio supra staminis insertionem haud canaliculata, supernè tenuiora, glandulis rotundis conspicuis aurantiacis punctata et dorso subasperata, æstivatione ut in masc. Stamina quatuor, petalis opposita et paullò suprà inserta, ac iisdem subdimidio breviora. Filamenta subulata at brevissima. Antheræ cordatæ, majusculæ, subcereæ, polline nullo. Ovarium liberum, 1-loculare, receptaculo magno globoso libero centrali sessili, ovatum, apice in stylum conicum corollâ brevius (in exempl. suppet. flexuosum) angustatum. Stigma dilatatum, medio depressum, margine obscurè fimbriato-lacerum. Ovula pauca, duo (an semper?), receptaculo supra medium immersa, lentiformia.

Frutices. *Rami cinerei*, in exempl. Linn. masc. *sublæves*, in fœm. *lenticellis crebris notati.* Folia *alterna, oblonga, integerrima, obtusa, basi paullò angustata, pallida, subtùs tamen pallidiora, glaberrima, tenuia ac minimè coriacea, lineolis fuscis crebris punctisque qui-*

* There being, as already said, but one flower with exserted stamens, I could not soften it in water so as to ascertain the true form of the anthers; but there is no reason to suppose that they afterwards differ from what I observed in the bud.

busdam rotundis (*post in aquâ macerationem conspicuè*) *notata,* 1–2-*uncialia,* $2\frac{1}{2}$–$2\frac{3}{4}$-*plò longiora quam lata.* Petiolus *sub-bilinearis.* Flores 5–7 *in corymbulum vel racemum brevem axillarem pedunculatum, folio* 3–4-*plò breviorem digesti.* Pedicelli *sublineares, bracteolâ dimidio breviore oblongo-lanceolatâ glandulis notatâ margine hinc inde ciliolatâ basi instructi, læves vel pilis glanduliferis paucis.* Pedunculi 1–2-*lineares.*

I should suppose, then, that no doubt can now exist as to the proper place for *Samara,* and also that *Choripetalum* of M. Alph. DeCandolle must be considered a synonym. The only difference is in the inflorescence : in *Samara læta* we find the raceme contracted into a kind of little corymb ; in *Choripetalum* the raceme is elongated. In *Choripetalum undulatum* Dr. Wallich finds only two ovules, precisely as in the ovaries of *S. læta* which I examined ; but in Wight's fructiferous specimen, correctly, as I think, referred by M. Alph. DeCandolle to *Ch. aurantiacum,* there appear to me indications of a greater number, but I do not yet quite understand the structure of its seed : in that plant, too, the rachis of the spike (for the pedicels are too short to permit it to be called a raceme) becomes woody in the female plant as the fruit ripens, resembling a short branch : its leaves are extremely variable, sometimes oblong, or ovate-lanceolate, and acute, sometimes elliptical and obtuse. The only positive character by which this genus can be separated from *Embelia* lies in the quaternary, not quinary, parts of the flower ; perhaps the æstivation may also slightly differ ; and it is not improbable that all the species exhibit the stamens elongated in some of the male flowers : but upon these latter points we have as yet no good information. As however I am of opinion that the relative length of the stamens and petals is not of specific importance, I am inclined to distinguish the four species hitherto discovered shortly as follows :—

S. læta, floribus corymbosis, bracteis pedicello duplò brevioribus, petalis intùs glabris, foliis membranaceis planis*.

S. læta, L., Sw., &c.

Hab. In Chinâ†.

* I do not see how *Choripetalum obovatum,* Benth. in Hook. Lond. Journ. of Bot. i. p. 490, differs, but I have not had an opportunity of examining the specimens collected at Hong-Kong by Mr. Hinds : they are obviously the female.—April 3rd, 1847.

† I have no doubt that all the Linnean specimens of *S. læta* were collected in China, and perhaps by Osbeck, and not in India strictly so called.

S. undulata, floribus racemosis, bracteis pedicello multò brevioribus, petalis intùs glabris, foliis membranaceis undulatis.

Myrsine? undulata, Wall. in Roxb. Fl. Ind. i. p. 299.

Choripetalum undulatum, A. DeC. in Linn. Trans. xvii. p. 131.

Hab. In Nepaliâ.

S. viridiflora, floribus racemosis, bracteis pedicello duplò brevioribus, petalis subacutis intùs subvelutinis, foliis subcoriaceis.

Choripetalum viridiflorum, A. DeC. Prodr. viii. p. 88.

Hab. In Javâ.

S. aurantiaca, floribus subspicatim racemosis, bracteis pedicellum florigerum brevem superantibus vel subæquantibus, petalis intùs velutinis, foliis coriaceis.

Myrsine? aurantiaca, Wall. in Roxb. Fl. Ind. i. p. 300.

Choripetalum aurantiacum, A. DeC. in Linn. Trans. xvii. p. 131.

Hab. In Penins. Indiæ Orient., ad Quilon.

To the above I may add what appears to be another species, but of which I have received but one specimen, the male plant, with the buds not expanded. This has the petals in æstivation nearly as described in *S. viridiflora,* and slightly convolute: these seem to be white and glabrous on their inner surface, but covered on the back with numerous black, prominent glands. The rachis of the raceme and the pedicels are scabrous from the presence of short rigid hairs, often tipped by a gland. The leaves are oval-lanceolate and on longish petioles. With this a fructiferous specimen in Herb. Wight (apparently selected to correspond with Wall. L., No. 2299 B, when the latter was sent by him to Dr. Wallich) agrees in the pedicels being so long as to form a distinct raceme. Other specimens in my own herbarium, also from Dr. Wight, exhibit the same conspicuous pedicels ($1\frac{1}{2}$ to 2 lines long), but others have short ones (scarcely half a line long) as in Wall. L., No. 2299 B, in the Indian herbarium of the Society. At that time Dr. Wight probably considered all these fructiferous specimens as one species; and their foliage and general aspect differ in no respect. I incline however to think that there may be two, and that the specimens with longish pedicels, which Dr. Wight has again found at Quilon, ought to be referred to *S. atro-punctata.* Dr. Wallich describes the pedicels of *S. aurantiaca* as being "very short:" and in the Indian herbarium of the Society, Wall. L., No. 2299 A, the pedicels are short, but obvious. These specimens were raised in the Calcutta Botanic Garden from seeds sent by Dr. Heyne: but in my native specimens from Quilon, also of the male plant, the flowers are almost sessile, so that the bracteoles sometimes reach up to the middle of the calyx. If the length of the pedicels affords no assistance, it will be impossible to say to which species the fructiferous specimens belong: and if moreover the petals of *S. atro-punctata* become pubescent on their inner surface as the buds expand, the supposed new species may have to be again reduced. At present I distinguish it as follows:—

S. atro-punctata, floribus racemosis, bracteolis pedicello florigero duplò longioribus, petalis obtusis intùs glabris, foliis coriaceis.

Hab. In Penins. Indiæ Orient., ad Quilon.

XIX. *On a new Genus of Plants of the Family of* Burmanniaceæ. *By* John Miers, *Esq., F.R.S., F.L.S. &c.*

Read April 20th, 1847.

THE curious little rhizomatous plant that forms the subject of the present notice is a native of Brazil, and is the more deserving of attention on account of its close relation to another not less singular plant lately found in a very opposite quarter of the world: but before offering any remarks on its affinities, I will present an outline of its generic features. The name by which I propose to distinguish it is *Ophiómeris*, from ὄφις, *serpens*, μερὶς, *membrum*, on account of the serpentine shape of the interior segments of its perianthium, which assume very much the same form as those of the remarkable genus *Triuris*, the details of which have been honoured with a place in the Society's Transactions*.

Ophiómeris.

Char. Diff. *Perianthium* superum, tubulosum, gibbosum, caducum; fauce laterali annulo semiclausâ; limbo 6-partito, laciniis 3 exterioribus brevibus ovatis, 3 interioribus longissimis subulatis. *Stamina* 6, libera, infra perianthii faucem inserta et ejus laciniis opposita, inclusa, versus tubum retroflexa; filamentis petaloideis expansis, margine appendiculatis; antheris adnatis, in sinu filamentorum terminalibus, 2-locularibus, loculis longitudinaliter dehiscentibus. *Ovarium* inferum, 1-loculare; placentis 3 parietalibus, medio ovuligeris, ovulis indefinitis anatropis. *Stylus* brevis. *Stigmata* 3. *Fructus* turbinatus, truncatus, apice operculatim dehiscens, 1-locularis. *Semina* plurima scobiformia. *Embryo* ignotus.

Char. Nat. *Perianthium* monophyllum, petaloideum, tubulosum, imo ovario adnatum, demùm circumscissum et deciduum, tubo lineis 6 notato, ventricoso, valdè gibboso, fauce ferè laterali valdè contractâ, coronâ depressâ annulari, margine integro colorato; limbi laciniis 6, in duplici serie, inæqualibus; 3 exterioribus (sepalis) obovatis, obtusis, reflexo-patentibus, æstivatione subimbricatis; 3 alternis (petalis) angustioribus tereti-subulatis,

* Trans. Linn. Soc. xix. p. 77.

longissimis, tubum æquantibus, æstivatione spiraliter inclusis. *Stamina* 6, æqualia, inclusa, libera, laciniis opposita, infra coronam orta; filamenta omninò retroversa et juxta tubi parietem deflexa, in laminas subpetaloideas complanata, citò contracta, demùm dilatata, apice profundè emarginata, lobulis 2 sejunctis terminata, margine utrinque lacinulâ lineari subulatâ sigmoideâ suberectâ notata; antheræ parvæ, ovatæ, 2-loculares, loculis collateralibus, subdivergentibus, dorso adnatis, longitudinaliter dehiscentibus, ad apicem infra sinum emarginaturæ positæ, perianthium spectantes, et tunc ob filamenti inflectionem pseudo-extrorsæ, sed reverà introrsæ. *Ovarium* suburceolatum, perianthio adnatum, apice liberum, subconicum, 1-loculare, multiovulatum; placentis 3 parietalibus. *Stylus* subbrevis, rectus. *Stigmata* 3, erecta, inclusa. *Pericarpium* carnosum, turbinatum, 6-sulcatum, perianthii imâ basi circumscissâ marcescente marginatum, discoque apicali (stylo) demum operculatim deciduo terminatum, orâ circulari apice apertum, 1-loculare, polyspermum. *Semina* minuta, oblonga, fusiformia, subcompressa, scobiformia, in placentis tribus parietalibus aggregata, erecta, et quoad funiculum deflexum retroversa; testa laxa nucleo paullò amplior, libera, diaphana, areolis longissimis angustatis reticulata, costis parallelis valdè prominulis, funiculo reticulato, tenui, ejusdem longitudinis; endopleura tenuissima, areolis magnis, paucis, subangulatis cancellata; nucleus? (albumen?) grumosus, homogeneus?; embryonis forma ignota.

Plantæ Brasilienses, *hyalinæ, super lignum cariosum parasiticæ,* rhizomate *tuberoso, fibrillis numerosis*; caule *simplici, erecto, subflexuoso, angulato, ferè aphyllo*; flore *solitario, terminali, basi 2–4-bracteato,* bracteolis *brevibus, vel sub flore, vel in medio caule, erectis*; perianthii tubo *subhyalino,* petalis *roseis,* sepalis *flavis,* coronâ *luteâ margine aurantiacâ*; fructu *hyalino.*

1. *Ophiomeris Macahensis,* caule nudo, bracteolis 2–3nis florem solitarium terminalem suffulcientibus, perianthio hyalino; sepalis rosaceis.

Hab. Ad Macahè, Provinciæ Rio de Janeiro.

Planta hyalina, 2–3-pollicaris.

2. *Ophiomeris Iguassuensis,* caule subnudo medio bracteolis 3–4 iis speciei prioris duplò longioribus in verticillum dispositis, flore solitario terminali nudo.

Hab. Ad Iguassù, Provinciæ Rio de Janeiro.

Planta hyalina, vix pollicaris.

Both these plants appear to be extremely rare, and were found by my son growing upon the decayed trunks of trees in the deep shady forests, in distant places, near the foot of the Organ Mountain range. Of the latter species I obtained specimens in 1841; but at that time I was unable to comprehend its nature, as it was only in seed after dehiscence, and it was not until I received last year two specimens of the former species preserved in spirits, together with a drawing of the plant in its living state, that I was enabled to ascertain its true relations. It appears to be seldom more than 2 inches high, with a knotty tuberous root, from which spring numerous fibrillæ, that seem to propagate themselves by stoloniferous offsets. The stem is slender, erect, somewhat flexuose, striated, colourless, and hyaline. The perianth, arising out of 2 or 4 short bracts, is gibbosely globular and pyriform, 4 lines in diameter in its widest part, somewhat fleshy, transparent, and of a delicate rosy hue on the more convex face, white and almost translucid on the opposite more contracted side, and is marked with 6 slender longitudinal lines, corresponding with the segments of the border. The sepals are somewhat triangular, thrown back, of a dull yellow colour at the base, transparent toward the apex, and about a line in length. The petals are slender, subulately terete, 6–7 lines long, slightly curved, irregularly patent, and of a pinkish hue; in æstivation they are spirally coiled together, and concealed within the sepals, whose margins slightly overlap each other: inside of the petals there is a raised edge of a bright chrome yellow, within which the mouth is nearly closed by a flat annular depressed rim, of the same but somewhat duller hue. The stamens derive their origin from beneath the annular rim, and are pendent against the inner wall of the perianth: they are quite free and equal; the filaments are broad at their origin, then somewhat contracted, and soon again widen into a broad petaloid expansion, with a somewhat truncated apex, having a broad emarginature in the centre, between 2 prominent thickened globular lobes, from the sides of which spring as many lateral, subulate, recurved, sigmoid appendages, which lie parallel with the filament, and are somewhat shorter; the anthers are oval, comparatively very small, consisting of 2 parallel cells, bursting longitudinally, laterally connected together at one extremity, slightly divaricated at the other, and fixed by their back near the apex of the filaments below the emarginature, being attached upon the inner face, so that their aspect is always towards the tube of the perianth: they seem therefore to be extrorse, although, if the filaments were not retroflexed, they would in reality appear in the usual introrse position. The ovarium is inferior, somewhat turbinate, and crowned with a thin conical disc; it is 1-celled, with 3 distinct prominent longitudinal parietal lines, that bear in their middle a somewhat 2-lobed placenta, on which a number of ovules are crowded. The style which terminates the conical disc is short, apparently fistulose, striated, expanding towards its apex into a 3-lobed, hollow, cup-shaped stigma, with 3 rather erect triangular fleshy lobes, which are alternate with the placentæ (as in *Dictyostega*); these lobes are covered with a mucous exudation and numerous hair-like papillæ, but after the process of fructification is completed the stigmatic lobes become quite glabrous on their surface. The tube of the perianth now falls away by a clean horizontal circumscissure, a little above the line of its junction with the ovarium: after this, the conical disc of the ovarium detaches itself like an operculum, leaving a fleshy open cup, in which the seeds appear arranged in 3 clusters, upon the parietal lines above-mentioned. The seeds are numerous, minute, and scobiform, erect, each being supported upon a recurved slender funiculus of its own length: the testa is quite transparent and reticulate, the cells being narrow and almost scalariform, often the length of the nucleus; beyond this, at each extremity, they become much smaller: the inner membrane that immediately covers the nucleus is also transparent, but does not fill the entire cavity of the testa; it is marked by a few (6 to 8) somewhat hexagonal areolæ: the nucleus appears to consist of a homogeneous grumous mass, but I have had no opportunity of determining the precise nature of its structure.

From the above details it will be seen how very closely this plant approaches the genus *Thismia* of the late Mr. Griffith, described in the 19th volume of the Society's 'Transactions,' p. 341; and it affords a singular coincidence, that plants of such curious structure, and so nearly allied, should about the same time have been discovered in the Malayan territory, Ceylon, and Brazil. I have lately had an opportunity of seeing in the herbarium of Sir William Hooker dried specimens both of Mr. Griffith's plant, and of another (probably the same species) found near Galle, in the island of Ceylon, by Captain Champion, from both which the Brazilian plant will be seen to differ in many essential points. In the latter, the remarkable gibbosity of the perianth is quite peculiar; its tube is also smooth, not impressed by 6 deep rounded grooves, and does not present the 12 crimson-coloured longitudinal rows of prominent tubercles with the intervening grooved lines seen even in the dried state in *Thismia*, although it has 6 almost imperceptible nervures; the corona is circular, not hexagonal: it differs also in the shape and disposition of the filaments, which are quite distinct and unconnected, while in *Thismia*, although at first separate in their origin, they soon become united into a long and completely monadelphous pendulous tube with 12 distinct nervures*: the anther-cells are here arranged in 6 pairs, near the commencement of the line of tubular junction, each pair consisting of 2 distinct and unconnected lobes, separated by the nerval lines that spring from the corona; alternate with these are 6 other nervures, arising from each sinus formed by the junction of the filaments, and terminating in as many coloured glands, at the points where the tube again becomes cleft into a double line of 6 equal pairs of thin parallel truncated laminæ, one overlapping the other, each being fringed at its extremity by 3 or more teeth. In *Ophiomeris*, on the contrary, the filaments are in no way monadelphous, and are considerably narrower at their origin; the anthers are placed, not towards the middle, but close to the apex of the filament, which is remarkable for its 2 obtuse terminating lobes and winged lateral appendages; the 2 cells of the anther, too, are laterally conjoined, not in separate lobes as in the Asiatic genus.

The alliance of *Thismia* to *Burmanniaceæ* did not escape the notice of Mr. Griffith, although on the whole he was somewhat more disposed to compare it with *Tacca*, on account of the analogy in the number and direction of the stamens fixed on a 6-partite perianthium, and the parietal placentation of the seeds: but it is clear that this eminent botanist was not then aware of the structure of the ovarium in the section *Apterieæ*, which I have proposed in the last-mentioned natural order. In fine, I have no hesitation in referring both *Thismia* and *Ophiomeris* to *Burmanniaceæ*, notwithstanding that both these genera differ from all others of this order in the greater number of stamens, their reflected position, the annular coronà, the circumscissure of the perianthium, and the opercular opening of the capsule; but the character of the order

* This is rather indistinctly shown in vol. xix. pl. 39, illustrative of Mr. Griffith's memoir above-cited, where the separation of the filaments at their origin, and their subsequent junction into a tubular form, are not made evident; the former circumstance is however distinctly stated in the text, but the latter is too ambiguously worded in page 341 to enable a reader to comprehend the author's true meaning; it is difficult indeed to say which part really constitutes the filament, and which the connective, for the whole appears one homogeneous petaloid membrane.

will of course require some modification, in order to embrace them within its limits. The dehiscence of the pericarpium in the two genera under consideration, which, on a cursory glance, seems greatly at variance with the usual character of the order, will not, on closer examination, appear so very incongruous; for if we assume an instance where the capsule bursts after the manner of that of *Gonyanthes**, and imagine in such case the perianthium to be not only wingless, but destitute of the strong nerve upon which each wing is formed, the result would occur as in *Ophiomeris* and *Thismia*, the circumscissure of the tube and the opercular dehiscence of the fruit; and from the little we know of Blume's genus *Gymnosiphon*, we have reason to suppose its capsule bursts in a somewhat similar manner. In *Dictyostega*, the 3 strong ribs which proceed from the base of the ovarium, and remain attached to the wall of the cell, bearing in their middle the clustered placentations, continue their course along the disc, and again become united in the persistent style; in consequence of which the dehiscence takes place, as in *Burmannia*, by the disruption of the weaker membranous portions between the 3 persistent ribs. In *Cymbocarpa*, in consequence of the gibbous form of the ovarium, the dehiscence is caused by a single longitudinal laceration along its weaker side. In fact, in no instance, as far as I am aware, is there any approach to the ordinary valvular dehiscence in *Burmanniaceæ*; *Cymbocarpa* offers certainly the nearest approach to it, but in all cases the bursting of the cell is effected by a mere laceration of its reticulated membrane, varied in different cases by the absence or interruption of the placentary ribs, or the intervention of dissepiments: in most instances this occurs rather in the sides of the capsule, on account of the greater tenuity of the membrane as it becomes dried; but in *Ophiomeris* and *Thismia* this takes place by the laceration (in an opercular form) of the disc, which is there more membranaceous than the comparatively fleshy wall of the unilocular cell†; while in *Dictyostega*, as before mentioned,

* See Linn. Trans. vol. xviii. p. 537. Tab. XXXVIII. fig. 3, *a*.

† I may here observe, although I had an opportunity of examining only a single dried capsule of *Ophiomeris*, that notwithstanding the disc had fallen off, as shown in fig. 14, it appeared to me there came away with it, after being moistened, a detached and somewhat gelatinous 3-lobed process, which perhaps formed an extension of the placentæ beneath the disc, which showed no indication whatever of any nervures on its surface; the style also that remained attached to the disc was now quite hollow and reduced to a thin fistular tube, leaving an uninterrupted channel through the open stigma

the dehiscence is effected by the rending of the thin membrane, both of the disc and the walls of the cell, in the manner shown in Tab. XXXVII. fig. 1, *i*. and fig. 2, *l*. of the eighteenth volume of the Society's 'Transactions.'

If, again, we imagine the stamens of *Apteria* with their curiously-expanded connective, retroflexed at their origin, we should see a structure of these organs quite analogous to that existing in *Ophiomeris*. Such considerations, combined with other manifest characters, serve at once to clear the way for the admittance of these plants into *Burmanniaceæ*, in which natural order I propose to class *Ophiomeris* and *Thismia*, under a distinct section, to which the name of *Thismieæ* may be given. This family would hence be subdivided as follows:—

Burmanniaceæ.

1. Burmannieæ. Perianth. tripterum. Stam. 3. Ovar. 3-locul. Placent. centrales.
   - Capsula longit. dehiscens . . . . 1. *Burmannia*.
   - Capsula transv. fenestrata . . . . 2. *Gonyanthes*.
2. Apterieæ. Perianth. exalatum. Stam. 3. Ovar. 1-locul. Placent. 3 parietales.
   - Capsula irreg. 3-valvis . . . . 3. *Dictyostega*.
   - Capsula lateral. hians . . . . 4. *Cymbocarpa*.
   - Capsula apice 3-valvis. Stamina appendiculata . . . 5. *Apteria*.
   - Capsula irreg. dehiscens. Petala nulla . . . . . . 6. *Gymnosiphon*.
3. Thismieæ. Perianth. exalatum. Stam. 6. Ovar. 1-locul. Placent. 3 parietales. Pericarpium circumscissum.
   - Tub. regul. Stam. monadelph. . . . . 7. *Thismia*.
   - Tub. gibbus. Stam. omninò libera . . . . 8. *Ophiomeris*.

Having before alluded to the fact suggested by Mr. Griffith of the analogy which these two genera bear to *Tacca*, I will now, before making any observation on this head, first point out the remarkable resemblance in habit and

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into the cavity of the cell; but whether the above-mentioned process formed the communicating medium of impregnation from the stigmata to the ovules, or whether it was foreign to its structure, I had no further means of ascertaining. I feel disposed however to prefer the former view, as it would seem to bear some analogy to the 2 glandular lobes that I formerly observed beneath the disc upon the termination of each of the 3 placentary ribs in the capsules of *Dictyostega*, *Cymbocarpa*, and *Apteria*, and which are represented in Tab. XXXVIII. fig. 4, *m*, illustrative of my memoir above-cited. If this should be the case, it would become a matter of some interest to ascertain what function these glandular masses perform in the process of fecundation, for it is natural to conclude, from their constant presence, that some definite office is assignable to them.

origin, as well as in the production of the lobes of the perianth into long setiform appendages, which are convolutely enclosed in æstivation, to that of the no less singular little plant *Triuris hyalina*, formerly described before the Society (Linn. Trans. xix. p. 78. tab. 7). It is also worthy of remark, that the genus *Peltophyllum* of Mr. Gardner (Linn. Trans. xix. p. 155. tab. 15), which is closely allied to *Triuris*, exhibits a radical leaf on a distinct lengthened petiole, offering another coincidental resemblance to *Tacca*, although the peltate form and peculiar venation of its leaf resembles more that of *Cissampelos*. It is true, that in *Tacca* there are 6 stamens fixed to the tube of a 6-partite perianthium, three of its lobes being smaller than the three other alternate ones; that the large fleshy connective which bears the anther is deflexed, so that it thus assumes an extrorse aspect; that the inferior ovarium is 1-celled, as in *Thismia*, and the ovules in like manner fixed on 3 parietal placentæ; that the seeds are borne upon a pendent funiculus, which, being retroverted, gives them an ascendant position, points in common in both cases: but their very distinct habit, the mode of their growth, the presence of large fully-developed leaves upon long radicular petioles, the mode of inflorescence, the existence of a distinct embryo enclosed in albumen, and other striking differences, prevent any association of these plants in the same natural order, the alliance of *Tacca* being evidently close to *Smilaceæ*. *Triuris*, again, resembles *Ophiomeris* in the particulars just alluded to; but then its diœcious character, the union of its 3 pairs of anther-cells on a central fleshy connective in the one sex, and its numerous 1-seeded free ovaria in the other gender, remove it at once from *Burmanniaceæ*. If however we imagine a plant with 3 pairs of anthers similar to those of *Tacca*, their cucullate enlarged connectives being united into one central fleshy column, we have a structure not very dissimilar from the male flower of *Triuris*: indeed a somewhat similar structure is exhibited by *Ruscus* in *Smilaceæ*. But although *Tacca* and *Triuris* offer several points of approach towards this last-mentioned family, the same cannot be said of any of the *Burmanniaceæ*, whose alliance is evidently close to the *Orchideæ*. It is however to be borne in mind, that in *Aristolochieæ* and *Menispermeæ* we have instances of stamens united in a central column, and in the latter case also unisexual plants; but the apparent want of decided cotyledonous form in the embryo, the low degree of development in the whole plant, and the absence of any approach to exogenous structure, places them at an immense distance in the natural system. Professor Lindley in his 'Vegetable Kingdom' arranges *Triuridaceæ* close to *Smilaceæ*, no doubt for reasons similar to those before enumerated; so that through *Hydrocharideæ* they are thus allowed to approach *Burmanniaceæ*, and perhaps through *Fluviales*, the *Araceæ*; but until we have better evidence of the structure of these plants, it would be idle to speculate further on their nature.

Hammersmith, May 1846.

DESCRIPTION OF PLATE XV.

Fig. 1. A plant of *Ophiomeris Macahensis*, Miers, of the natural size.
Fig. 2. An unopened bud:—magnified.
Fig. 3. An expanded flower, seen in front:—magnified.
Fig. 4. An expanded flower, seen laterally.
Fig. 5. An expanded flower, seen from the summit.
Fig. 6. An expanded flower, cut longitudinally.
Fig. 7. Filament, turned up to show the anther.
Fig. 8. Filament, with a portion of the perianthium, seen in profile.
Fig. 9. Filament, in its natural position, seen from within.
Fig. 10. Anther-lobes, in their natural direction.
Fig. 11. Style and stigma:—magnified.
Fig. 12. A fruit, with the perianthium fallen off:—of the natural size.
Fig. 13. A longitudinal section of the fruit, magnified, showing the placentæ.
Fig. 14. A longitudinal section of the fruit, magnified, after the falling off of the disc.
Fig. 15. A transverse section of ditto, showing the lines of placentation and the position of the seeds.
Fig. 16. Disc, style and stigma:—magnified.
Fig. 17. Seed, with its *funiculus*:—highly magnified.
Fig. 18. Seed, divested of half its testa, to show the included nucleus?
Fig. 19. Included nucleus?
Fig. 20. Section of a flower of *Thismia Brunonis*, Griff. (from a specimen in the herbarium of Sir W. J. Hooker):—magnified.
Fig. 21. Section of a flower of ditto, with the monadelphous staminal tube turned up to show the anthers.

XX. *On* Jansonia, *a new Genus of* Leguminosæ, *from Western Australia.*

By Mr. Richard Kippist, *Libr. L.S. &c. &c.*

Read May 4th, 1847.

HAVING recently been engaged in the examination of an interesting collection of plants formed by the late Mr. Gilbert in Western Australia, and kindly forwarded to me by Mr. Saunders for determination, and the selection of a set for the Society's herbarium, I have had the satisfaction of finding among them one which, as it appears to me, cannot with propriety be referred to any existing genus; and I venture to hope that a short account of it may not be thought wholly unworthy the attention of the Linnean Society, whose Transactions have so greatly contributed towards elucidating the Australian Flora, of all others perhaps the most interesting from the number of singular and anomalous forms which it includes.

The plant which I now propose to describe belongs to the Papilionaceous subdivision of *Leguminosæ*, and is remarkable for its deviation from the prevailing structure of the floral envelopes in that order, more especially of the petals, the proportions which these commonly bear to each other being here exactly reversed; the vexillum, for example, which in a Papilionaceous flower of the more usual type exceeds both keel and wings in size, is here so exceedingly minute, as, in a cursory glance, almost to escape observation; while the keel, usually shorter than the wings, here far exceeds them in length. The ordinary proportions of the calyx are in like manner reversed; the upper lip, generally the largest where any difference of size exists, being scarcely one-fourth as long as the lower, whose intermediate segment extends beyond the lateral ones, while the upper lip is cleft nearly to the base, still further increasing the apparent obliquity. The stamens likewise participate in this irregularity, the anterior filaments being considerably longer than the posterior, and adhering slightly to each other and to the tube of the calyx, while the remaining ones are perfectly free.

I shall now proceed to give the essential characters of the genus, which I propose to dedicate to the memory of my lamented friend Joseph Janson, Esq., F.L.S., whose ardent attachment to the study of natural history (which formed a principal relaxation of his leisure hours), and whose constant exertions to infuse a taste for it in others, eminently entitle him to such a distinction; while his entire devotion to the interests of the Linnean Society, and the zeal and liberality which he ever evinced in promoting its objects, give him an especial claim to be commemorated in its publications.

Jansonia.

Char. Gen. *Calyx* ebracteatus, bilabiatus; labio superiore ferè ad basin bifido; inferiore 4-plò longiore, tripartito; segmentis omnibus acutis. *Corollæ Papilionaceæ petala* longè stipitata: *vexillum* ovato-lanceolatum, reflexum, *alis* oblongo-ellipticis multò brevius: *carinæ* compressæ (alis $\frac{1}{3}$ longioris) petala oblonga, basi auriculata, dorso connata. *Stamina* 10, libera vel imâ basi cohærentia, inæquilonga, persistentia. *Ovarium* villosissimum substipitatum, *stipitulo* basi vaginulâ cincto, pauci- (4–6-) ovulatum, *suturis* non inflexis. *Stylus* filiformis, elongatus, apice incurvus, glaber. *Stigma* parvum. *Legumen* ignotum.

Suffrutex Novæ-Hollandiæ Austro-occidentalis, Brachysemati *proximus*; ramis *erectis vel adscendentibus*; foliis *oppositis oblongo-ovatis, emarginatis, mucronatis, utrinque reticulatis, margine revolutis, subundulatis, minutè denticulatis*; stipulis *lanceolato-subulatis, demùm deciduis*; floribus *sessilibus, in capitula cernua, 4-flora, bracteis* 4 *ovatis, decussatis, coriaceis, fuscis, extùs sericeis suffulta, ramos breves axillares terminantia, congestis.*

J. formosa.

Descr. Suffrutex? Rami suberecti vel adscendentes, teretes; juniores subcompressi, longitudinaliter striati, pilis laxis cinereis obsiti; adulti glabri. Folia opposita, brevè petiolata, 2–3-pollicaria, internodiis multò breviora, ovato-oblonga vel elliptica, emarginata, subcoriacea, margine undulata, recurva, minutè repando-denticulata, utrinque reticulato-venosa, subtèr pallidiora, glabra, vel pilis appressis inconspicuis tecta; nervo medio, subtùs valdè prominente, in mucronem brevem recurvum desinente. Petioli breves, 1–3 lineas longi, laxè pilosi. Stipulæ lanceolatæ, subulato-acuminatæ, petiolo multò longiores, coriaceæ, fuscæ, extùs pilosæ, recurvæ, tardè deciduæ. Flores sessiles, in capitula 4-flora, cernua, brevissimè pedunculata, ad extremitates ramorum brevium axillarium sita, bracteis 4 ovatis, coriaceis, extùs velutinis inclusa, parùm infra ramuli apicem in mucronem brevem sericeum productum verticillatìm dispositi. Calyx extùs longè sericeus, ebracteatus, bilabiatus; labiis valdè inæqualibus, superiore minore, ferè ad basin fisso, inferiore 4-plò longiore, profundè tripartito. Corolla papilionacea. Petala omnia longè stipitata, atro-rubra. Vexillum minimum, laminâ lanceolato-ovatâ, stipite paullò breviore, reflexâ. Alæ segmenta lateralia labii inferioris calycis æquantes, carinâ $\frac{1}{4}$ breviores, laminâ ellipticâ, basi cucullatâ, stipitem subæquante. Carinæ elliptico-oblongæ, calycem parùm excedentis, petala basi suprà auriculata, dorso cohærentia. Stamina 10, persistentia, inæqualia, anteriora longiora, parùm exserta. Filamenta glabra, basi dilatata, obliquè calycis tubo (et 3 inferiora inter se) brevissimè connexa. Antheræ oblongæ uniformes. Germen subsessile, ovatum, ventricosum, pilis longis sericeis vestitum, 4–6-ovulatum, suturis non introflexis, stipitulo basi vaginulâ carnosâ cincto. Stylus filiformis, glaber, staminibus paullò longior, apice incurvus. Stigma minutum, subcapitatum. Legumen haùd visum.

Habitat in Novæ-Hollandiæ orâ Austro-occidentali, ad "Scott's River," ubi (anno 1842?) legit beat. *Gilbert* (*v. s.*). Vidi etiam specimen, habitu debiliore, et foliis ramulisque pubescentioribus, paullò diversum, a *Dom. Jac. Drummond* in vicinitate Coloniæ "Swan River" lectum, et a *Dom. C. M. Lemann, M.D.* mihi benignè communicatum.

The nearest affinity of *Jansonia* unquestionably is with *Brachysema*, with which genus it agrees in its unguiculate petals, in the form and unusual length of the keel, in the extreme shortness of the standard, in its elongated filiform style, and in its shortly-stalked villous germen, surrounded at the base by a minute fleshy ring. It is however abundantly distinguished by its capitate inflorescence, by the remarkable inequality of its calycine segments, by the much greater length of the claws of its petals, and by the paucity of its ovules, which in *Jansonia* do not appear to exceed six in number, while in three species of *Brachysema* which I have examined, I have never found fewer than twelve.

From its possessing many of the characters ascribed to *Leptosema*, I was at one time disposed to regard my plant as a second species of that genus, although evidently very different in habit from the one described by Mr. Bentham in the 'Annalen des Wiener Museums,' from a specimen gathered by the late Mr. A. Cunningham at Sims Island, on the north coast of New Holland: but Mr. Heward having kindly permitted me to examine an authentic specimen in his possession, I found no difficulty in satisfying myself that the two plants were generically distinct; the calyx in *Leptosema* being bibracteate, and composed of two *nearly equal* lips, the upper *very slightly* bifid, the vexillum scarcely unguiculate, the wings* about equal in length to the keel, and *the carinal suture of the legume distinctly inflexed.* The inflorescence is likewise very different in the two plants: in *Leptosema* the flowers are distinctly pedicellate, alternate, and disposed in a densely-crowded raceme, rather than a capitulum; whereas in *Jansonia* they are perfectly sessile, arranged in a verticillate manner round a common axis, which is slightly prolonged beyond the point whence the flowers spring in the form of a short mucro.

EXPLANATION OF PLATE XVI.

Fig. *a.* Capitulum, with its bracts expanded, and three of the flowers removed.
b. Calyx, with the stamens adhering to its base.
c. Standard.
d. One of the wings.
e. Keel.
f. Germen.
g. Germen, laid open.
h. Germen, magnified.

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* The wings, which (apparently from their contracted upper portions having been broken off in the flowers examined by him) are described by Mr. Bentham as "vexillo subæquilongæ," are in reality distinctly longer than the vexillum, and fully equal in length to the keel, described as "alis longior et latior."

P.S.—Since this paper has been in print I have received the final part of Dr. Lehmann's Plantæ Preissianæ, in which (vol. ii. p. 206) Dr. Meisner has described, apparently for the first time, under the name of *Cryptosema*, a plant which I have no doubt will prove identical with my genus *Jansonia*.

Although the title-page to the second volume of 'Plantæ Preissianæ' bears date '1846–7,' and the preface '*Nov.* 1847,' it is evident, from an advertisement on the cover of that part of the work in which *Cryptosema* is described, that it was not published before *May* 1848. A brief report of my paper, however, had appeared in the Gardener's Chronicle of *May* 8th, 1847, and a somewhat fuller notice, indicating the principal characteristics of the genus, and its nearest affinities, in the Athenæum of May 15th. The essential character in Latin was given in the Proc. Linn. Soc., No. 33, issued *Sept.* 11, 1847, and reprinted in the Ann. Nat. Hist. for March following. There can therefore, I apprehend, be no question that the name *Cryptosema* must be suppressed in favour of that of *Jansonia*.—R.K.

R Kippist del

XXI. *On the Structure of the Ascidia and Stomata of* Dischidia Rafflesiana, *Wall. By the late* William Griffith, *Esq., F.L.S. &c. Communicated by* R. H. Solly, *Esq., F.R.S., F.L.S. &c.*

Read January 20th, 1846.

THIS curious plant occurs abundantly about Mergui, and affects old and partially decayed trees. I have hence been able to examine abundance of specimens loaded with Ascidia of different degrees of development. I offer the observations relating to these curious appendages, as I conceive they throw light on their nature, which, if analogy holds good, appears to have been generally misunderstood. The commonly adopted opinion, and that which Dr. Lindley advocates in his 'Outlines of the First Principles of Botany' and in his 'Introduction to the Natural Orders,' is, that the pitcher is a modification of the petiole and the lid or operculum of the lamina. The structure of *Dionæa* certainly seems in favour of this opinion. Mr. Brown, in his "Remarks on the Structure and Affinities of *Cephalotus*," Lond. and Edin. Phil. Mag. for Oct. 1832, says, that Ascidia in all cases are manifestly formed from the leaves, but does not refer the pitcher or lamina to any particular part of the leaf.

The Ascidia of this species have, as might be expected, the same arrangement as the leaves: they are opposite and shortly pedicellate. They are however crowded together, while the leaves are distant. In shape they are oblong-ovate, somewhat compressed, with a few elevations and depressions, which correspond to those formed in the leaves by the nervures. They are open at the base, the margins being rounded off owing to their being inflected into the pitcher in the shape of a linguiform process. Immediately below the base they are slightly constricted. The opening is invariably directed upwards. Their colour externally is that of the leaves,—a dingy yellowish green, often inclining to glaucous. Internally they are of a rich dark purple, studded with innumerable and very minute white spots.

The colour of the inflected portion internally is much lighter than that of the corresponding surface of the leaf: its outer surface is of a light purplish brown (TAB. XVII. fig. 1). They appear at no period to contain fluids, but invariably contain one or more branched roots, which, taking their origin from various parts of the petiole, pass down through the opening. These roots are always more succulent and of a lighter colour than those formed in any other part. Their structure is precisely that of the limb of the leaves; the only difference being in form and in the colour of the inner surface, which corresponds to the concave of the leaves*. This structure presents nothing peculiar, with the exception of the Stomata, to which I shall hereafter recur. The proofs I have to give of their being modified laminæ are:—

1. Their similarity in texture and internal structure, and that of the stomata with those of the limb of the leaves.

2. There is a constant and appreciable though slight tendency in the limb of the leaves to assume an involute form, their margins and apex being always, and especially in old leaves, more or less incurved.

3. The occurrence of an imperfectly transformed pitcher (TAB. XVII. fig. 2), in which the body of the pitcher is clearly referable to the limb of the leaf. The petiole has retained its usual form. This specimen resembled closely the bottom of a perfect pitcher, being however much less compressed: it was completely open at the top, no constriction having taken place. The margins and apex were slightly incurved: there was a slight tendency towards coloration, but only towards the fundus.

4. In this family at least, it is more natural to refer the Ascidia to the limb, from the general construction of their petioles.

If we can extend the analogy drawn from the structure of the Ascidia of this plant to the other cases of their formation, in *Nepenthes*, *Cephalotus* and *Sarracenia*, in which the development is much more perfect, we shall have a

* The leaves are smooth and somewhat concave on one surface, convex and rugose on the other; but the whole growth is so straggling, that it is difficult to say which is the upper and which the under surface. I think the inner surface of the pitcher corresponds to the upper of the leaves, that being the smooth concave surface.

petiole of ordinary form and a curiously modified limb, the lamina being an appendage of the limb. I consider the inflected portion of the pitchers of *Dischidia* as analogous to the moveable opercula of the more perfect examples cited above, although in this it is continuous with the body of the pitcher. Mr. Brown however says (*loc. cit.*), that the Ascidia of *Dischidia* have no laminæ. I may add, that petioles are much less liable to modifications than the laminæ. If the pitchers of *Nepentheæ*, &c. are modified petioles, the cucullate bracteæ of *Marcgraviaceæ* will be referable to the petiole of the bracteæ.

With respect to the Stomata, they exist on both surfaces of the leaves and of the ascidia; most abundantly on the concave surface of the leaf and the corresponding inner surface of the pitcher: most of those developed on the under surface of the leaf and outer surface of the pitcher are imperfect, the degree of imperfection varying much. They are in particular remarkable for the existence of an external cellular *bourrelet*, considerably elevated above the surface and of a whitish colour (Tab. XVII. figs. 3 & 5). It is to their presence that the minute white dots existing on both surfaces of the leaves and ascidia, and so particularly visible on the inner coloured surface of the latter, are to be attributed. They appear to have a very slight connection with the cuticle, being easily detached; they are confined to their respective Stomata, and have no communication of structure between one another; and they appear to be deciduous, since they are not met with in old ascidia. Each *bourrelet* is composed of from 3 to 5 cells: their margins are somewhat inflected. Their appearance is that of a cup-shaped gland. Are these originally parts of a cellular epiderm, the remains of which are visible on many parts of the plant? They cannot be referred to the peculiar epiderm, the discovery of which is due to M. A. Brongniart, from their compound structure.

The Stomata themselves are somewhat elevated above the cutis; the surrounding cells are parallelogrammic and disposed in circles, into the composition of which 3 or 4 cellules enter; and each circle diminishes successively in size from without inwards (Tab. XVII. figs. 4 & 6). The Stoma occupies the space of the innermost circle, and in itself presents nothing unusual. In many of those developed on the inner surface of the pitcher, the whole Stoma is opake and has a grumous appearance. The cells surrounding those from the inner side of the pitcher are colourless, while in those of the outer surface of the pitcher and both surfaces of the leaves they are greenish, from a deposit of minute green corpuscles (Tab. XVII. figs. 4 & 6). The space between the Stoma and the inner margin of the innermost circle is invariably uncoloured; any imperfection, when it does exist, is confined to the Stoma, the surrounding circular tissue being in such instances perfect. The fact of the existence of Stomata in the inside of these Ascidia, where there can be but a comparatively small ingress of light and air, is curious enough, particularly when coupled with the deep coloration of the tissue on which they are developed; and one is naturally led to ask, Can they have the same functions with those of ordinary foliaceous structure? May not the functions of those in which the Stoma is opake be glandular?

November 7, 1834.

EXPLANATION OF TAB. XVII.

Fig. 1. A portion of the stem of *Dischidia Rafflesiana*, Wall., bearing a pair of leaves and a pitcher; the latter longitudinally divided:—of the natural size.

Fig. 2. A pair of young pitchers; one well-developed, the other partly abortive.

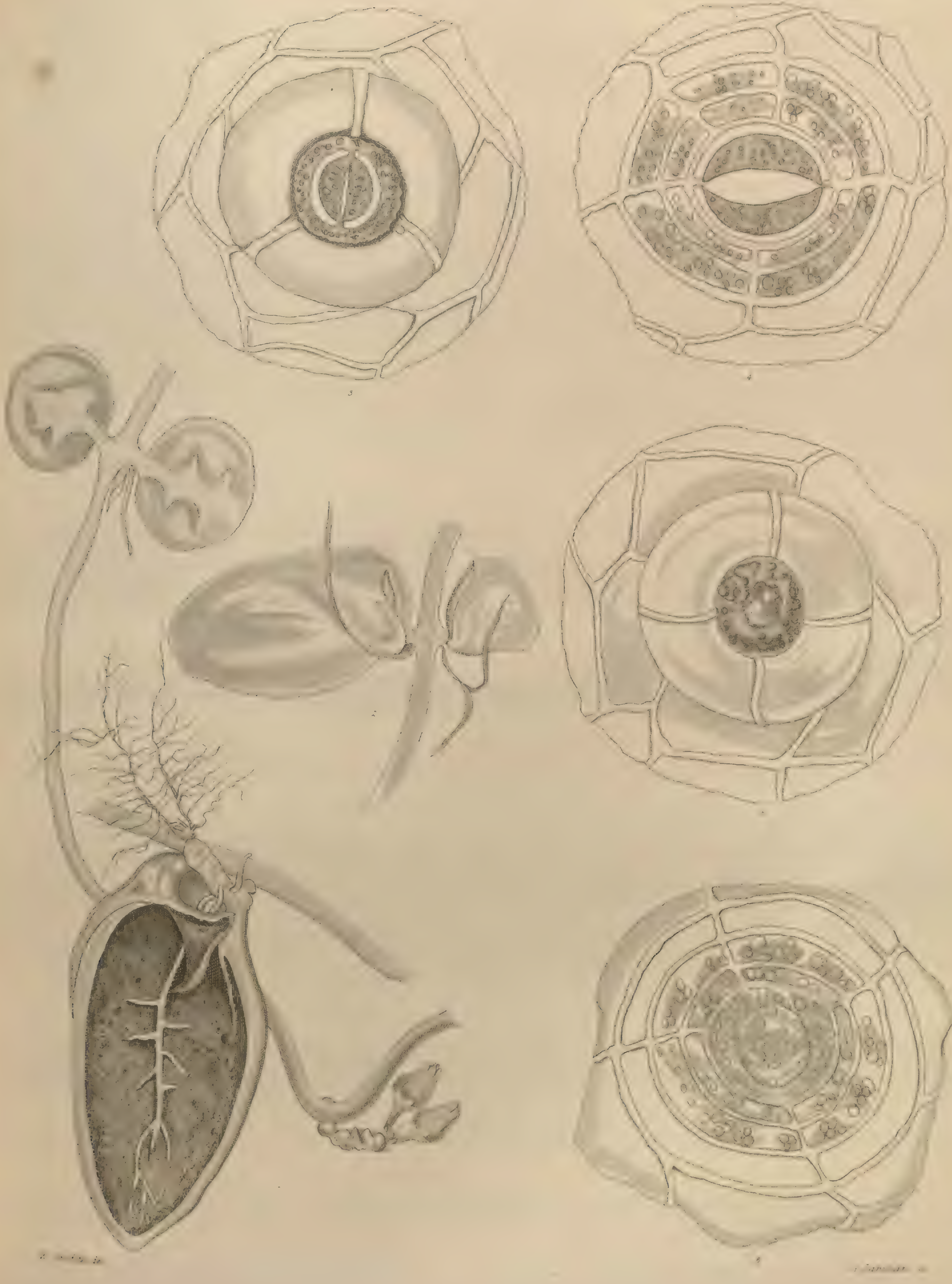
Fig. 3. Stoma, from the upper surface of the leaf, which corresponds to the inner surface of the pitcher.

Fig. 4. The same, with the *bourrelet* removed.

Fig. 5. Abortive stoma from the surface of the leaf corresponding to the outside of the pitcher.

Fig. 6. The same, with the *bourrelet* removed.

All the figures of the Stomata are viewed as transparent objects, and with triplets of $\frac{1}{18}$ and $\frac{1}{33}$ of an inch focus.



XXII. *On the Impregnation of* Dischidia. *By the late* WILLIAM GRIFFITH, *Esq.*, *F.L.S. &c. &c.* *Communicated by* R. BROWN, *Esq.*, *V.P.L.S. &c. &c.*

Read March 2nd, 1847.

THE following observations were made on the *Dischidia Rafflesiana*, Wall., about the 18th of January 1835. They were confirmed by subsequent re-examination about a week after that time, and, with the exception of the development of the ovula, by the examination of another species, apparently allied to *D. bengalensis*, on the 3rd of February 1835. I shall first run over the changes that occur in the ovula while passing from their infant to their perfect form.

At the earliest period the ovula are mere rounded elevations on the placentæ, attached to this by broad bases (TAB. XVIII. fig. 1). The first change takes place when the corolla begins to exceed the calyx in length, and merely consists of a narrowing towards the base (TAB. XVIII. fig. 2). When the corolla is about twice as long as the calyx, this narrowed portion has put on the appearance of a funiculus. At the same time a rounded rather shallow cavity appears on the upper edge of the ovule and close to the funicle. Both diameters of this are nearly equal (TAB. XVIII. fig. 3). The changes now take place rapidly. When the corolla is two-thirds longer than the calyx, the ovula have assumed to a considerable degree their perfect form, differing chiefly in size. The rounded cavity has now assumed the appearance of a deep fissure, extending from the base of the ovule close to the umbilical cord, along the upper margin of the ovule for about one-fourth of its length. The margins of this fissure appear raised: its greatest diameter is longitudinal (TAB. XVIII. fig. 4). Up to this period there is no trace of a central excavation or cavity. When the corolla is half-developed the ovule retains the same form, but the fissure is longer and its lips more expanded. A small rather indistinct grumous-looking mass is now visible in the central line, but towards the apex of the ovule.

This is the first rudiment of the nucleus, or of the cavity within which the future embryo is to be developed (Tab. XVIII. fig. 5). Just before the expansion of the corolla this mass becomes distinct, and frequently assumes a rounded form. The globules I consider to be dislocated tissue. It consists of an aggregation of brownish globules and smaller granules, which in fact closely resemble the granules of the boyaux. The perfect ovule is compressed laterally: the umbilical cord is attached close to its base. The upper margin is convex; the lower or dorsal generally straight, and often more or less concave. The fissure is now very large, extending longitudinally from the base of the umbilical cord for about one-third of the length of the convex upper margin; its lips or edges are gaping; it is of considerable depth. It appears to narrow gradually towards its fundus. The grumous globular mass is now very distinct, and the first indications of an excavation around this mass are appreciable (Tab. XVIII. fig. 6). In flowers which have passed their meridian (no impregnation however having taken place) the excavation is enlarged: the grumous mass is now more irregular, and frequently appears to be broken up, the component parts being then irregularly grouped together.

In this genus the corolla is always closed to a considerable degree by the connivence of its divisions. In addition to this, the divisions of the corolla in *D. Rafflesiana* are furnished with short hairs, which project inwards. We may therefore subtract the aid of foreign agency in determining the escape of the pollinia from the anthers; and we may likewise state, that when impregnation takes place in a given flower, it is by the action of its *proper* pollinia.

The pollinia are erect, oblong, somewhat compressed; they have no diaphanous margin. The dehiscence takes place along the inner margin of each mass, that is, as regards the cell of the anther in which it was previously lodged. This corresponds with the margin of dehiscence of the pendulous pollinia, first noticed by Mr. Brown. This line presents no appreciable structural difference,—nothing to indicate why the boyaux pass out here in preference to any other point. The fissures of communication are open in *D. Rafflesiana*; in the other species their edges are closely approximated as far as their most prominent angles.

The base of the stigma is *stigmatic* (*i. e.* papillose) in both species; slightly so in *D. Rafflesiana*, considerably more so in the other species. The cellular tissue of the apiculus in both contains opake, round, minute bodies, of the nature of which I am ignorant. In neither of these species have I seen the pollinia engaged in the fissures of communication. In the cases I have examined, in which impregnation had taken place, the pollinia were either caught by the processes of the corona, or had fallen into the fundus of the corolla.

The cord formed by the aggregation of the boyaux, in whatever situation they may have been emitted, passes up towards the nearest fissure, in which it engages itself. Having become engaged, it becomes more opake and grumous, and the boyaux are closely approximated. Its course is thence upwards to the base of the stigma (Tab. XVIII. fig. 9). Having reached this point, it is reflected along and in close apposition to the base of this body, until it reaches the union of the stigma with the styles: it then dips into the style or styles, generally however one, and, from the shortness of these, soon reaches the placenta, producing in its course slight discoloration of the adjoining tissue. On reaching the ovuliferous portion of the placenta, the boyaux separate and proceed in every direction among the ovula, to which they become firmly applied. These boyaux have the usual appearance and termination: they contain much granular matter and many coagula: the granular matter has a strong tendency to accumulate towards the termination of the boyaux, the upper part remaining quite empty: they are often exceedingly numerous about the part in application with the ovula: in others, again, scarcely any granules are visible. This does not appear to depend upon a greater degree of duration of such boyaux. The irregularity as to number seems to throw doubt upon their supposed nutrient functions. I have seen oscillatory motion of the *contained* granules, but no motion of ascent or descent. Coagula are likewise seen occasionally in the vicinity of the ovula. The tubes are simple, and one appears to be allotted to each ovule: they remain applied to the ovula for some time; they are distinctly visible when the ovarium has exceeded the calyx about one-third in length. Even at this time the granules are frequently crowded about their extremities. They invariably pass in at the centre of the fissure (Tab. XVIII. figs. 7, 8), and are so firmly applied that they break across sooner than separate from their attachment. The tissue of the ovula is so opake and so delicate, that I have hitherto been unable to demonstrate their terminations by actual dissection. In one case I have seen the boyaux terminate about the fundus of the groove or fissure in a cul de sac (Tab. XVIII. fig. 8), which was crowded with granules. They may frequently be traced, though indistinctly, towards the same point.

Whatever the functions of the granules may be, similar bodies exist in the cellular tissue of the ovula both before and after the application of the tubes: they are probably much larger than the real fecundating agents, as Mr. Brown supposes. The majority certainly disappear before the tubes reach the ovula.

With regard to the changes produced in the ovula after the application of the tubes, I may remark that there is no immediate effect produced. The cavity or nucleus I have already shown to pre-exist. Some time after the action of the tubes has commenced the excavation appears larger, and extends towards the point of insertion of the boyau. As this action is continued, the whole of the granular and globular mass disappears, and the chief part of the ovule is occupied by the now empty excavation (Tab. XVIII. fig. 7). No further appreciable changes other than in size take place for some time, and the rudiments of the coma are even visible before any part of the embryo appears to be formed.

I shall conclude with observing, that the emission of the boyaux without the engagement of the pollinia within the fissures of communication, and without any appreciable cause to produce such an effect, is very remarkable: still more so is their passage to, and engagement in, these fissures. The passage of the cord *upwards* to the base of the stigma, and its subsequent reflection along its surface to the apex of the style is still more striking. What is the use of the papillosity of the stigma? One would imagine, that as the cord does not enter at this point, it might as well have passed directly towards the apex of the styles. It shows distinctly that this portion of the stigma exerts a peculiar and essential influence over the boyaux.

The pre-existence of the nucleus or central excavation is contrary to what has been observed in *Asclepias* by Mr. Brown. There is the same correspondence between the attenuated extremity of this and the point of insertion of the boyau as in *Asclepias*.

EXPLANATION OF PLATE XVIII.

Fig. 1. Ovules of *Dischidia Rafflesiana,* Wall., with a portion of the placenta, at an early stage, magnified.

Fig. 2. The same, somewhat more advanced.

Fig. 3. An ovule, taken when the corolla is twice as long as the calyx; the first appearance of the subsequent fissure, *a,* is now visible.

Fig. 4. The same, taken when the corolla is three times as long as the calyx; *a,* the more developed fissure.

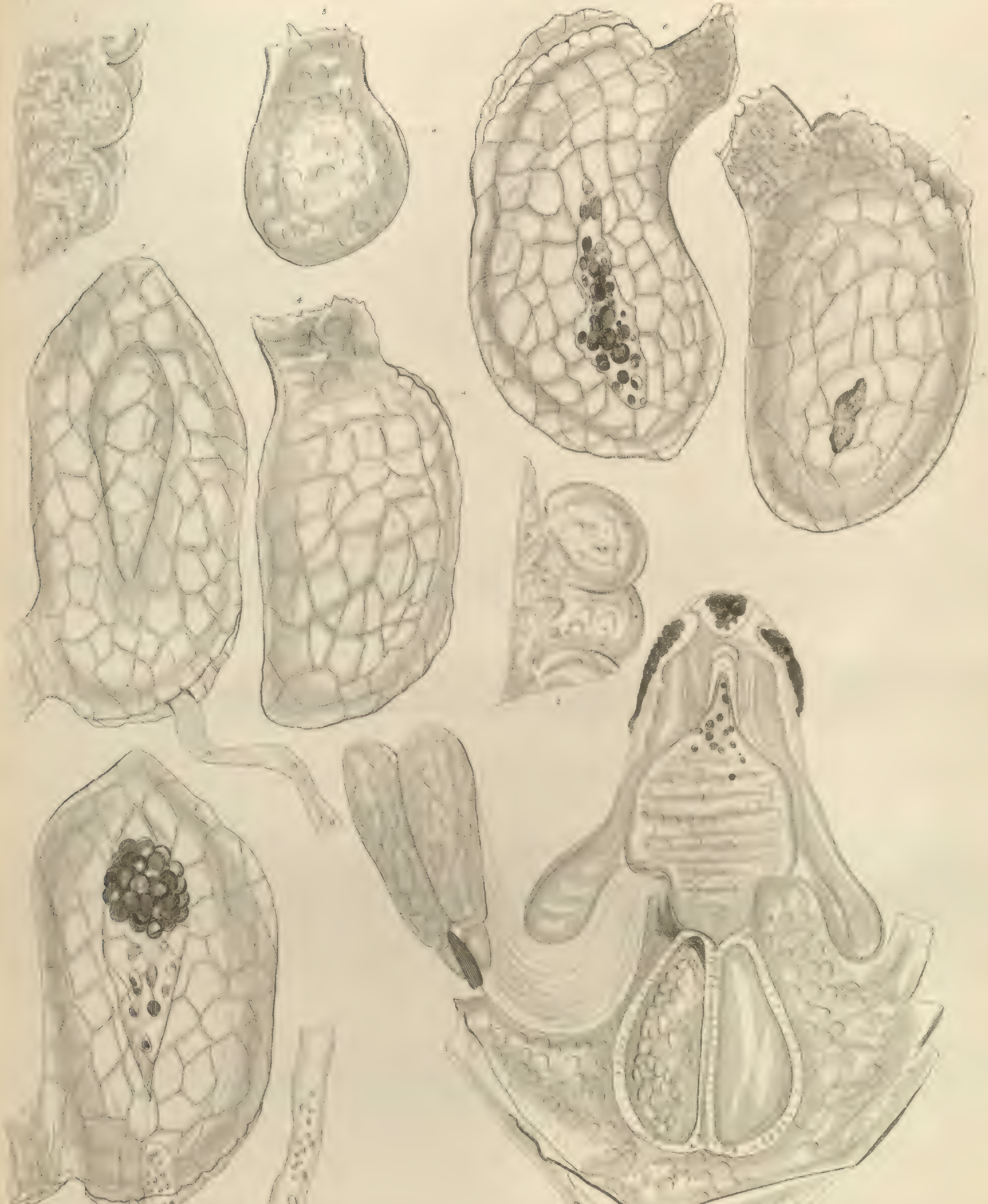
Fig. 5. The same, taken when the corolla is half-developed; *a,* the fissure, is now of considerable size; *b,* the grumous indication of a nucleus.

Fig. 6. A perfect ovule, before the application of the pollen-tube.

Fig. 7. An ovule, to which the pollen-tube has been attached for some time. The central excavation is now very distinct, and the grumous globular mass has disappeared.

Fig. 8. An ovule, with its boyau, showing the termination of the boyau within the fissure.

Fig. 9. A longitudinal section of the *corona staminea* and sexual organs of the same species, the floral envelopes being removed, with the exception of their bases, to show the course of the cord from the *pollinia* to the *placentæ.*



XXIII. *On* Athalamia, *a new Genus of* Marchantieæ. *By* Hugh Falconer, *Esq., M.D., F.R.S., F.L.S., Superintendent of the Hon. East India Company's Botanic Garden at Calcutta, &c. &c.*

Read June 1st, 1847.

Marchantieæ.

Gen. Athalamia, *Falc.*

Char. Gen. *Flores masculi*?

Capituli feminei receptaculum nullum; floribus immediatè pedunculo insertis, erectis. *Involucrum* nullum. *Involucella* tubulosa, vertice bivalvia, basi inter se connata. *Calyptra* persistens, subbifido-lacerata. *Sporangium* in lacinias 4–5, demum revolutas, dehiscens; pedicello elongato, subexserto.

Frons *simplex vel radiatim triloba, crassa, carnosa, subtùs margine squamis foliaceis pluriseriatis instructa, lobis oblongis concavis margine attenuatis*; pedunculo pedicellisque *crassis, succulentis, teretibus.*

Athalamia pinguis, *Falc.*

Obs. Genus *Athalamia* dictum propter flores receptaculo destitutos.

Descr. Frond simple or radiately 3-lobed, very thick and fleshy in the centre, gradually thinning off towards the margins, of a light green colour; surface very finely and densely papillated, without pores: lobes oblong, with somewhat wavy or sinuated margins, which are slightly erect so as to give a concave section across; extremities of the lobes retuse or emarginated, with the auricles inflexed: lower surface of the same colour, bearing under the margin several rows of imbricated white lanceolate subulate leaf-like scales, which are inflexed on the surface of the frond at the terminal sinuses. Flower-stalk emitted from about the centre of the simple frond or its lobes, thick, succulent, cylindrical and smooth, of a pale green, without any kind of pubescence, or persistent paraphyses at the base. Capitulum 3–4-flowered, with no common receptaculum, the flowers being erect and immediately attached to the summit of the peduncle. Involucrum none. Involucella tubular, of rather a tough and thickish texture, slightly ventricose at the base, connate below at the axis, distinct upwards, opening at the top into two concave valves, with the slit of dehiscence extending lower on the outside; continued downwards on the inside in a slightly-keeled ridge descending to the point of confluence. Calyptra persistent, somewhat funnel-shaped, divided vertically about half-way down into two lacerated valves, reaching about half-way up the pedicel. Sporangium globose, somewhat compressed at the sides, opening into 4, or generally 5 subequal segments, which are at first explanate, and at length revolute: in the ripe state the sporangium is just protruded beyond the summit of the involucella. Pedicel thick, smooth and cylindrical like the peduncle, fully the length of the involucellum, slightly bulbose at its base where inserted on the peduncle. Spores very numerous, nearly globose, of a light brown, with the sporoderm slightly dilated into a toothleted wing beyond the nucleus, mixed with elaters.

Obs. Only seen in the ripe state, with the frond beginning to wither. The so-called male flowers were not made out. One of the lobes of the calyptra terminated by a filamentous process.

Apparently an undescribed and very distinct genus, characterized by the absence of a common receptacle and the erect flowers: most nearly allied to *Lunularia,* in the dehiscence of the sporangium and elongated pedicel.

EXPLANATION OF PLATE XIX.

Fig. 1. *Athalamia pinguis,* Falc., of the natural size.

Fig. 2. One of the sporangia, with its 2-valved involucellum.

Fig. 3. The same, opened to show the calyptra.

Fig. 4. A 3-flowered pedunculus, with the sporangia unopened.

Fig. 5. The same, after dehiscence of the sporangia.

Fig. 6. A sporule, with its dilated margin.

XXIV. *On the early Stages of Development of* Lemanea fluviatilis, *Agardh.* *By* G. H. K. Thwaites, *Esq., Lecturer on Botany and Vegetable Physiology at the Bristol Medical School. Communicated by the Rev.* M. J. Berkeley, *F.L.S.*

Read February 15th, 1848.

It is not a little remarkable that the early condition of our very abundant *Lemanea fluviatilis* should have so long escaped the observation of botanists, and this can perhaps only be accounted for by the circumstance of its bearing a very considerable resemblance to *Trentepohlia pulchella, β. chalybea,* Harvey (*Conferva chalybea,* Dillwyn), not only in its colour and general appearance when growing, but also in the kind of situations in which it occurs; the two species, indeed, may not unfrequently be found growing intermingled.

Towards the end of November the young *Lemanea* may be observed in the greatest abundance in places where the species occurs, covering the surface of stones with a uniform dark olive somewhat villous coating, and adhering with such pertinacity by means of its minute roots, as not to be detached without injury to these, or by removing a part of the stone on which it is growing.

On examining more minutely the character of the plant in this early stage of its growth, the structure will be found to consist of numerous conferva-like filaments, of about one line in length, sparingly branched in the manner of *Trentepohlia* or of *Conferva glomerata.* Each of its filaments is about $\frac{1}{1100}$ in. in diameter, and consists of a single row of cells, which are from four to six times longer than wide. The endochrome or colouring matter of the cells is of a blue-green colour, and arranged in a spiral manner, except in the terminal cells, where it is more abundant, and thus gives to these a darker colour than the rest of the plant. In many of the cells, however, the spiral vittæ are so divided and contorted as to give the endochrome a reticulated appearance.

The structure, so far as has been now described, might well be mistaken for a minute Conferva; yet, notwithstanding, it bears the same relation merely to the mature *Lemanea* that the confervoid shoots do to the perfect Moss, or the *mycelium* to the fully-developed Agaric.

Kützing in his 'Phycologia Generalis,' p. 322. tab. 19. fig. 10, has described and figured the early condition of *Lemanea torulosa*, Ag. Except in the more considerable development of the primordial confervoid filaments of the *Lemanea fluviatilis*, there is little difference in the mode of growth of the two species.

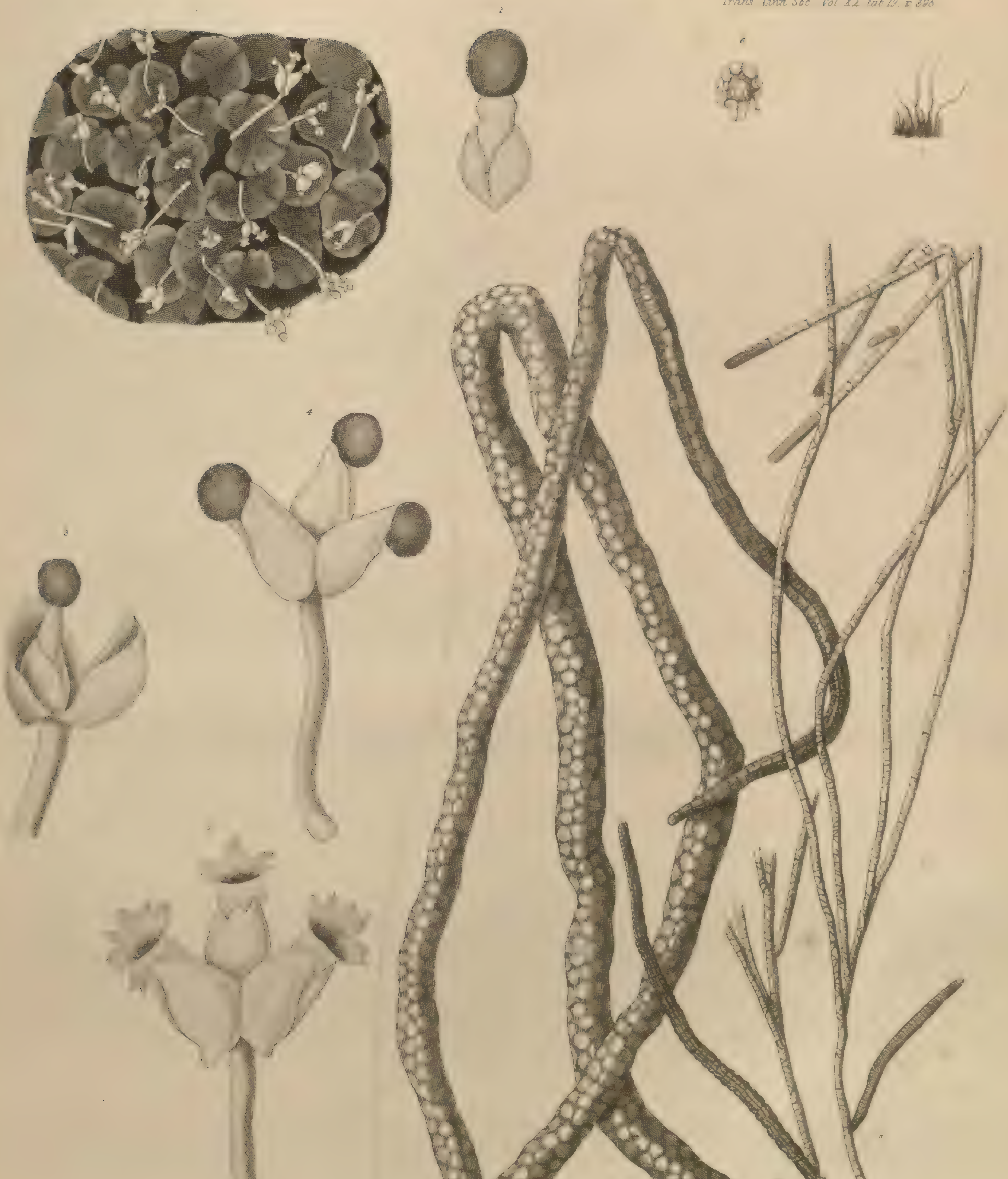
From a cell near the base of the conferva-like structure a branch is given off (Tab. XIX. fig. 8 *a* & *b*), which at first differs apparently from one of the ordinary branches only in the cells of which it is composed being much shorter. This little branch, however, increases very rapidly in length as well as thickness from the multiplication of its cells by frequent fissiparous division. At one period of its growth it recals to mind the *silicle* of an Ectocarpus; but the similarity does not long continue, for it soon exceeds in height by many times the conferva-like filaments; and as this rapidity and excess of development has called for a greater supply of nourishment and a firmer support than could be furnished by the filament from which it took its origin, a number of roots have been given off from its own base (just as occurs in the *phyton* of a Moss), by which it is enabled to assume an independent existence (fig. 8 *b* & *c*), and from this period it by degrees puts on the well-known characters of the *Lemanea* frond, which it is quite unnecessary to describe upon this occasion.

The subject of the early stages of growth of the Algæ opens a wide field for investigation, which would doubtless repay the careful observer by the discovery of many most interesting facts, valuable to the physiologist as well as to the systematic botanist. It is highly probable that very many of the structures now classed with the *Palmelleæ* are merely immature states of more complicated species; and there are perhaps many others of the same character which we at present look upon as being in the condition of complete maturity. For arriving at safe conclusions, however, in such investigations, a good microscope and a practised eye are indispensably requisite, since without such precautions, really essential characters in these minute forms easily escape detection, and structures totally different come to be considered identical; and it may easily be conceived to what confusion and mischief the promulgation of such errors may give rise.

EXPLANATION OF PLATE XIX.

Fig. 7. The young state of *Lemanea fluviatilis,* Agardh, of the natural size.

Fig. 8. The same, highly magnified, showing at *a,* the early development of a branch; *b,* another branch, more advanced, from which rootlets are given off at the base; *c,* a still more developed branch, attached by its roots.



G H K Thwaites del

G Jarman sc

XXV. *On* Melianthеæ, *a new Natural Order, proposed and defined by* J. E. Planchon, *Docteur-ès-Sciences. Communicated by the Secretary.*

Read March 7th, 1848.

THE task of naturalists, in tracing out the affinities of beings, is not unlike that of putting together the many and various parts into which a picture has been purposely cut. If of these parts a great number are wanting, the difficulty of arranging the existing ones will be increased; groups will form themselves either isolated, or connected only by narrow links; and perhaps some parts, finding no immediate neighbour, will be forced into unnatural connexions. But in proportion as the missing pieces are collected, gaps will successively be filled and projecting angles find their corresponding sinuses; until at last, by the connexion of all its parts, the picture will assume its perfect integrity. Such would be the progress and such the end of systematical natural science, if, according to an ingenious suggestion of Linnæus with respect to plants, the juxtaposition of countries on a geographical map were a faithful pattern for the representation of the affinities which connect in one harmonious whole the innumerable objects of nature. Now, although such a disposition of natural tribes is but a degree of improvement over the imperfect linear series; although the outline of no group can be traced with mathematical precision; still every real advance in knowledge, every new object which is carefully compared with the mass of others, serves ultimately either to fill up intervening chasms, or to give a new direction to the outline of some group; or perhaps becomes itself the central nucleus around which parts, until then floating without determinate station, will gather themselves into one homogeneous mass. That such is the usual march of natural methods I need not to say in a place where the memory of Linnæus, although justly connected with the most ingenious of systems, is no less so with the happy and correct delineation of the groups which animate the vast picture of organized creation. The subject which I submit to the enlightened judgement of the Society naturally suggested the foregoing reflections, since it offers a striking example of the use which the natural method makes of new materials to improve (as I venture to hope) the arrangement of the old.

Melianthus, as defined by Linnæus and all subsequent authors, is one of those anomalous vegetable forms which puzzle the judgement of botanists by the very means which render them objects of eager and favourite inquiry. While the singular asymmetry of its flowers offers an interesting problem to morphological botany, its natural affinities have exercised, with more or less unsatisfactory results, the minds of the three great masters in that field of science, Adanson, Jussieu and Linnæus. By the first it is included in his family of *Gerania*, where are found besides the representatives of six different natural groups, namely *Malpighia* and *Banisteria* for *Malpighiaceæ*; *Cardiospermum* for *Sapindaceæ*; *Geranium* for *Geraniaceæ*; *Oxalis* for *Oxalideæ*; *Hermannia* and *Melochia* for *Büttneriaceæ*; *Viola* for *Violaceæ*; and also *Tropæolum*, which is there, I believe not unaptly, placed close to *Cardiospermum*. Fearing that a bare quotation of names might throw a shade of eccentricity upon that original and profound author, I must hasten to say, that he first and alone anticipated, with his usual perspicuity, the results which new materials enable me to consider as positive: he alone placed *Melianthus* between *Cardiospermum* and *Geranium*. The views of Linnæus upon the same subject will appear more fanciful and much less correct; since his order of *Corydales* exhibits the unexpected assemblage of *Melianthus*, *Monniera* (this last now well-known as a genus of *Diosmeæ*), of *Epimedium* and *Leontice* (*Berberideæ*), *Hypecoüm* and *Fumaria* (*Papaveraceæ*), *Impatiens* (*Balsamineæ*), *Utricularia* and *Pinguicula* (*Utricularieæ*), and *Calceolaria* (*Scrophularinæ*), the last marked with a well-deserved and very significant (?). Lest I should appear to quote these opinions as matter of criticism, I must refer my readers to the delightful work* from which they are extracted; and there, under the title of that very same order, they will find that a mixture of erroneous data and of deceitful but ingenious analogies prevailed in this case, in the acute mind of the author of the 'Philosophia Botanica.' On the other hand, A. Laur. de Jussieu, whose wonderful aptitude for detecting natural

* Prælect. in Ord. Nat. Pl. (ed. Gisecke), p. 371, *et seq.*

affinities borders somewhat on divination,—Jussieu himself failed to seize those of *Melianthus*, which in his 'Genera' ranks as an appendage to his dimorphous order of *Rutaceæ*, and is more particularly compared with *Dictamnus* on one side, and *Tropæolum* (one of his *Geraniaceæ*) on the other. More recently, in his excellent monograph of *Rutaceæ*, M. Adr. de Jussieu, illustrating by accurate figures the structure of the flowers of *Melianthus*, refers again to the analogy of that genus with *Tropæolum*; while however he places it as a *genus affine* at the end of the group of *Zygophylleæ*, which he, following his illustrious father, considers as a mere section of *Rutaceæ*, but which Mr. Robert Brown had already distinguished as an independent order. To that view of the affinities of *Melianthus* subsequent authors have either implicitly or positively acceded; with the exception of M. Reichenbach, who, perhaps better inspired by Chance, the deity who must have presided over his vast bird's-eye view of the vegetable kingdom, has revived the idea of Adanson as to the immediate connexion of *Melianthus* with *Sapindaceæ*.

After these too long but unavoidable details, I proceed to take up the question anew, by a sketch of the striking features of those plants which I consider to be the real types of *Melianthus*; that is to say, *Melianthus major*, L., a well-known Cape species, and *M. Himalayanus*, Wall., a truly unexpected member of the flora of Northern India. All these are shrubs, with simple and half-herbaceous stems, large pinnate leaves of a glaucous hue, and long terminal racemes of dull reddish flowers, which spring singly from the axils of coloured bracteæ. A strong fœtid and virous smell of all the parts, the widely-winged petiole, deeply serrated folioles, large intrapetiolar stipule (made up of the connexion of two), the abundance of the honeyed liquor of the flowers,—all these points are highly characteristic of the genus. The flowers themselves, if seen at and long before the time of their expansion, appear under a deceitful attitude; since by the early torsion of their pedicels, they present downwards, as regards the general direction of the erect raceme, that side which normally and actually in the young bud is turned upwards, or lies close to the rachis. Hence that which by all authors has been described as *posticum* or *superum*, must be understood as *anticum* or *inferum*, and *vice versâ*. According to this view, each flower exhibits the following structure: —A large coloured calyx, with a depressed and somewhat triangular base, compressed on its sides, and deeply cut into five unequal segments. Of these, the two larger are in fact inferior, but in appearance superior in the expanded flower; then follow two lateral ones, narrower and shorter than the first; and lastly, on the posterior (in appearance anterior) angle of the base of the flower appears the fifth segment, which, much shorter than the rest, is not unlike a Phrygian cap, or rather a cowl, with its wide and oblique aperture turned towards the inside of the flower, and its apex generally tapering into a short pendent spur. Out of this concave sepal seem hardly to emerge four of the comparatively small petals, which are inserted around a large horseshoe-shaped concave gland filling almost all the upper (apparently lower) half of the receptacle. Although the claws of those petals are all converging, and even connected together towards their apex by means of the woolly indumentum of their margins, their bases of insertion are however, according to rule, alternate with the corresponding sepals; that is to say, the two superior (apparently inferior) petals are inserted each between the cowl-like sepal and the adjacent lateral one; the two other (lateral) petals each between one of the lateral narrower sepals and the adjacent anterior (but apparently posterior) one. In addition, an artificial expansion of those two inferior larger sepals will show, alternating with them, a small imperfect fifth petal, generally reduced to a thick linear unguis, with or without a rudiment of a lamina. The alternation of the five petals with the calycine segments being thus successfully ascertained, let us turn now to the more internal organs. The large gland already noticed, and which is evidently an incomplete disc, fills a broad interval between the two posterior (apparently anterior) petals and the two posterior stamens. Hence the position of the fertile organs of the flower is remarkably eccentric, and their insertion nearer to the anterior sepals than to the posterior cowl-shaped one. They consist of a four-celled ovarium and of four slightly didynamous stamens, which, like the style, are gently turned backwards (apparently forwards in the expanded and inverted flower). Of these, the two anterior (apparently posterior) are free and opposite to the larger sepals; while the small abortive petal alternates with them. The two others, more or less connected at their base, are in fact, although less evidently, alternate each with two of the connected petals. To arrive then at a perfect symmetry of the flower one stamen only is required, and that, if developed, would be the posterior one which should alternate with the two posterior petals, and of course be intermediate between the two posterior and connate stamens. Now the position thus theoretically assigned to the wanting stamen is almost practically ascertained by the fact of a small tooth or short filament being found in the place just mentioned. To sum up then, the structure, apparently so anomalous, of the flowers of *Melianthus*, we may use the following formula:—" Calyx deeply cut into five unequal segments. Posterior segment cowl-shaped, short; anterior ones large, ovate-oblong; lateral ones broadly-linear, shorter than the anterior. Petals five, comparatively small, alternate with the calycine segments; inferior one more or less abortive, distant from the others; lateral and posterior ones converging towards the cowl-like sepal and connected together by the woolly margins of the apex of their claws. Disc incomplete, horseshoe-shaped, and at the same time concave, with its aperture turned towards the ovarium and the inferior (apparently superior) side of the flower, interposed between the two posterior stamens and the two posterior petals. Stamens (normally 5) hypogynous, alternate with the petals: the posterior one always abortive, occasionally represented by a short sterile filament; the inferior ones free, the intermediate or lateral ones more or less connected at their base. Ovarium four-celled, its cells alternating with the stamens." If to these floral characters we add an awl-shaped style, with four small stigmatic toothlets; four ovules inserted in two rows above the middle of the internal angle of each cell; a membranaceous, inflated, almost tetrapterous, four-lobed capsule, the carpels of which open along the obliquely-internal suture of their superior lobe; and lastly several seeds (generally two in each carpel), horizontal or ascending, anatropous, with a hard shining testa, a large somewhat horny albumen, a narrow, straight embryo with a claviform radicula longer than the plano-convex cotyledons;—in recapitulating, I say, all these characters and combining them with those of general habit, vegetation, foliation and properties already mentioned, we shall have a comprehensive idea of the leading features of *Melianthus*,—a sketch sufficient at least to guide us in the search of the affinities of that singular genus.

Thus, if we find shrubby plants with pinnate leaves, winged, or at least marginated petioles, intrapetiolar and connate stipules, simple racemes, and flowers bearing the strictest analogy to the normal or usual structure of those of *Melianthus*, we shall be inclined to take so striking a conformity as a sign of some close connexion; and perhaps the very conflicting points, which are distinctive generic marks of the plants under consideration, will throw a new and unexpected light upon their general as well as mutual affinities.

The plants I have been just alluding to are no ideal types, but two remarkable genera lately discovered in several parts of tropical and subtropical Africa, one of them, *Natalia*, Hochst., being represented by one species in Port Natal, on the coast of Cafferland, and by another species in Sierra Leone; while the two known species of *Bersama*, Fresen. (the second genus), seem to be confined within the limits of the Abyssinian flora. Both genera agree in their habit and structure to such a degree as to leave no doubt of their being rightly approximated by M. Hochstetter, although M. Endlicher, probably through a pardonable inadvertence, leaves *Bersama* among *Ampelideæ*, whose characters are totally at variance with it; while, at the suggestion of M. Hochstetter, he assigns to *Natalia* a place among *Sapindaceæ*. On the other hand, M. Ach. Richard, who in his 'Tentamen Floræ Abyssiniæ' has recently given a correct figure of *Bersama*, seems to make no doubt of its being a true *Meliacea*; although the position of the disc, outside instead of inside of the stamens, would suffice to exclude the genus from that very clearly defined order, and point out its affinity to *Sapindaceæ*. But if *Natalia* and *Bersama* are in fact closely allied to this last group, it is no less certain that they do not come within its limits: for the want of albumen, and the greater or less curvature of the embryo, are characters of primary, and one may say, necessary importance in *Sapindaceæ*; and, contrary to this, *Bersama* and *Natalia* have like *Melianthus* a narrow, straight embryo in the axis of a copious albumen.

But, to revert to the analogies or differences between those plants and *Melianthus*, let us take a short notice of the flower of *Natalia*. There the calyx is comparatively small, and its irregularity not very striking. However the two inferior of its five segments are connected into one, with only a slight emarginature to mark their limits. Five unguiculate and thick petals alternate with the calycine segments, above which their nearly uniform borders are almost equally spread. But a closer examination shows that the lower petal, corresponding to the emarginate apex of the double calycine segment, is in fact narrower than the rest, and represents a kind of labellum, analogous by its position to the small abortive petal of *Melianthus major.* A somewhat hippocrepiform gland embraces the base of the back of the two posterior stamens, which are half connected together, while the other two are free; the whole of the andræcium and disc being thus the very image of the corresponding parts in *Melianthus.* In both, the quaternary number of the stamens is in strong contrast with the quinary proportion of the petals and calycine segments; the disc is in both incomplete and excentric, opposite to the posterior stamens, and placed outside of their filaments, the vacant place of the fifth not developed stamen being opposite to the posterior sepal; so that, when we come to *Bersama,* where the quinary proportion and the regular alternation of all the verticils of the floral parts is a constant and usual character, we find there exemplified, by a living demonstration, what the laws of symmetry led us to conceive of the normal state of the flower of *Natalia* and *Melianthus.*

What has been said of the three genera in question will perhaps appear sufficient to justify their combination into one natural order, to which the name of *Meliantheæ* may be applied. It remains still to point out the distinctive marks which, according to their importance, may be deemed either of generic or of sectional value in these plants. A large, coloured, remarkably irregular calyx; four of the petals in part connected by their claws; the stigmatic toothlets of the style very small; a capsule of a papyraceous texture; two ovules at least, and sometimes four or six in each cell; and seeds destitute of arillus;—these are the characteristic features which distinguish the section of *Eumeliantheæ* or *Meliantheæ* proper; while the slighter irregularity of the flowers, the free petals, thick stigmatic lobes, coriaceous capsule, solitary ascending ovules, and arillate seeds will obviously define the section of *Bersameæ,* including *Bersama* and *Natalia.*

As to the less important features, a few words suffice to express the distinction between the two last-mentioned genera: *Natalia* has, like *Melianthus,* four stamens, two of which are quite free; *Bersama,* on the other hand, more strictly symmetrical in its structure, has its five stamens equally connected by the broad bases of their filaments.

Until now, while speaking of *Melianthus,* I have purposely restricted my observations to *Melianthus major* and *M. Himalayanus,* because they deviate in several important points from the structure of the two other Cape species, viz. *Melianthus minor,* L. and *Melianthus comosus,* Vahl: in these, the constant abortion of the fifth anterior (apparently posterior) petal, the total absence of any depression in that part of the receptacle which is inclosed by the gland, and of any lobes at either end of the capsule,—all these points concur with the striking peculiarities of facies, to point out the plants in question as types of an independent genus; the name of which, *Diplerisma,* will allude to the character of their free, lateral, subulate stipules, so very different from the wide, double, intrapetiolar stipule of the real *Melianthus.*

Having thus brought under a comparative review the four genera which constitute the order of *Melianthеæ,* we may conclude with some general inferences on their common relations to other groups; or, rather, we may establish upon proofs what has been anticipated above of their being equally removed from *Rutaceæ* and *Zygophylleæ,* while they are closely allied to *Sapindaceæ* on the one hand and to *Geraniaceæ* on the other.

First, although the sagacious and profound A. Laur. de Jussieu had connected, under the common name of *Rutaceæ,* the genera which Mr. Robert Brown distributed afterwards into the independent orders of *Zygophylleæ* and *Diosmeæ,* it strikes me that those orders belong to natural classes truly bordering on each other, but quite distinct. On one side, *Diosmeæ* (including *Ruteæ, Diosmeæ* proper, *Xanthoxyleæ* and *Aurantiaceæ*) form, with *Simarubeæ* and *Meliaceæ,* a vast and indivisible class; on the other side, *Zygophylleæ, Oxalideæ, Connaraceæ, Leguminosæ* and *Moringeæ* are connected by so many points of structure and habit, that they offer, in my humble opinion, a rare example of a well-marked and at the same time complete natural group; where the constant tendency of the folioles of the compound leaf to periodical sleep, or sometimes to sudden motion under an irritating influence, is always connected with that important structural fact, the articulation of the foliole with the stipes on which it moves. *Sapindaceæ* do not seem to me to belong to the first class, any more than *Geraniaceæ* deserve to be united with *Oxalideæ,* although this last opinion is generally prevalent. In fact, the true spirit of improvement in science is not to submit tamely and blindly to received opinions, but to examine, with proper caution, the grounds upon which they stand. Now the result of such a labour will no doubt, in many cases, strike at the root of ideas to which age and custom give a strong colouring of truth, and which however are not the less really misunderstandings of nature. Thus, to quote the only example of that prejudice which belongs to my present subject, who does not follow Jussieu in considering *Acerinæ* as immediately connected with *Malpighiaceæ*? Yet neither habit nor characters, but merely a deceptive resemblance between the winged carpels of some *Malpighiaceæ* and those of *Acer*, is the ground on which that connexion is founded. Now while such a trifling circumstance, which is almost in all cases only of generic value, is there the object of an exclusive attention, the real signs of the affinity of *Acerinæ* with *Sapindaceæ* seem to have escaped notice. Of these marks the most important, because the most general, is the position of the disc between the stamens and the petals,—a character which may be observed in all *Sapindaceæ* (including *Hippocastaneæ*) as well as in *Tropæoleæ* (including *Limnantheæ*), and also in *Meliantheæ* and *Geraniaceæ*; that is to say, in all the orders which, with the addition of *Cochlospermeæ*, I consider as members of the same natural class.

Having thus traced the outline of the groups with which *Meliantheæ* may be compared, and having fixed the place of that order in the last-mentioned class, it remains to justify that opinion by more circumstantial details. First, as to the facies,—a new species of *Natalia* is so strikingly like some *Paulliniæ*, that I have alluded to that resemblance by giving it the specific name *Paullinioïdes*. Moreover, *Sapindaceæ* include poisonous plants, the leaves of several *Paulliniæ* and *Serjaniæ*, like those of the *Magoniæ*, being used to intoxicate fish; and among them the *Paullinia australis*, A. St. Hil., being suspected by M. Aug. de St. Hilaire to be the plant which communicated to the honey of the *Lecheguana* wasp the noxious effects which that distinguished traveller has related from his own perilous experience*. Now analogous properties may be supposed to exist in *Melianthus*, judging from the strong narcotic and virous smell of the whole plant; and even a like induction might perhaps make us extend the suspicion to many of the *Geraniaceæ*. As to floral characters, the contrast of the quaternary proportion of the

* See Aug. de St. Hilaire in Mémoires du Mus., vol. xii. p. 293.

stamens and petals with the quinary division of the calyx is equally striking in *Diplerisma* and *Natalia* among *Meliantheæ*, and in *Paullinia*, *Serjania* and other *Sapindaceæ*; the cohesion of two of the calycine segments takes place in several *Serjaniæ* and *Paulliniæ* as well as in *Natalia*; the excentricity of the floral organs is the same in all these cases; the disc is obliquely unequal and incomplete; moreover, as the petals of many *Sapindaceæ* have on the inner side of their claws a lamelliform or crest-shaped appendage, so we find occasionally on the apex of the claws of the petals of *Natalia Paullinioïdes*, Planch., some fleshy tubercles, which are evidently the rudiment of a corresponding crest; and, lastly, as nothing can be more striking than the resemblance and general agreement of the capsule of *Diplerisma* with that of *Cardiospermum*, so, on the other hand, the coriaceous capsule of *Bersameæ*, with its arillate seeds, single in each cell, and ascending from the base of its inner angle, corresponds in all respects with the fruit of *Paullinia*. Thus the most important points of structure concur in proving the close connexion of *Meliantheæ* with *Sapindaceæ*.

The analogy of floral organization which exists between *Melianthus* and *Polygala* is too obvious to be totally neglected, although the balance is rather against an immediate approximation of those plants. In both cases we have a remarkably irregular calyx, cut into five segments; the petals connected by their claws, and the stamens in a quaternary proportion. But here, as everywhere else, care must be taken not to confound floral analogy with real signs of immediate connexion; not to mistake parallelism of structure for that direct tendency which habit, the true touchstone of affinities, points out more or less clearly from one natural group to another. Now, it is on the combined suggestions of that general resemblance and of particular links of connexion, such as that of *Krameria* with *Janusia*, of *Securidaca* with *Acridocarpus* and *Hiptage*, it is, I say, upon these grounds that I am inclined to consider the affinity of *Polygaleæ* with *Malpighiaceæ* as more close than that of each of those orders separately with *Sapindaceæ* and *Meliantheæ*. Still, however, these groups cannot be far removed from each other.

Besides the four genera which rank naturally under the first of these groups, another anomalous Cape genus may, according to Mr. Harvey's suggestion, be conveniently placed near them. The plant I allude to is *Aitonia*, whose habit is rather that of a *Lycium*; its leaves simple, fasciculated, and without stipules; its flowers solitary; its embryo evidently curved, and including, according to Mr. Harvey, on its concave side a small quantity of albumen,—all characters which militate against so close a connexion with *Meliantheæ* as other points of structure, and especially that of the fruit, are calculated to suggest.

Meliantheæ, as defined above, might be said to be an exclusively African tribe, if the existence of *Melianthus Himalayanus*, Wall., in the mountains of Northern India did not contradict so general an assertion. As no species of *Melianthus* has been observed in the intermediate regions between the Cape and the Himalaya, we may truly wonder, as Dr. Lindley observes, at the unexpected distribution of the genus; but that very fact must guard us against the danger of hastening to draw general inferences upon the geographical distribution of plants, since the only satisfactory results of that most important study must proceed from the careful limitation of the orders, tribes, genera, subgenera and species, from a knowledge of their mutual affinities, in short, from an analytic, comparative and comprehensive view of the immense sphere of vegetable creation. What I have to offer upon that point, in this particular case, is but a mite compared with the mass of the work; but, as it is, I have summed it up in the following synoptical table, which is the anticipated result of the systematical part of this paper.

Synoptical Table of the Geographical Distribution of MELIANTHEÆ.

	Sect. Eumeliantheæ.		*Sect.* Bersameæ.	
	Melianthus.	*Diplerisma.*	*Natalia.*	*Bersama.*
Cape of Good Hope . .	M. major	D. minor. D. comosa.		
Port Natal, (Subtrop. S.E. Africa.)	. . . .	. . . .	N. lucida.	
Sierra Leone, (Trop. W. Africa.)	. . . .	. . . .	N. Paullinioïdes.	
Abyssinia	. . . .	. . . .	. . . .	B. Abyssinica. B. serrata.
Kamaon, (Subtrop. N. India.)	M. Himalayanus.			
No. of species of each genus	2	2	2	2

Revisio Systematica Ordinis Melianthearum.

Ord. MELIANTHEÆ, *Planch.*

Genus (*Melianthus*) familiæ Geraniorum, *Adans. Fam. Pl.* ii. p. 388 (ann. 1763).—Genera in ordine enumerata: *Malpighia, Banisteria* (Malpighiaceæ); *Tropæolum* (Tropæoleæ); *Serjania, Paullinia, Cardiospermum* (genera Sapindacea sub nomine *Corindi*, Tourn., ab auctore in unum confusa); *Melianthus* (Meliantheæ); *Geranium* (Geraniaceæ); *Hermannia, Melochia* (Büttneriaceæ-Hermanniaceæ); *Viola* (Violaceæ).

Genus (*Melianthus*) Rutaceis affine, *Juss. Gen.* p. 297 (ann. 1789).—Genera in ordine enumerata: sectionis primæ, *Tribulus, Fagonia, Zygophyllum, Guaiacum* (Zygophylleæ, *Br.*); sectionis secundæ, *Ruta, Peganum, Dictamnus* (Rutaceæ-Ruteæ, *Adr. Juss.*); genera affinia, *Melianthus* (in annotatione cum *Dictamno* et *Tropæolo* comparatus) (Meliantheæ), *Diosma, Empleurum* (Rutaceæ-Diosmeæ, *Adr. Juss.*), *Aruba* (Simarubeæ, *Rich.*).

Genus (*Melianthus*) ordinis Corydalium, *Linn. Prælect. in Ord. Nat.* p. 371 (ed. Giseck. ann. 1792).—Genera enumerata: *Melianthus* (Meliantheæ), *Monniera* (Rutaceæ-Diosmeæ, *Adr. Juss.*), *Epimedium* (Berberideæ, *Juss.*), *Hypecoum, Fumaria* (Papaveraceæ, *Juss.*), *Leontice* (Berberideæ, *Juss.*), *Impatiens* (Balsamineæ, *Ach. Rich.*), *Utricularia* (Lentibularieæ, *Rich.*), *Calceolaria* (cum ?) (Scrophularineæ, *Juss.*), *Pinguicula* (Lentibularieæ, *Rich.*).

Genus (*Melianthus*) Rutaceis-Zygophylleis affine, *Adr. Juss. Mém. Rut.* p. 76 (ann. 1825); *Endlich. Gen.* No. 6043 (nomine ordinali *Meliantheæ* adjecto, sed absque definitione, nec genus cum ullo alio consociatum).

Genus (*Melianthus*) Sapindacearum, *Reichenb.* ex *Steud.*

Genus (*Bersama*) Ampelideis dubitanter adscriptum, *Endlich. Gen.* No. 4572 (ann. 1836–1840).

Genera (*Bersama* et *Natalia*) Sapindacearum, *Hochst. in Flor. Ratisb.* (ann. 1843) ii. p. 663.

Genus (*Bersama*) Meliacearum, *Ach. Rich. Tentam. Flor. Abyss.* i. p. 107 (ann. 1847).

CHAR. ORD. *Flores* hermaphroditi (an interdum polygami ?), plùs minùs irregulares. *Calyx* 5-partitus, laciniâ impari posticâ, omnibus æstivatione quincunciatim imbricatis.

Petala 4–5, laciniis calycinis alterna, unguiculata, nuda v. intùs ad unguis apicem tuberculis carnosis minutis interdùm aucta.

Stamina 4–5, petalis alterna; *filamentis* crassis; *antheris* supra basin dorso affixis, bilocularibus, loculis connectivo dorsali intùs adnatis rimâ introrsâ dehiscentibus.

Discus inter petala et stamina positus, sæpiùs hippocrepiformis, nunc incompletè annularis.

Ovarium 4–5-loculare. *Stylus* plùs minùs crassè subulatus, dentibus v. lobis 4–5 *stigmaticis* terminatus. *Ovula* in loculo singulo 2–4, biseriata, supra medium anguli interni affixa, horizontalia v. adscendentia, nunc solitaria et e basi anguli interni adscendentia.

Capsula loculicidè 4–5-valvis (dehiscentia tamen non semper secus dorsum carpelli extensa).

Semina (fertilia) in loculis solitaria; *testâ* crustaceâ; *albumine* copioso, subcorneo; *embryonis* axilis recti *radiculâ* hilo admotâ, lineari-clavatâ; *cotyledonibus* lineari-ellipticis, crassiusculis, facie planâ sibi invicem applicitis longiore.

Frutices *sempervirentes,* gemmis *squamosis destituti.* Folia *alterna v. subopposita, imparipinnata,* petiolo *sæpiùs inter foliola alato v. marginato.* Stipulæ 2, *in unam intra-axillarem sæpiùs concretæ, nunc laterales et liberæ.* Racemi *terminales et axillares.*

Trib. I. Eumeliantheæ.

Flores sub anthesi, ob pedicelli torsionem, resupinati. *Calyx* magnus, conspicuè irregularis, laciniis inter se non concretis. *Petala* calyce minora (evidenter perigyna), 4 superiorum (nempe 2 posticorum et 2 lateralium) *unguibus* conniventibus et mediante indumento lanuginoso sursùm inter se cohærentibus (nec verè concretis). *Filamenta* staminum 2 (reverâ lateralium, sed ex facie posticorum) unà cum rudimento staminis postici semper abortivi nunc plânè deficientis, basi concreta. *Ovarium* 4-loculare, *loculis* 2–4-ovulatis; *ovulis* supra medium anguli interni affixis, horizontalibus v. adscendentibus, biseriatis. Denticuli *stigmatici* minuti. *Capsula* papyracea, subtetraptera, carpellis (abortu) monospermis (*fide Ad. Juss.*), secus dorsum haud dehiscentibus. *Semina* exarillata.

Racemi *bracteosi.* Flores *nutantes.* Odor *virosus, fœtidus.*

Gen. 1. Melianthus, *Tournef.*

Melianthi sp., L. et Auct. subseq.

Char. Diff. *Calyx* hinc (versus latus reverâ posticum sed in flore resupinato ex facie antico) in gibbum subscrotiformem intùs cavum productus. *Petala* 5, antico abortivo. *Capsula* apice 4-loba, lobis suturâ internâ dehiscentibus.

Folia *glaberrima, glauca.* Stipulæ *in unam intra-axillarem petiolo infernè adnatam magnam concretæ.*

Obs. In pluribus floribus specierum infrà enumeratarum ovarii septa semper completa et ad axim inter se concreta vidi; Cl. Ad. de Jussieu, contrà, ovarium *M. majoris* supernè incompletè septatum descripsit et delineavit. An ideò character illud inconstans? An stirps quæ Cl. auctori in hortis innotuit a vero *M. majore*, L., specificè diversa?

Sp. 1. *Melianthus major*, L.—M. petalorum laminis densè pubescentibus.

α. Gibbo calycis conspicuo, subscrotiformi.

Melianthus major, *L. sp.* ii. p. 892, *et Herb.*! *Sims, Bot. Mag.* tab. 45.

β. Gibbo calycis obtusissimo et lato vix conspicuo. An sp. distincta? sed foliis deficientibus, ibi non definienda.

Hab. Ubique in cultis coloniæ Capensis; ex *Eckl. et Zeyh.* Varietatem *β.* prope Cape Town legit *cl. Hook. fil.*

Sp. 2. *M. Himalayanus*, Wall.—M. petalorum unguibus glabris.

M. Himalayanus, *Wall. Cat.* No. 1190.

Hab. In Indiæ superioris ditione Kamaon (Vid. sicc. in herbb. Soc. Linn. Lond. et Lindl.).

Gen. II. DIPLERISMA.

Melianthi sp., L. et Auct. subseq.

CHAR. DIFF. *Calyx* nec conspicuè gibbosus nec intùs intra aream a disco limitatam excavatus. *Petali* antici ne quidem rudimentum. *Capsula* utrinque obtusa, vix ac ne vix 4-loba.

Rami foliaque *præsertim subtùs pube adpressâ canescentes.* Stipulæ 2, *subulatæ, laterales, liberæ.*

Sp. 1. *Diplerisma minus*, Planch.—Melianthus minor, *L.*; *Vahl, Symb.* iii. p. 85.

Hab. In Coloniæ Capensis provinciis occidentalibus, maritimis. Saldanha Bay, prope Compost, *Thunb.*—Langevaley, district. Clanwilliam, versus littus maris, lat. circit. 32° 30′, infra altit. 1000 ped., *Drège in Herb. Hook.*

Petalorum laminæ basi utrinque ligulâ lineari auctæ.

Sp. 2. *D. comosum*, Planch.—Melianthus comosus, *Vahl, l. c.*

Hab. In Coloniâ Capensi; Langevaley, in Carro infra Bockland et alibi, *Thunb.*; Zuureberg, dist. Albany, *Burke in Herb. Hook.*; Graafreynet, in scopulosis et petrosis montanis, alt. 3000–4000 ped., August, *Drège*, No. 7716. Ad ripam arenosam fluminis Camtoursrivier, distr. Uitenhage, tùm in lateribus montium prope Philipstown (ceded territory), *Eckl. et Zeyh. Enumer.*

Trib. II. BERSAMEÆ.

Flores non resupinati. *Calyx* haud magnus, nec conspicuè irregularis, laciniis 2 anticis inter se plùs minùs concretis. *Petala* 5, calyce majora, antico cæteris paullò angustiore, omnia libera et subæquidistantia, crassa. *Stamina* 4–5. *Ovarium* 4–5-loculare, loculis

1-ovulatis; *ovulis* e basi anguli interni adscendentibus. *Lobi stigmatici* 4-5, crassi, in conum approximati. *Capsula* coriacea, ab apice ferè ad basin imam in valvas 4–5 medio septiferas dehiscens. *Semina* arillo cupuliformi, carnoso, testæ adnato prædita.

Bracteæ *minutæ*. Flores *patentes v. nutantes.*

Gen. III. Natalia, *Hochst. in Florâ, ann.* 1841, p. 663 (partibus anticis floris perperam posticis dictis et vice versâ).

Rhaganus, E. Mey. Mscr. in coll. Drèg. (ut cl. Bentham me monitum fecit).

Genus novum Sapindaceum, Bentham in Herb. olim et in litt. ad cl. Harvey.

Char. Diff. *Stamina* 4, antica 2 (reverâ lateralia, sed ob antici staminis defectum hujus sedem pro parte usurpantia), basibus dilatatis filamentorum concreta.

Obs. Discum dimidiatum staminibus duobus posticis adjacentem in specie utrâque observavi.

Sp. 1. *Natalia lucens,* Hochst. l. c.—*Rhaganus lucida,* E. Mey.

Hab. In Africæ Australis subtropicæ orâ orientali, ad Port Natal, *Krauss.,* No. 71; *Drège in Herb. Hook.*; *Peddie in Herb. Benth.*

Sp. 2. *N. Paullinioïdes,* Planch. in Hook. Icon. Pl. tab. 780.

Hab. In Sierra Leone, *Vogel in Herb. Hook.*

Gen. IV. Bersama, *Fres. in Mus. Senck.* ii. 280. *ex Endl. Gen.* No. 4572.

Sp. 1. *B. Abyssinica,* Fres. l. c. ex Ach. Rich.—Bersama integrifolia, *Ach. Rich. Tentam. Fl. Abyss.* i. p. 107. tab. xxvi.

Hab. In prov. Chiré, Abyssiniæ, *Quartin Dillon,* ex *Ach. Rich.,* et etiam in regione mediâ montis Sellenda, *Schimper* ex *Ach. Rich.*; sed specimina *Schimperiana* ex eâ regione quæ in Herb. Hook. vidi, ad speciem subsequentem referenda. In illis enim stylus longè exsertus et discus ferè completè annularis, dum in icone stirpis *Dillonianæ* stylus inclusus et discus dimidiatus apparent.

Sp. 2. *B. serrata,* Ach. Rich. l. c.

Hab. In collibus prov. Ouodgérate Abyssiniæ, *Ant. Petit.* ex *Ach. Rich.*; et in monte Sellenda, si specimina *Schimperiana,* No. 942 (sect. 2dæ) hùc rectè relata.

Obs. Specimen *Schimperianum,* No. 1507 (sect. 3dæ) differt a suprà dicto (No. 942), fructibus conspicuè minoribus, vix pulveraceo-cinereis, nec rufo-pubescentibus. Flores etiam, quorum fragmenta tantùm vidi, minores esse et ad illos *Bersamæ Abyssinicæ,* Fresen. (fide Ach. Rich.) accedere videntur; tamen, ob exsertionem styli, et discum ferè completè annuliformem diversi. Cæterùm differentias longitudinis styli et staminum potiùs polygamiam florum quam veras notas specificas denotare valdè suspicor, quum in floribus omnibus stylo exserto præditis (qui tantùm mihi suppeterant) pollen in antheris frustrà quæsivi. An igitur reverâ plus quam una species?

EXPLANATION OF PLATE XX.

Fig. 1. A flower of *Melianthus Himalayanus*, Wall.

Fig. 2. The same, with half of the calycine segments removed.

Fig. 3. The four posterior petals inserted round the concave glandular disc, with part of the receptacle which supports both petals and disc.

Fig. 4. Flowers of *Melianthus major*, *β*.

Fig. 5. The same, with half of the calycine segments removed.

Fig. 6. The half of the posterior part of the calyx, and gland.

Fig. 7. The four posterior petals around the disc:—side view.

Figs. 8 & 9. Two different forms of the fifth anterior abortive petal.

Fig. 10. The fruit of *Melianthus major*, *α.*:—natural size.

Figs. 11, 12, 13. Seed and embryo of the same:—copied from M. Ad. de Jussieu's memoir on *Rutaceæ*.

Fig. 14. A flower of *Diplerisma minus*.

Fig. 15. One of its lateral petals.

Fig. 16. A flower of *Diplerisma comosum*.

Fig. 17. The same, after the cutting off of the posterior and one of the lateral and anterior calycine segments.

Fig. 18. Ovarium of *Diplerisma comosum*, with one of its cells cut open.

Fig. 19. Diagram of *Diplerisma comosum*; c', posterior calycine segment; c, c, c, c, other calycine segments; p, p, p, p, petals; d, disc; s, s, s, s, stamens; o, ovarium.

Fig. 20. The fruit of *Diplerisma minus*:—natural size.

Fig. 21. A flower of *Natalia Paullinioïdes*.

Fig. 22. Internal organs, and one of the posterior petals of the same.

Fig. 23. Disc.

Fig. 24. A flower of *Bersama Abyssinica*.

Fig. 25. The same, after the removal of the petals and the forcible expansion of the calyx.

Fig. 26. The capsule of *Bersama Abyssinica*.

Figs. 27 & 28. Seed and embryo of *Bersama integrifolia*, Rich.:—copied from Ach. Richard's *Tent. Fl. Abyss.*

Obs. All the parts are more or less magnified, except when the contrary is stated.

XXVI. *On the Formation and Use of the Air-sacs and Dilated Tracheæ in Insects.* *By* George Newport, *Esq., F.R.S., F.L.S. &c. &c.*

Read December 7th, 1847.

It is well known to every comparative anatomist, who has paid any attention to the *Invertebrata*, that many insects in their perfect state have their respiratory organs more or less dilated, in different parts of their course, into vesicles, or sacs. In some tribes, as in most of the *Hymenoptera*, *Lepidoptera* and *Diptera*, these sacs are present in almost every species, and occupy a large portion of the interior of the body, more especially of the abdominal region. In the most active *Neuroptera* the sacs are very numerous and capacious, especially in the *Dragon-flies*; but they are much smaller and fewer in number in the *Ephemeræ*, the *Sialidæ* and the *Scorpion-flies*. In the *Coleoptera* the sacs exist only in the volant species, and are more or less numerous and capacious in these in proportion to the bulkiness of the insect, and its degree of activity on the wing. This difference exists not only in different genera, but in different species of the same genus, according as they are winged or apterous species. Thus distinct vesicles are found in the winged *Carabidæ*, but not in the apterous, in which the respiratory organs are simply tracheal. In the more heavy-bodied genera the vesicles are not confined to the abdominal and thoracic regions, but are sometimes extended into other parts, as in the unwieldy *Stag-beetles*, in which they are extremely numerous, and occupy the chief portion of the interior of the mandibles. In the *Lepidoptera*, as in the *Neuroptera*, they are largest in the swiftest and most powerful species, and more especially so in those in the males, which are known to be the most active on the wing. On the contrary, in the majority of the *Orthoptera*, which are merely saltatorial in their habits, the tracheæ never assume the form of distinct vesicles, excepting in a few genera, which have the power of flight. They retain the arborescent form in the perfect as in the larva state, but are considerably enlarged throughout the greater part of their course, their extreme ramifications only retaining their original setiform structure and distribution. In the truly apterous insects the tracheæ are invariably arborescent, and diminish in size from their origin to their extremest point in their perfect as in their larva condition; and they are invariably smaller in diameter, and have fewer ramifications, in the most inactive species.

The respiratory organs are always simply tracheal in the larva state of all insects, and it is not until the period of change to the pupa is fast approaching that they begin to be enlarged, even in those in which vesicles afterwards are most numerous. The enlargement, as I have elsewhere shown*, commences in Lepidopterous insects at about the time when the larva ceases to feed. It is perceptible first in the longitudinal tracheæ of the thoracic segments of the Sphinx, immediately before the insect enters the earth; and by the time that the cell in which it is to undergo its transformation is completed, the tracheæ from the second to the fifth spiracles are distinctly enlarged. In the Diurnal species, which do not enter the earth, but undergo their changes in the open air, the dilatation of these tracheæ commences while the insects are spinning their silken threads. When this labour is finished, and they have remained for a few hours at rest, the skin is fissured along the dorsal surface of the thoracic segments and thrown off, the change to the pupa is effected, and the longitudinal tracheæ in the fifth and sixth segments are dilated into vesicles, which continue to be enlarged during the first few days after the change. The tracheæ of the third and fourth segments each give off a small trunk on their external surface, which is divided into two branches, and is involved in a fold of the new tegument that is formed beneath the old skin of the larva some days before its change. The fold of tegument on each side of the third and fourth segments is supplied with ramifications of tracheæ from these minute trunks, and very closely resembles in appearance the external abdominal branchiæ of the aquatic larvæ of *Neuroptera*. It is these folds which become the most important organs in the perfect state of the insect, its wings. When the old skin of the larva is fissured, and the thoracic segments become shortened, as the skin is thrown off, previous to their forming one region, the thorax, the tracheæ in these folds are rapidly enlarged

* Phil. Trans. 1836, part ii. p. 535.

and elongated, and mainly assist in inducing a rush of blood into these structures, which are thus expanded on the sides of the new pupa as the rudimentary wings. This elongation of the small trunks at the sides of the longitudinal tracheæ in the thorax, relieves them of a portion of that tension which results from the powerful respiratory efforts of the insect in effecting its change; and which, with a tendency to enlarge by the natural forces of growth in these structures, results in the dilatation first of the tracheæ at the base of the abdomen, and afterwards of those of the thorax, and the sides of the abdomen, into distinct sacs. This is the manner in which the air-sacs are formed in all insects. After the main trunks have become dilated their ramifications also are enlarged in like manner, and this enlargement continues from the time when the insect enters its pupa, to that of its appearance in the perfect state.

But although we are enabled to show the manner in which the vesicles are formed, it is difficult to give direct proof of their immediate use. It is assumed from the facts I have mentioned, that they are most numerous and large in volant insects, and entirely absent in apterous, that they are connected with the power of flight; but in what way, has never yet, so far as I am aware, been actually proved. It was assumed by John Hunter that they are for the purpose of enabling the insect to alter the specific gravity of its body,—a view which I have myself long ago adopted,—but the facts on which the opinion is founded are only those of anatomy, and not of direct observation or experiment, which are required to confirm it. Anatomical facts alone, as will be seen in this instance, although the safest guides, are not always sufficient. Thus we find that a vesicular structure of the organs of respiration exists in the whole of the air-breathing *Vertebrata.* The lungs of Man and the *Mammalia* are formed of multitudes of vesicles, which are more numerous than in any other class; those of *Birds* exhibit a like condition, but in these the vesicles are distributed more extensively over the whole body. A vesicular condition of the respiratory organs exists also in the *Reptiles* and *Amphibia*, but far less extensively than in *Birds.* Thus each of these classes agrees with insects in possessing a vesicular form of the respiratory organs. The whole of them also, excepting the *Mammalia,* agree in the fact that the vesicles are parietal, that the tracheal structures are dilated in different parts of their course, while in *Mammalia* this is not the case, the vesicles in them being only at the extremities of the ramifications of the respiratory structures.

In what way then will the anatomy of the structures lead us to a well-founded inference that is supported by direct observation on the function? We must compare insects with those animals which approach nearest to them in the function of these structures,—Birds. In Birds the respiratory organs are not only vesicular, but are more extensively distributed over the whole body than in any other Vertebrata. These, as every anatomist knows, are not confined merely to the great cavities of the body, but are extended to every part of the skeleton, as in insects. They communicate directly with the interior of the bones of the wings and legs, as the tracheæ of the thorax are extended also into these parts in insects. This distribution in both is more extensive and complete in the most active species. In Birds which are unaccustomed to flight, as in the Ostrich, as remarked by Mr. Owen*, the communications of the respiratory organs with the bones is imperfect; whilst in Insects, although tracheæ exist in all, the vesicles are found only in those of flight. This fact extends even to the sexes of the same species. Thus vesicles exist in the male of the common Glow-worm, which is winged, and designed to search out the apterous female, in which the respiratory organs are simply tracheal. The like conditions exist in the common winter-moth, *Geometra brumaria*. In the male of this insect I have found the vesicles large and numerous, but not a trace of these occurs in the female. The tracheæ in this sex, which has only the rudiments of wings, are larger relatively than in the female Glow-worm, and are precisely in that condition in which I have found them in the Diurnal Lepidoptera shortly before changing to the pupa. These anatomical facts are inferential of the real use of the vesicles, and are supported by an observation which I have been able to make on the common Dung-beetle, *Geotrupes stercorarius*, at the moment when it is preparing to take flight. A specimen of this insect which had been in confinement for about twenty-four hours, and consequently had not expanded its wings during that time, when placed on a table immediately prepared to escape. After walking away quickly for a short distance it began to respire freely, alternately shortening and elongating its abdominal segments at the rate of about forty respi-

* Cyclop. of Anatomy and Physiology, art. "*Aves*," vol. i. p. 341.

rations per minute. It then ceased for an instant, and slightly separated its elytra without elevating them, and began again to respire more rapidly. At first its respiration was slowly but gradually increased, until a few seconds before it attempted to expand its wings and to elevate itself upon them, when the acts of respiration became exceedingly rapid, and amounted to at least 120 per minute. These were most rapidly performed, and were then suddenly arrested at the instant before it attempted to unfold the wings. During this increased respiration the abdomen of the insect was distinctly enlarged, and it was quite evident that this enlargement, and the expansion of its wings, were being effected by forced inspirations, and maintained by the expansion of the air-sacs over the whole body, and the communication of these with the tracheal vessels in the wings themselves. As however the wings had become stiffened and dried through many hours, it did not completely succeed in its attempts to escape, but only partially raised itself upon them. The results were nevertheless sufficiently satisfactory to prove to me that the respiratory organs became distended previous to the act of flight, as the entire body was distinctly enlarged; the effect of which enlargement, together with an increased evolution of heat in the body, as the result of increased respiration, must, of consequence, be to diminish the specific gravity of the insect, and thus, by lessening the degree of muscular force required to raise it on its wings, considerably augment its powers of locomotion, which seems to be the chief use for which the vesicles are developed.

XXVII. *On the Anatomy and Affinities of* Pteronarcys regalis, *Newm.: with a Postscript, containing Descriptions of some American* Perlidæ, *together with Notes on their Habits.* *By* GEORGE NEWPORT, *Esq., F.R.S., F.L.S. &c. &c.*

Read May 2nd, and June 20th, 1848.

THE existence of a winged insect which retains the branchial form of the respiratory organs of its larva state as a permanent structure, was looked upon by naturalists, when first announced *, as so curious a condition of life, that many doubted its reality. Indeed, when I first observed branchiæ in a specimen of *Pteronarcys regalis* (TAB. XXI. fig. 1), preserved in spirit, and brought to this country by George Barnston, Esq., from Canada, I was fain to regard them merely as of accidental occurrence, the result of incomplete development, similar to what is sometimes observed in the partial retention of branchiæ in adult *Amphibia*, an example of which has lately been shown to me in a Triton from Tunis. I was then disposed to think that the *Pteronarcys*, like this Triton, had not completed its changes; and, consequently, had retained in its imago form a structure which it possesses as a normal organ in its inferior condition as an aquatic larva, or pupa (fig. 2). But on minute examination, other parts of its body were found to be of a perfectly natural type, a fact which was strongly opposed to this view, since a well-marked aberration of form, or retardation of development in one part of a body rarely or never occurs without some alteration in another.

On comparing this specimen with others preserved in a dried state, and now in the cabinets of the British Museum, but which originally belonged to the Entomological Club, and are the type specimens from which Mr. Newman described his species, I immediately found that the retained branchiæ were not peculiar to the insect in my possession; as branchiæ, more or less developed,

* Meeting of Entomological Society, December 4, 1843, and Annals and Magazine of Natural History, January 1, 1844, p. 21.

but imperfectly preserved in the dried insect, and consequently most easily overlooked, exist in all the specimens of the different species of *Pteronarcys* in that collection. Branchiæ were thus found to be normal structures in the imago *Pteronarcys*, and even to characterize the genus, although they had hitherto entirely escaped observation.

Since the period when I obtained my single specimen, in December 1843, I have anxiously awaited the receipt of other examples of the insect preserved for dissection; but as I have not yet been so fortunate as to obtain them, and as I desire to make known some account of the internal structures of this remarkable insect, I have now made an anatomical examination of my specimen, having taken especial care to preserve it as entire as possible, in illustration of the facts of its anatomy, and in authentication of my account of them.

M. Pictet, the most diligent and elaborate of all monographers of the *Neuroptera*, has regarded the insects of the genus *Pteronarcys*, Newm.*, as only large *Perlidæ* †, which have the body strong and elongated, and the wings large and supported by numerous and solid reticulations. He has, however, very properly, retained the genus as established by Mr. Newman on the structure of the wings. But the entire organization of *Pteronarcys*,—not merely those portions of its external anatomy, the branchiæ, which were unknown to that gentleman when he established the genus, but also the whole of its internal conformation,—most fully authorise the separation of *Pteronarcys* from *Perla*. The peculiarities of the structures I am about to describe prove the correctness of view, and the acuteness of zoological perception and tact, which led the naturalist just mentioned, although entirely unacquainted with the anatomy of some of the primary and really important organs of the insect,—the peculiarities of which, doubtless, are of first importance in the life and habits of the species,—to establish his genus on characters which then were the most obvious for zoological description, although of only secondary physiological consequence,—the reticulations of the wings.

To understand rightly the nature of the peculiarities of this insect, I must

* Entomological Magazine, vol. v. p. 175.

† Histoire naturelle générale et particulière des Insectes Neuroptères. Première Monographie, Famille des Perlides. Genève, 1841, p. 126.

first mention that, like a very large proportion of the *Neuroptera*, it is entirely aquatic in its larva and pupa (fig. 2) states, and, consequently, that its respiration is then wholly branchial; but that in its imago or perfect state (fig. 1) it not only possesses true spiracles and tracheæ for atmospheric respiration, like other winged insects, but also retains the branchiæ of its earlier conditions, both on its thoracic and its abdominal segments, fitted for aquatic respiration. Now, although branchiæ invariably perform similar functions in all insects which possess them, they have hitherto been found only in the larva and pupa states. They are situated on different parts of the body in different genera, and, as naturalists are aware, exist, sometimes even in different species of the same genus, under different forms. In the true *Libellulæ* they are anal, and are contained within a cloaca or cavity posterior to the termination of the alimentary canal, into which the respired water is drawn by the insect at each inspiration, and is expelled from it in expiration. When this act takes place by a forcible effort on the part of the insect, it urges the body forwards, and thus becomes an act of progression. In the *Agrionidæ* the branchiæ consist of long caudal plates, through which the blood circulates to be submitted to aëration. In the *Ephemeridæ*, as in *Ephemera vulgata*, the branchiæ are both caudal and abdominal, each ring of the abdomen being furnished with bipectinated, projecting cilia, folded over the upper surface of the body. In the genera *Palingenia* and *Baëtis* of M. Pictet and Dr. Leach the abdominal branchiæ are both pectinated and lamellate, the lamellæ being folded upwards on the dorsal surface of the body. In *Potamanthus cinctus*, according to Pictet*, they are simply dendrical and setaceous, the setaceous terminations of the included tracheæ being the apices of the branchiæ; while in some few species of the same genus, as in *Potamanthus erythrocephalus*, they are lamellate, as they are also in *Cloë*. In the whole of the true *Phryganidæ*, *Mystacidæ*, *Trichostomes* and *Sericostomes*, the branchiæ are simple, hair-like structures, which cover the sides and dorsal surface of the abdomen, and these are retained in the pupa state as the respiratory organs. In *Rhyacophilus vulgaris* †

* Hist. nat. des Ins. Neuropt. Seconde Monogr., Fam. des Ephémérines. Genève, 1843, pl. 28. figs. 1 & 2. p. 198.

† Recherches pour servir à l'Histoire et l'Anatomie des Phryganides. Par J. F. Pictet. Genève, 4to, 1834, pl. 15. fig. 1.

the branchiæ have the same simple form, but instead of being distributed over the whole surface of the body they are collected into tufts, one on each side of each abdominal segment. In the *Hydropsyches* also they are setaceous and tufted, not merely at the sides of the abdomen, but also at the terminations of the caudal styles. In the *Sialidæ*, which come near to the *Perlidæ*, the respiration of the larva is both caudal and abdominal. Each segment of the abdomen in *Sialis* has a pair of single, articulated, lateral branchiæ projecting from it, while the caudal styles also are respiratory organs, as in *Agrion* and *Hydropsyche*.

In some of the *Perlidæ*, as in *Nemoura*, Pictet has shown * that the branchiæ are not tufted, as in *Perla*, although they are almost entirely confined, as in that genus, to the thoracic instead of the abdominal segments. They consist of single cylindrical appendages, as in *Sialis*, and project from the pectoral surface of each of the thoracic segments, three pairs from each. In the true *Perlidæ* † the branchiæ are tufted, are almost entirely thoracic, and are found in the whole of the species, except only in two or three, *Perla virescens*, *P. nigra* and *P. abnormis*, Newm., the *P. arenosa* of Pictet ‡. In all other known species the sternal surface of each thoracic segment has on each side one or more tufts of these branchial filamentous appendages. Usually each tuft is formed of three bundles or packets of these simple structures, into each of which a minute branch of a tracheal vessel is extended, and around which the blood circulates to be aërated. Pictet has shown that in the larva of *Perla bipunctata*, as also in other species, the middle one of each three tufts covers the future respiratory orifice or spiracle in the imago. A very similar form of tufted branchiæ exists in *Pteronarcys* (figs. 3 & 4).

The *Pupa* (fig. 2) of *Pteronarcys regalis*, the subject of the present communication, was discovered by Mr. Barnston, who favoured me with a specimen of it, but it has not yet been described. It differs both in its general appearance and habit from that of *Perla*. It is of a dark olive colour, and is covered with slight pubescence. The head is short and triangular, with setaceous antennæ, almost equal in number of joints to those of the imago. On the upper surface of the head there are three rudimentary ocelli, and the eyes project

* Monogr. Fam. des Perlides, pl. 53. fig. 7.

† *Loc. cit.* pl. 11. figs. 7 & 8.

‡ See Postscript to this paper.

widely from the posterior angles. The mandibles are short, strong and corneous, agreeing in structure with the carnivorous habits of the species. The palpi are much shorter than in the imago. The prothorax is quadrangular, much wider than long, with free elevated margins, and with the angles elongated and slightly curved. The rudiments of the wings are broad and flattened, the posterior pair being directed transversely outwards. The abdomen is cylindrical, slightly tapering, and formed of ten segments, with obsolete marks of spiracles at the sides. The ninth segment is exceedingly short on the ventral surface, but is much elongated, and is united with the terminal portion of the tenth, on the dorsal, projecting over, and completely covering the ventral portion of the tenth segment as a triangular process. The ventral portion of the tenth or anal segment is very short, and is divided longitudinally into two plates, which give origin to the caudal styles. The eighth segment in the male pupa has its posterior margin on the ventral surface elongated, as in the male imago. The legs are strong and powerful, and the meso- and metathoracic pairs have the tibiæ densely ciliated for swimming. The branchiæ on the pectoral surface of the thoracic segments correspond precisely, both in the situation and number of the tufts, with those of the imago, excepting only that the filaments are larger and more elongated, and one tuft exists in the pupa in the place of the future prothoracic and mesothoracic spiracles, which is wanting in the imago, in which the spiracles exist.

Branchiæ.—In the perfect insect (fig. 5) there are eight sets of branchial sacs, or tufts (*b*, *b*, *b*), distributed over the pectoral surface of the thoracic segments, and first two segments of the abdomen. The first of these is situated in the soft tegument that connects the head and prosternum. It consists of three pairs of sacs arranged transversely, and partially encircling the neck like a collar or ruff. The second set consists of two pairs of sacs, one of which is behind the coxæ of the first pair of legs, and the other immediately behind the ante-furcal orifices (*f*) in the prosternum. The third set consists also of two pairs of sacs situated on the anterior of the mesosternum. The fourth is a single pair of sacs between the coxæ of the second pair of legs and the mesofurcal orifices (*g*). The fifth set, like the third, is formed of two pairs of sacs, one of which is in the tegument that connects the mesoand metathorax, below the second, or mesothoracic spiracles, while the other projects from the anterior of the metasternum. The sixth, like the fourth, is only a single pair of sacs in the soft membrane of the articulation of the coxæ of the third pair of legs (*h*); while the seventh and eighth, also single pairs of sacs, project from the inferior lateral surface of the first and second abdominal segments, in situations nearly corresponding to the usual place of spiracles in other insects.

M. Pictet has described the branchial tufts in the larva of *Perla bipunctata* very precisely, and has successfully combated the opinion put forth by M. Burmeister, in opposition to his view, that the branchial filaments are only stiff hairs. A careful examination of the tufts in *Pteronarcys* has confirmed to me the correctness of M. Pictet's observations as regards their true nature. Each tuft or sac (fig. 3) is an extension outwards of the soft tegument from which project an abundance of delicate cæcal filaments. Each filament (fig. 4) is a simple, unarticulated, uniform structure, slightly tapering and closed at its extremity, and in the interior of which there is an extremely minute tracheal vessel (*c*). On examining some of these filaments taken from the branchiæ of my specimen of *Pteronarcys* formerly, in company with Professor M.-Edwards, we were unable, at that time, to satisfy ourselves of their true branchial function; but longer-continued, repeated, and more carefully conducted investigations have now most fully satisfied me of their real importance as active organs in the imago. The uncertainty of former examinations arose, as I now find, from the branchial filaments being greatly altered in their appearance by the contraction of their fibrinous tissue, together with the coagulation of the circulatory fluid and blood-corpuscles within them, occasioned by the insect having been killed and preserved in spirits. I have since recognised corresponding appearances, induced by a similar cause, in the branchiæ of other insects killed in like manner.

The number of filaments produced from each sac varies from about twenty to fifty or more. It is greatest in the sacs of the meso- and metathorax, and smallest in those of the neck and of the abdomen. The filaments originate in little bundles, four or five in each, from the distal border of the sac, but not all on precisely the same line. Usually each filament is simple and distinct; but in a few instances, as in some (fig. 4) from the external sac at the anterior of the mesothorax, two filaments sometimes arise from a common origin, in which case they are supplied with their tracheæ from the same root (*c*), but these are exceptions to the general structure. The manner in which the sacs are supplied with tracheæ directly from the great trunks of the body, and the distribution of branches of these to the filaments, are important considerations, as the demonstration of these facts fully proves that the sacs in the imago *Pteronarcys* are true respiratory organs. With this object I removed the anterior mesosternal sac from the left side of *Pteronarcys* in connexion with a portion of tegument and of trachea (fig. 3 *a*), and found on examination beneath the microscope that this sac is supplied by a large short branch from the great trunk that passes across the mesosternal surface from the bundle of tracheæ posterior to the prothoracic spiracle, from which bundle other tracheæ pass to the anterior pair of wings, to the œsophagus, and to the dorsal muscles. A precisely similar mode of distribution exists also in the metathorax (fig. 10 *i*, *k*). The division of the trachea within the sac differs a little from what has been described and delineated by M. Pictet * in the larva of *Perla*. In that species the tracheæ are shown to divide abruptly into a multitude of minute ramifications. In *Pteronarcys* the trachea (fig. 4 *b*) divides immediately it enters the root of the branchia into two branches. Each division soon again separates into two, and these again each into two others, and this binary mode of distribution is repeated until the whole terminate in ramifications of similar diameter, one of which enters each branchial filament (fig. 4 *c*), and, gradually becoming smaller from its base to its termination, gives off other small ramifications as it passes onwards, and terminates by dividing into a pair of exceedingly delicate closed tubes. M. Pictet remarks † that he has not been able to satisfy himself in what way the ramifications terminate, and thinks that the interior of these is continuous at their apex with the "*muqueuse interne du tube*," the filament. I am not able to confirm this opinion. On the contrary, I have reason to believe that the terminations, becoming gradually more and more delicate, end as cæca.

Circulation of the Blood.—The blood-corpuscles of the whole body circulate through the branchiæ for the purpose of aëration. The current of blood is always in the vicinity of tracheal vessels, "whether simply along inter-

* *Loc. cit.* p. 87. pl. 3. figs. 3 & 4. † *Ibid.* p. 88.

cellular spaces," "or bounded by distinct vessels," as I formerly pointed out in my article "INSECTA*," and as since further exemplified by M. Blanchard†. It enters the branchia at the root of the main trachea (fig. 3 *a*) on the anterior or external surface, and, bathing the whole of the branches, penetrates into each filament, passing—as I have repeatedly witnessed in the simple branchiæ of *Sialis*, and I doubt not that the course is precisely similar in *Pteronarcys* (fig. 4)—outwards along the anterior (*d*) and inwards along the posterior surface (*e*), absorbing oxygen, by the principle of endosmose, from the air that is mechanically mixed with the water, and giving out carbonic acid by the same means. This takes place in every form of branchia, so that the function itself, in every structural variety of the organ, is identical, although the conditions under which it is exercised may vary. Thus the broad flattened branchiæ of some of the *Ephemeridæ* may have reference to the occasional detention of blood in those organs under particular circumstances, and a like explanation may account for differences in the form, and in the situation of others.

We have thus established the fact that true branchiæ exist as normal structures in the imago *Pteronarcys*, as well as in the larva and pupa. Now Mr. Barnston has informed me that in both the latter states the insect constantly resides in the water, "at the bottom of streams and rivers;" while the larva of *Perla abnormis*‡, which does not possess the thoracic branchiæ, is always found hidden in the clefts of water-logged timber on the surface, or even in the trunks of trees and other places on the banks,—a difference in habit which corresponds to the difference in structure. The imago *Pteronarcys* is a nocturnal insect; the imago *Perla abnormis* is crepuscular, and perhaps diurnal, although, as Mr. Barnston remarks, "it prefers the shade in the heat of the day." The *Pteronarcys* comes abroad only at dew-fall, or in the night, and Mr. Barnston has observed it, when on the wing, "constantly dipping on the surface of the water." Another able naturalist, Edward Doubleday, Esq., F.L.S., who also has captured the insect in its native haunts, at Trenton Falls, in North America, has informed me, that he has taken it chiefly "on wet evenings," and that it hides itself by day in crevices of rocks which are constantly wetted by the spray of falling water, under stones, and in other damp

* Cyclopædia of Anatomy and Physiology, part xviii. vol. ii. p. 981, 1839.

† Comptes Rendus de l'Institut, May 1847.

‡ See *Perla abnormis*, in the Postscript.

places. This also appears to be the habit of other species of the genus as well as of *Pteronarcys regalis*. Mr. Gosse, who first figured the latter species in his 'Canadian Naturalist,' informs me that he has taken *P. Proteus* and another smaller species in Lower Canada, at Sherbrooke, where the Magog river forms a waterfall of considerable height, on the rocky sides of which, constantly washed by the spray, he has found *P. Proteus* in great numbers, hanging to the sides, or concealed in the crevices of stones and rocks, and that he has but very rarely taken it on the banks of other parts of the river. The *Pteronarcys* thus resembles an amphibious animal in its habit of life, and may be designated,—if I may be allowed the term,—an *Insect Proteus* among the winged *Articulata*,—the representative in structure, as it appears to be in habit, of the *Proteus* of *Vertebrata*. Its organs of respiration fully justify us in instituting this comparison. The true *Proteus* has both lungs and branchiæ, and a similar conformation of structure exists in *Pteronarcys*, in so far as the ramified tracheæ being the direct recipients of atmospheric air, are to be regarded as the representatives of lungs.

Sternal Orifices and Endo-skeleton.—In the short notice which I formerly published on this singular insect *, I pointed out the existence of three pairs of orifices in the tegument of the sternal surface of the thoracic segments (fig. 5 *f*, *g*, *h*), one pair in each segment, between the insertions of the legs, precisely analogous in situation to the respiratory orifices in *Iulus* and some other *Myriapoda*. But as these orifices had not then been traced to their termination within the body, and as their situation in the segments was of doubtful indication in a hexapod insect, no conclusion could be drawn from the mere fact of their existence as to whether they had or had not any communication with the tracheæ. I have now examined them carefully, and find that they pass into the thorax as strong, bone-like tubes, diverging from the axis to the periphery of the body, in the immediate vicinity of some of the principal tracheæ, but that they do not in any way communicate with them, as they terminate abruptly as cæcal structures. They are, in fact, intussuscepted parts of the hardened tegument,—organs of support,—which in most other insects are solid. They are the ento-thoracic portions of the sternal plates in each segment (fig. 14), the *ante-furca* (*u*), *meso-furca* (*v*), and *meta-*

* Annals and Magazine of Natural History, Jan. 1844, p. 23.

furca (*w*), the rudiments of an internal or endo-skeleton, to which the principal muscles of the segments and organs of locomotion, the legs, are attached, and which partially enclose and protect the nervous cord and ganglia, like the rings of vertebræ in the *Vertebrata*. Some traces of the entrances into these furcal bones exist in the sternal plates of *Perla*, but they are flattened and quite unlike those of *Pteronarcys*.

Spiracles.—But although the sternal orifices do not communicate with the respiratory organs, the imago *Pteronarcys* most certainly is endowed with an aërial as well as a branchial form of respiration. It has three pairs of large thoracic spiracles of most complete structure, which are situated in the places usually occupied by these organs in other insects, and which are covered in the pupa of this insect by branchiæ. The first pair (figs. 6, 7, 8) is in the tegument which connects the pro- and mesothorax, the second in the junction of the meso- and metathorax behind the first pair of wings, and the third is in the anterior of the segment immediately behind the metathorax, at the base of the second pair of wings. The segment which bears the latter pair bears also on its under surface a pair of branchiæ, like the true thoracic segments, and ought perhaps to be regarded only as part of the metathorax instead of a distinct segment, the first abdominal. Besides the thoracic spiracles there are also a series of false abdominal ones, one pair at the sides of each segment. These are situated at the precise spot occupied in the second abdominal segment by the last pair of branchiæ (fig. 5 *b*). They are enclosed by a circular elevation in the tegument (fig. 9) and have an imperfect vertical valvular opening, which leads into a small cavity that is closed internally by a cribriform membrane by which the spiracle is separated from the cavity of a large trachea that is connected with it. These spiracles therefore are mediate in structure between the branchial and aërial form of organ, and resemble those which I formerly described in the Transactions of this Society * as common to a genus of *Myriapoda*, the *Heterostoma*. The thoracic spiracles of *Pteronarcys*, on the contrary, are most complete structures. The three pairs are all similar in formation, the second, or mesothoracic, being somewhat the largest. They are placed vertically in the flexible tegument between the segments, and open and shut by a double valve. The pro-

* Vol. xix., Monograph of the Class *Myriapoda*, p. 413.

thoracic spiracle of the left side (fig. 6) has the anterior valve convex, and bounded by a soft, thickened, pad-like, semicircular margin, and resembles the upper lid of the human eye; the posterior valve, on the contrary, has its margin somewhat rigid, is deeply excavated, semilunar, and extended forwards at its superior angle into an elongated, slightly flattened broad process or caruncle, to the posterior border of which is attached a broad levator muscle, which opens or retracts the valve (fig. 8). The inferior angle of this valve has also a small caruncle, which projects slightly over the anterior valve when the spiracle is completely closed, but which has almost disappeared when the spiracle is expanded. The closing of the spiracle seems to be effected by circular fibres in the tegument, very similar to those of the orbicular muscle of the eye in *Vertebrata*, attached (as shown in fig. 7) at the anterior superior angle. The closure of the spiracle is completed (as in fig. 6) by the action of other muscles on the tegument behind the posterior valve, by which this is carried forwards, and its process is made to cover and shut down like a lid on the anterior valve, so as to render it impossible for anything to penetrate into the chamber of the spiracle when the valves are completely closed. This structure indicates that the action of these respiratory orifices is under the control of the will or instinct of the insect, as well as of the reflected influence of the nervous power on the application of stimuli, and probably has some direct reference to the habits of this anomalous insect.

But what peculiar modification in œconomy can we infer from this duality of respiratory organs, branchiæ and spiracles in the same individual? Can it be that the imago *Pteronarcys* ever actually re-enters the water for any purpose after it leaves it, as Mr. Barnston has informed me it does, to change to an imago under stones, on the banks of rivers? Does it ever as a perfect insect dive in search of food? or, besides residing constantly in the most damp situations, does the female, creeping down the stems of water-plants, as is said to be the habit of *Phryganea grandis**, descend beneath the surface of the stream to deposit her ova, or the male to assist in her operations? These are questions which only a close attention to the habits of the insect can solve, whilst the duality and the peculiar structure of its respiratory organs admit of their being entertained. That the structure of the spiracle may have refer-

* Curtis, British Entom., fol. 592.

ence to a frequent submersion of the insect may fairly be inferred from facts supplied to us by comparative anatomy in the *Vertebrata*. The nostril of the common Seal has a form somewhat analogous to that of the spiracle of this insect, which the animal closes most effectually, at will, when he dives, and a similar power may be possessed by *Pteronarcys* and its affinities.

Distribution of the Tracheæ.—The internal organs of respiration are almost as remarkable in their distribution and structure as the external. In most winged insects, more especially those of swift flight, or with large wings, the principal tracheæ of the body are either considerably enlarged in diameter, or are dilated in some parts of their course into vesicles or sacs. But although *Pteronarcys* has large and powerful wings, its flight is laboured, heavy and slow, while not a trace of vesicular structure exists in any part of its internal respiratory organs. Even in the principal tracheæ of the thorax (fig. 10 *i*, *k*), which communicate directly with the spiracles by small chambers, from which go off the main trunks to the wings, to the dorsal and ventral surfaces, and to the alimentary canal, there is only a very slight enlargement. In other parts of the body the tracheæ are uniform in size, are narrow, slender, and ramose. They are of a light brown colour, as in *Perla*, and differ in this respect from those of *Sialis*, which are of a jet-black. The principal trunks at the sides of the segments consist of two sets, which pass backwards, curved in opposite directions, from one segment to another, like the abdominal tracheæ in *Melolontha*, as shown by Strauss *, and as I have found also in *Lampyris* and some other genera. These trunks unite opposite to each spiracle, and then divide and pass on to the next and are again united. They are smaller in diameter, compared with the size of the insect, than the corresponding tracheæ in *Sialis*, or even in *Perla*. In each of these genera, as in *Pteronarcys*, the respiratory system is without vesicles, although in *Sialis*, which is slow and heavy in flight, the principal tracheæ are somewhat enlarged. The largest tracheæ in each of these genera are the lateral and transverse trunks of the sides and pectoral surface of the thoracic segments. Besides these, there are in *Pteronarcys* and *Perla* a pair of longitudinal tracheæ, passing directly backwards on each side of the nervous cord and gan-

* Considérations générales sur l'Anatomie Comparée des Animaux Articules, &c., 1828, 4to, pl. 7. fig. 4.

glia, which are somewhat larger than corresponding tracheæ in other insects in which the lateral abdominal trunks are dilated into sacs. A curious termination of the lateral abdominal trunks occurs in the posterior segments. These trunks end abruptly immediately after their junction (fig. 11) in a kind of cæcum, from which a small branch extends backwards to the caudal styles, analogous to the mode in which the branchial filaments are supplied from the main tracheæ. One of the most curious distributions of tracheæ in *Pteronarcys* is of those which are supplied to the alimentary canal. Tracheæ which supply this organ are rarely or ever dilated in any insect, not even in the *Hymenoptera*, in which the sacs of the main trunks are the largest. They pass off as slender branches, either from the lateral sacs or from the main trunks in the immediate vicinity of the spiracles, and decrease in size as they are distributed on the canal, as I have figured and described * in the male of *Bombus terrestris.* A slender branch passes longitudinally backwards in that insect from the main trachea, behind the metathoracic spiracle on each side of the œsophagus, to the anterior portion of the stomach on which it is distributed, and a similar origin and distribution of the gastric tracheæ exists in all insects with but little variation. In *Pteronarcys* a long, slender branch (fig. 10 *i*, *k*) passes off from the slightly enlarged trunk behind the mesothoracic spiracle, and another (*l*) from behind the metathoracic, which are extended longitudinally backwards, slightly reduced in size, as far as the middle of the abdomen, where they divide into branches which are distributed on the sides and anterior of the stomach. This is the general character of the tracheæ in the whole of the *Perlidæ* and in *Sialis.* These exceptions to the law which I have heretofore endeavoured to exemplify by facts, that a vesicular form of the respiratory organs in insects has reference chiefly to power of flight, and enables the insect to alter the specific gravity of its body at the moment it takes wing, and thus diminish the amount of muscular exertion required in its movements, tend in reality to confirm the previous conclusions. The retention in the imago of the simple setaceous tracheæ of the larva is accompanied, as in *Sialis*, *Perla*, and *Pteronarcys*, with a low power of flight, although the species of each of these genera have ample wings, and might have been expected to be extremely active. *Pteronarcys* thus resembles

* Philosophical Transactions, 1836, part ii. pl. 26. fig. 2. p. 564.

Perla and *Sialis* in the general character of its respiratory organs, but it differs from them in other parts of its structure.

Alimentary Canal.—The *alimentary canal* (fig. 10) consists in chief part of an enormously elongated œsophagus (*m*), which, instead of joining with the stomach (*p*) in the metathorax, passes backwards, accompanied by the tracheæ (*k*, *l*), as far as the fourth segment of the abdomen, and then terminates in the digestive organ, which does not exhibit even the smallest rudiments of gastric glands, which exist of large size in *Perla* (fig. 12 *o*). This proves as marked a difference in the habits of these two genera as exists between these and *Sialis* (fig. 13), in which the œsophagus is extended backwards in the form of a pouch (*n*), as in the Diurnal *Lepidoptera*. The stomach (*p*) of *Pteronarcys* differs as much from that of *Perla* as the œsophagus. It is capacious, muscular, and of considerable length, forming two or three convolutions before it terminates in a pylorus, around which the Malpighian vessels are inserted; whilst that of *Perla abnormis* is surrounded at its cardiac origin by six large cæcal glands (*o*), is short, somewhat funnel-shaped, straight, and has no convolution. In these respects the stomach of *Perla* resembles that of the *Blattidæ*. In the number, appearance, size, and place of insertion of the Malpighian vessels (*r*), *Pteronarcys* resembles *Perla*, but both differ from *Sialis*, in which there are only six of these vessels, while in the others there are from forty to fifty. These three genera also differ as regards the ilium (*q*), and the form and size of the colon (*s*). In *Pteronarcys* and *Sialis* the ilium is short and slender, but it is more than twice as long in *Perla*. The colon in the latter is very muscular, is almost as large as the stomach itself, and has a cæcum projecting from it. In *Sialis* the colon is larger than the stomach, and has a small lobulated cæcum at its commencement, as in Lepidopterous larvæ; but in *Pteronarcys* it is shorter and much smaller than in either of these genera. These differences in organization indicate differences in kind of food, or in habit and œconomy, and establish the distinctness of the genera. The existence of gastric glands in *Perla* shows that this genus stands at the head of its family, and approaches the *Orthoptera*; while the absence of these in *Pteronarcys*, and in the smaller *Perlidæ*, *Nemoura*, shows also that these genera are of a type inferior to *Perla*.

Nervous System.—The nervous system of *Pteronarcys* (fig. 14) leads us to a conclusion similar to that which we arrive at from the anatomy of the digestive organs. The number of segments to the body in *Pteronarcys* and *Perla* is the same, fourteen in each, but that of the ganglia of the nervous cord is different. In *Pteronarcys* the nervous system is composed of the brain and cord with twelve subœsophageal ganglia. The first of these, the analogue of the *medulla oblongata* of *Vertebrata*, is situated, as in other insects, in the head, immediately below the brain, or cephalic ganglia, and supplies the organs of manducation, the mouth and pharynx. The second, third and fourth, of larger size, are in the three segments of the thorax, one in each, supplying the organs of locomotion, the legs and wings; and eight smaller ganglia, the first of which is in the metathorax, at a short distance behind the great ganglion of that segment, while the remaining seven are in the abdomen. But the nervous system in *Perla* consists of the brain and only ten ganglia in the cord. Of these the *medulla oblongata* and thoracic ganglia are in their usual situation, but the meso- and meta-thoracic are larger than in *Pteronarcys*, more especially the latter, owing to the fifth, or first of the smaller ganglia of the cord, having united with the metathoracic in *Perla*, during the changes of the larva and pupa, as I have elsewhere shown * takes place also in the metamorphoses of the *Lepidoptera*, together with a shortening of the cord in one or more of the basal segments of the abdomen. Owing also to a similar cause, the shortening of the interganglionic portion of cord, the analogue of the sixth ganglion in *Pteronarcys* occupies the position of the fifth of that genus in *Perla*, the sulcus of the metafurca (*w*); while the seventh of *Pteronarcys* is situated in *Perla* at the anterior of the basal segment of the abdomen, and is separated from the preceding ganglion only by a very short portion of cord. Similar alteration in position, with coalescence of ganglia, seems to have taken place at the termination of the cord in *Perla*, in which the eleventh and twelfth ganglia of *Pteronarcys* seem to have become united. This may account for the remarkable difference in the number of ganglia in these two genera. *Perla* is thus as much in advance of *Pteronarcys* in the general structure of its nervous system, as in that of its digestive and respiratory organs. Approaching as these two genera do in their entire organization to the *Orthoptera*, they seem to represent some of the lower forms of the

* Philosophical Transactions, 1834, part ii.

perfect and larva states of insects of that Order. *Perla,* with its enlarged tracheæ, its sacculated stomach and colon, and its more concentrated nervous system, is much in advance of *Pteronarcys,* which retains the larva type of organization in all its structures, branchial organs of respiration, a capacious œsophagus and elongated alimentary canal, and more numerous and separated ganglia in its nervous cord. On passing from the general conformation to the details of its nervous system, *Pteronarcys* still preserves the same inferiority. The *cephalic ganglia,* which constitute the brain, have not completely coalesced, as in some of the more perfect insects, but have only partially united in the middle line above the œsophagus; while the antennal ganglia in front of them are also distinct and separate. The *ocelli* on the front and vertex of the head in the perfect insect (fig. 10) are supplied by short nervous trunks, which proceed directly from the cephalic ganglia (fig. 11). The anterior or median ocellus is primarily a double organ. It derives its nerve from two trunks, which originate one from the front of each of the cephalic ganglia, and which immediately are united laterally to form the nerve to the ocellus. This is the mode of origin of the anterior ocellar nerve in *Pteronarcys,* as I have found it to be also in *Hymenoptera*, and other insects. The posterior ocelli are supplied each by single trunks from the two cephalic ganglia. The true optic nerves, which supply the compound lateral eyes of the insect, have distinct gangliform enlargements at their base, and are expanded at their termination into a broad retina.

The *nervous cord* exhibits distinct indications of its compound structure. The aganglionic portion, which I formerly described * in *Lepidoptera,* is very distinctly seen on its superior or visceral surface, while passing over the ganglia in the thoracic segments (u, v, w). It gives off a branch on each side in its course between the pro- and meso-thoracic ganglia in company with some organic or transverse fibres. This branch passes diagonally backwards, distributes some ramifications to the respiratory organs connected with the prothoracic spiracle, and then joins the first nerve from the mesothoracic ganglion, and with it forms the anterior *alar* nerve that supplies the muscles of the first pair of wings, thus directly associating the function of respiration with that of flight. The origination of the wings, during

* Phil. Trans. 1834.

the changes of the insect, in a fold of tegument that includes branches of tracheæ, is thus in most perfect harmony with the character of the nerves that regulate their mixed functions. The cord also gives off, between the meso- and meta-thoracic ganglia, another compound branch, which first supplies the second or mesothoracic spiracle and tracheæ, and then unites with the first nerve from the metathoracic ganglion, to form the *second alar nerve* to the muscles of the second pair of wings. Besides the posterior, or ganglionic roots of the alar nerves, each ganglion gives off two others, one small one to the muscles of the segment, and another, the largest nerve of each ganglion in *Pteronarcys* and other *Perlidæ*, to the legs. In all insects of powerful flight, the *alar* are the largest nerves of the trunk; but in insects of inferior power of wing, as in the *Perlidæ*, and more especially in those in which the legs are strong and much employed, the *pedal* nerves, as in *Pteronarcys*, are much the largest.

The aganglionic tract of the cord is as distinct in its transit over the ganglia in the abdominal region as in the thorax. Each ganglion gives off a large trunk to the muscles of the segment, and anterior to each, lying loosely upon the aganglionic tract, a nerve passes off on each side to the false spiracles and internal organs of respiration. These are the *transverse* or *respiratory* nerves, which I formerly described * in the larva of the *Sphinx*, and which in perfect insects usually become approximated to, and most closely connected with, the trunks from the ganglia. They are the analogues of the compound anterior roots of the *alar nerves*. Some of them have not united with the other trunks in the anterior segments of *Pteronarcys*, but remain as in the larvæ of *Lepidoptera*, thus further indicating the low type of development in this genus. Others, although they have joined with the ganglionic trunks, present irregularities in their position and distribution. The terminal ganglion of the cord, as in other insects, supplies the organs of reproduction and the terminations of the alimentary canal.

Organs of Reproduction.—The organs of reproduction in *Pteronarcys* are formed on the same inferior type as those of other parts of its system. They differ less from those of *Perla* than its other structures. The specimen I have dissected proved on examination to be a male, and showed that a curious

* Phil. Trans. 1832 and 1834.

error has been committed by M. Pictet in regard to the sexes of *Pteronarcys*, as I shall presently show.

The male internal organs are very simple in their character. They consist of a pair of *testes* (fig. 14 x) with long convoluted ducts, and a pair of short *vesiculæ seminales* (y). These, with the ducts, unite behind the terminal ganglion of the nervous cord in a short *vas deferens* on each side, which terminates in a long *ductus ejaculatorius* and organ of intromission (z).

The *testes* are placed above and on each side of the alimentary canal in the fifth, sixth and seventh segments of the abdomen. Each testis (x) is formed of a multitude of pear-shaped follicles attached around, and opening into a common canal. These follicles (fig. 15) are filled with rounded bodies, which line their interior, the proper secretory structures for the production of spermatozoal cells, some of which, of minute size, I have observed at the junction of the follicles with the canal. The aggregation of follicles together forms an elongated oval testis, which terminates in a long convoluted duct. The *vesiculæ seminales* (y) are short, thick cæcal organs of an opake white colour, and folded twice or thrice on themselves. They occupy the posterior part of the eighth abdominal segment, and are continuous backwards with the *vasa deferentia* on each side, at the point of union of the ducts from the testes. The *vasa deferentia* thus formed pass backwards to the margin of the eighth abdominal segment, and then unite laterally and pass to some distance forwards, where they end in a single vessel, a long *ductus ejaculatorius*, which returns backwards to the outlet of the tenth segment to end in the penis (z). The object of the great length of this duct, and of the arrangement of the organs, seems to be to facilitate the transmission of the male influence at the time of union of the sexes. The long process on the under surface of the eighth segment (fig. 16) appears to be elevated and employed by the male as an organ of prehension, to grasp and retain the terminal segment of the female, the body of the male being reversed during the act, as in the *Dermaptera* and *Orthoptera*. By the elevation of the process of the eighth segment, and the elongation of the ninth and tenth segments, the position of the *vesiculæ* and *ductus ejaculatorius* is altered, and the passage of the male influence is then direct and unimpeded.

M. Pictet, however, has mistaken the process in the male for an ovipositor, and consequently has described the male *Pteronarcys* as the female, and the latter as the male. He seems to have been led into this very error, which he points out as having been committed by others *, by confining his attention chiefly to *Perla*, in which he correctly says that the reproductive organs "in the males open at the extremity of the abdomen, whilst in the females the entrance of the oviduct is under the eighth ring." This description is perfectly true, as a matter of fact, both in *Perla* and *Pteronarcys*. Nevertheless, M. Pictet has confounded the sexes of the latter, by mistaking the prehensile appendage of the male for a supposed ovipositor of the female, which does not possess such an organ, but in which the outlet of the oviduct is situated in the eighth segment, precisely as in *Perla*, as I have found on examination of specimens of this sex of *Pteronarcys regalis* (fig. 17) now in the cabinets of the British Museum.

The body of the female *P. regalis* (fig. 17), and of other species of this genus, is easily distinguished from that of the male. The segments are more depressed, are much broader than long, and altogether are less elegant in form. The terminal tenth segment is considerably wider than in the male, and is only partially divided longitudinally on the under surface into two valves, each of which is marked with an imperforate spiracle, the situation of the caudal branchiæ in the larva. The valves are united at their base, and are separated throughout the remainder of their length only by a slight sulcus. The female organs open externally in the eighth segment (fig. 17. 8), which has its ventral surface divided longitudinally into two plates, which cover the entrance to the oviduct. The margin of the segment, in some specimens, is simply notched in the middle, at the point of junction of the plates, as in the one delineated; but in others there are two minute processes at the angles of the notch, the rudimentary representatives of corresponding, more elongated parts in the male, which, united, form the process of the eighth segment (fig. 16. 8). These parts, which are of their smallest size in the females of this, are much larger in those of other species. In the original specimen of *P. biloba*, now in the British Museum, and correctly regarded by Mr. Newman as a female, not only the margin, but a large part of each plate is included in two triangular curved lobes, from which the species is named.

* *Loc. cit.* p. 37.

The male of this species, in which we may expect to find these parts much more developed, is unknown. The female of a third species, *P. Proteus*, differs both from *P. regalis* and *P. biloba*. Instead of having the margin of the eighth segment notched, it has it slightly elongated and rounded in the middle, and it is not divided longitudinally into two plates. In this respect it somewhat resembles the male *P. regalis*. It is thus evident that the mere presence or absence of a process to the eighth segment is not a character peculiar to either sex; as a rounded margin to this segment exists in some *Perlæ*, as well as in *Pteronarcys Proteus*. The distinctive character of the sexes in *Pteronarcys* is the *length* of the process. The notched or toothed margin in the female *P. regalis* is elongated into a bifid appendage in the male; whilst the slightly developed part in the former sex of *P. Proteus* also is enlarged into a long, thick, spoon-shaped structure in the latter, very different in shape from the corresponding part in the same sex of *P. regalis*. The view entertained by M. Pictet, that the appendage to the eighth segment is characteristic of the female *Pteronarcys*, and that it is designed for the purpose of retaining her eggs, thus appears to be incorrect as regards this genus. Nevertheless, it may be valid as regards *Perla*, in which the structure is absent in the male. Scopoli *, Suckow †, and Curtis have remarked that the female *Perla cephalotes* carries her eggs in a mass, inclosed in a membrane, at the apex of the abdomen; and there is a specimen of *Perla abnormis* in the collection of the British Museum, taken by Mr. Barnston in Canada, which has a rounded mass of small black eggs attached to the eighth segment, like the egg-capsule in *Blatta*. Another observer, Mr. Westwood ‡, has noticed a similar mass of eggs borne by a female *Eusthenia diversipes*. Thus the view is correct as regards *Perla* and *Eusthenia*, although quite unsupported with reference to *Pteronarcys*. The female of *Perla abnormis* has the whole margin of the segment semicircular, and it is deeply incised in a diagonal direction on each side, so as to form a kind of lid or valve, from behind which the eggs in Mr. Barnston's specimen project §. The males

* Ent. Carniol. p. 705.

† Zeitschr. Organ. Phys. t. ii. No. 3. Mar. 1828.

‡ Introduction, &c. vol. ii. p. 22.

§ M. Pictet seems to have noticed a somewhat similar shield-shaped process in the females of *Perla Hanii* (pl. 19. figs. 10 & 11) and *Perla limbata*.

of this species, of which I have dissected several, have not the slightest rudiment of process from the eighth segment, nor any enlargement of its margin.

These marked differences of structure in the external organs of reproduction still further distinguish *Perla* and *Pteronarcys*, and seem to indicate that there are some differences of habit on the part of the females with regard to their oviposition. Of the internal anatomy of the female I can only speak generally, as I have not been able to procure a specimen sufficiently good for precise description. The only one I have dissected had originally been preserved in a dried state. It may, nevertheless, be of use to compare the few facts I have noticed in the anatomy of *Pteronarcys* with those of *Perla*, more especially as the internal reproductive organs have not yet been described in the former of these genera. The general structure in both is similar, and that of the organs in the two sexes differs less than in most other insects. In *Perla* as in *Pteronarcys* the follicular testis of the male (fig. 14 x) is represented by a multitude of short ovigerous tubes, which, aggregated together around and opening into a common duct or cavity, constitute the ovary in the female. Each egg-tube, of which there are upwards of twenty in each ovary, is filled with at least ten distinct rudimentary ova, which give it a beaded or nodulated appearance. It is large and dilated at its base, and is rapidly diminished in size in proportion to the distance of its attachment around the egg-chamber of the duct. It is the representative of the short cæcal follicle (fig. 15) in which the spermatozoal cells are formed in the male, and which, instead of being arrested at the follicular stage of development, continues to be elongated, while some of the nuclei of its centripetal layers of cells, in which the forces of growth are most energetic, become individualized as separate organisms, the germs of future ova, and which, more rapidly nourished by the principle of endosmose than the surrounding cells, constitute the materials of future beings. In like manner the convoluted spermatic duct of the male (x, y) is represented by a long dilated oviduct, which commences in the egg-chamber, in the female, and which differs but little, except in diameter, from the spermatic or deferential duct of the male; and, like it, terminates, by junction with its fellow of the opposite side, in a common passage for the eggs, the analogue of the ejaculatory duct (z) formed by the union of the deferential ducts of the two sides and of the seminal vesicles. At the point of union of the analogues of these parts in the female the passage is dilated into a large cæcal cavity, from the closed end of which, on each side, proceed two diminutive cæca, the undeveloped representatives of the *vesiculæ seminales* (x) of the male. The dilated pouch-like cavity in the female, the so-called *spermatheca*, which receives and retains the influence of the male at the union of the sexes, is thus an enlarged uteroid expansion of a portion of the common oviduct which is formed by the union of the terminations of the deferential and seminal tubes of the male. This is the general anatomy of these organs, both in *Pteronarcys* and *Perla*; and to which that of all other Hexapods, subject to variations in the relative development of particular portions of these structures, is conformable.

From this comparative examination of structure in *Pteronarcys* it may be asked, what are the proper affinities of the insects of this genus? and whether, with the other *Perlidæ*, they occupy a proper position in the arrangement of systematists? The great similarity of the digestive organs of *Perla* to those of the *Blattidæ*, and the remarkable existence of certain talc-like structures on the head in insects of this family external to the ocelli (fig. 10), resembling others which are known to exist at the base of the antennæ in the *Blattidæ*, suggest the conclusion that if the *Megaloptera*, including *Perla* and *Pteronarcys*, are not joined to the *Orthoptera*, they ought at least to follow that Order, at the head of the *Neuroptera*, and to be succeeded by the *Libellulæ*, *Agrionidæ* and *Ephemeridæ*, as the most natural arrangement, and as most conformable to their anatomy.

POSTSCRIPT.

Descriptions of some American Perlidæ, *together with Notes on their Habits.*

Read June 20th, 1848.

The anatomical facts shown in the paper on *Pteronarcys* and its affinities, already communicated to this Society, prove that the insects of that genus differ greatly from those of *Perla*, and others of the same family; and that instead of being placed at the head of the tribe, according to the views of M. Pictet, they more naturally follow *Perla*, and precede *Capnia* and *Nemoura*, both which they resemble in the form of the alimentary canal. On the other hand, they seem to be connected with the former genus by means of *Perla infuscata*, which has the eighth abdominal segment developed as in *Pteronarcys*. The true *Perlæ* approach the *Orthoptera*, through the *Blattidæ*, in the structure of the alimentary canal, in the form of the manducatory organs, in the membranous spots at the base of the antennæ, and in the habit of carrying their eggs attached in a mass to the under surface of the body,—the subgenus *Acroneuria* of Pictet, the *Perla abnormis* of Newman, being placed at the head.

The species *Perla arenosa* of M. Pictet most certainly is the *Perla abnormis* of Mr. Newman. The former gentleman states that he has examined three female specimens of his insect, one from Philadelphia, sent to him from the museum at Paris; a second from Pennsylvania belonging to the Berlin museum; and a third to the museum of Neufchatel, also obtained from the United States. The original specimen of *Perla abnormis*, which M. Pictet knows only from description, was obtained from North America; and Mr. Barnston took this species on the Albany River in Canada. Since the return of this gentleman to Canada I have received from him some specimens of a *Perla* in spirit for dissection, taken at Tadousac, on the northern shore of the River St. Lawrence, which on comparison with the original specimen of *Perla abnormis* now in the British Museum, have proved to be that species; and on comparing the whole of these with M. Pictet's figure and description of *P. are-*

nosa, they agree with both in every particular, so that I have no doubt of their identity. The species appears to have a wide geographical range, from Philadelphia southward as far north as Canada; and probably is the common species of the North American continent. The larva and pupa of this species have also been taken by Mr. Barnston, and specimens of them, presented by that gentleman, are now in the cabinets of the British Museum. As they have not hitherto been described, I may state generally that in size, colour and markings the pupa closely resembles that of the European species, *Perla bipunctata*, Pictet*. The *larva* is smaller, and of the same colour as the pupa, but is less distinctly marked. It is yellow with black bands. Its head is flattened and subtriangular, with the eyes black, depressed, and placed on the upper lateral surface, and on the front there are three minute black points in the place of the future ocelli. The antennæ are setaceous, yellow, and have about ninety articulations. The labrum is short, wide, and of a brown colour, and the front has two transverse, waved brown bands. The prothorax is suboval, flattened, with two indistinct black marks on the upper surface, encircled with a black band. The meso- and metathorax are transverse, subquadrate, with the posterior angles and margin dilated. Each segment has an indistinct subtriangular mark in the middle, encircled with a broad black band. The abdomen is yellow, with the posterior margin of each segment on the dorsal surface dark brown, or black. The caudal styles are tapering, yellow, and with about fifty articulations. The ventral surface of the body is entirely yellow, and there are small branchiæ on the first and second abdominal segments, but not on the ventral surface of the thoracic. The legs are compressed, with the thighs dilated and the tibiæ densely ciliated.

The *pupa* differs from the larva in its greater size, darker colour and markings, and in the elongation of the angles of the meso- and metathoracic segments into long triangular rudiments of wings, which, in addition to the black band at the base of each, have also another at their apex. The thighs are dilated as in the larva, and have two brown bands, and the tibiæ are also ciliated for swimming. It is entirely without external branchiæ.

The habits of this species have been carefully observed by Mr. Barnston.

* *Loc. cit.* pl. 11.

In some manuscript notes, which he has favoured me with, he has designated the perfect insect the *Drummer* (*Perla sonans*, Barnston's MSS.). He says that, "when confined upon a table it sometimes makes a drumming noise, by beating on the wood with the end of its abdomen, whence I have given it its specific name, as I have not observed this done by any other species. It appears after the *Pteronarcys regalis*, and is more numerous. The perfect insect prefers the shade in the heat of the day. The sexes pair like the Grass-hopper, and their union lasts for some time. Its habits separate it much from *Pteronarcys* and *Phryganea*. The larva and nymph are aquatic and carnivorous. The cast-off spoil of the nymph is generally found under stones on the banks of rivers. The larva is very active in the water, and frequents the clefts and cracks in decayed stumps of trees, into which its flattened shape permits it to enter with facility. It is a favourite food of the trout."

The *Pteronarcys*, according to Mr. Barnston's observations, is as inferior to this *Perla* in its habits of life, as I have shown it to be in its organization. In its pupa state it resides constantly at the bottoms of streams, and the perfect insect comes forth at an earlier period, and at a lower temperature of the season than *Perla*. Some other Canadian *Perlidæ*, which are more nearly allied to it in structure than *Perla abnormis*, come forth at about the same time, and as it is doubtful whether these species have yet been described, I shall characterize them from specimens given by Mr. Barnston to the British Museum, and add some observations on the habits of each from notes made by that gentleman.

The generic characters of *Pteronarcys* I propose to correct as follows, in accordance with its structure.

Genus Pteronarcys, *Newm.*

Char. Gen. *Segmenta thoracica* etiam in Imagine branchiis externis prædita. *Alæ* magnæ, reticulatæ. *Palpi maxillares* labialibus multò longiores, 5-articulati; articulis 2 basalibus brevibus, reliquis elongatis, externè dilatatis. *Mandibulæ* parvæ, obtusæ. *Segmentum abdominale* octavum in mari processu longo ventrali munitum, in fœminâ paulò evolutum vel bifidum.

The following new species has recently been brought by Mr. Hartweg from California.

Pteronarcys Californicus ♂, capite thoraceque saturatè brunneis, fronte clypeo labroque rufis, oculis ocellisque nigris, segmentis thoracicis lineâ longitudinali interruptâ flavâ, abdomine aurantiaco lateribus brunneis, stylis caudalibus basi flavis, antennis pedibusque totis atris, alis obscuris nigro-nervosis sed absque maculâ stigmali.
Hab. in Californiâ, *D. Hartweg.*

This species, like others of the genus, possesses the thoracic and abdominal branchiæ. It is very closely allied to *P. Proteus,* and is of the same size; but it differs from that species in having the antennæ, eyes and legs entirely black, the labrum and front of the head red, the wings of a darker colour, more strongly veined, and without the stigmal patch. The process from the eighth segment in the male also, although of the same form as in *P. Proteus,* readily distinguishes the two species of this sex. It is broad, pilose, and deeply scarred in *P. Californicus,* but is much narrower, and is sparingly punctured in *P. Proteus.*

I shall now proceed to characterize the new species of *Perla,* together with a species of *Nemoura,* collected by Mr. Barnston in Canada.

1. Perla citronella (*Barnston MSS.*), saturatè flava, antennarum articulis 33–35, oculis ocellisque brunneis, alis hyalinis pallidè luteis margine costali flavis, abdominis dorso brunneo.—Long. lin. 3–3½.
Hab. in Canadâ, ad Albany River, latit. 54°.

This species resembles the *Perla flava,* Pictet, which occurs in Europe as far northward as Lapland, but seems to differ from it in the antennæ being entirely black, the thorax yellow, without a black lateral margin, and in the wings being yellow, without green nervures. It is however about the size of *Perla flava,* and may be only a variety. "It usually remains on the branches or leaves of trees during the day."

2. Perla minima (*Barnston MSS.*), nigra nitida, antennarum articulis circa 26 submoniliformibus pilosis, fronte paululùm excavato, palpis subclavatis, thorace angusto subquadrato, stylis caudalibus 13-articulatis, alis obscuris nigro-nervosis in mari brevibus obtusis abdomen semicooperientibus in fœminâ amplis corpore longioribus.—Long. lin. 1¾–2.
Hab. in Canadâ, ad Albany River.

This species somewhat resembles the *Nemoura nigra,* which is from Pennsylvania.

The pupa is of a light brown colour. "The perfect insect retreats when out of the water to the cracked fissures of decayed trees. This is the habit of most of the species. They shun the light. This insect appears early in April. The wings of the male are twisted, and cover only half of the abdomen."

3. CAPNIA VERNALIS, nigra nitida pilosa, thorace posticè rotundato, antennarum articulis 30–33 pubescentibus, alis obscuris pilosiusculis nervis magnis nigris, stylis caudalibus subulatis 21–23-articulatis.—Long. lin. $2\frac{1}{2}$.

Perla vernalis, *Barnston MSS.*

Hab. in Canadâ, ad Albany River.

Male smaller and more intensely black than the female. This is a minute species, with the general aspect of *Sialis*. It resembles *Capnia Pygmæ*, Pictet, which inhabits Pennsylvania and Newfoundland, and perhaps is that species. Mr. Barnston says, "The nymph comes up frequently in the cracks of the ice, and casts its spoil there. It comes up *when the thermometer stands at freezing*."

The next is an entirely new species, and together with an European one, *Nemoura trifasciata*, Pictet, may form a subgenus, which I propose to designate *Brachyptera*, from the short anterior wings of the males.

NEMOURA (BRACHYPTERA) GLACIALIS (*Barnston MSS.*).

Mas saturatè brunneus ferè niger, thoracis margine anteriore recto, alis anterioribus triangularibus rudimentalibus segmentum abdominale primum tantùm attingentibus; posterioribus albidis longissimis acutis emarcidis decussatis, antennis elongatis pubescentibus 53–56-articulatis, pedibus longis compressis cursoriis; paris postremi longissimis, abdominis segmento terminali lato plano pubescente.

Fœmina multò major, in reliquis tamen similis, capite paululùm excavato, alis amplis obscurè brunneis nigro-nervosis.—Long. unc. $\frac{1}{2}$.

Hab. in Canadâ, ad Albany River.

This insect differs from the European species, *Nemoura trifasciata*, Pictet, in the wings of the females being entirely brown, and also the legs; and in the straight margin to the prothorax. Like that species, "It appears in the spring (end of March or beginning of April), when the ice becomes honeycombed, and even before then, at the same time as the preceding species

(*Capnia vernalis*), but it is not so numerous. It pairs in the crevices of decaying ice. The male has long antennæ, and his wings are generally rumpled, as if glued together. I believe he seldom takes wing." Mr. Barnston tells me that he has seen this insect coming up between the crevices of the ice.

DESCRIPTION OF PLATE XXI.

Fig. 1. Imago of *Pteronarcys,* male :—of the natural size.

Fig. 2. Pupa of *Pteronarcys,* male :—of the natural size.

Fig. 3. Branchial tuft, showing the trachea within it (*a*) and its mode of distribution (*b*).

Fig. 4. Branchial filament (*c, d, e*), showing the direction of the current of blood.

Fig. 5. Inferior surface of *Pteronarcys,* showing the situation of the branchiæ (*b, b, b*), and the sternal orifices (*f, g, h*).

Figs. 6, 7, 8. Left prothoracic spiracle : (6) closed, (7) partly open, (8) fully open.

Fig. 9. One of the abdominal false spiracles with trachea.

Fig. 10. Diagram of the body, with the internal respiratory organs and alimentary canal: (*i*) bundle of tracheæ from the second spiracle giving off branches to the wings, and others across the body, (*k*) a branch from the second, and (*l*) one from the third spiracle, (*m*) œsophagus, (*n*) the crop, (*o*) gastric cæca, (*p*) stomach, (*q*) ilium, (*r*) the Malpighian vessels, (*s*) colon, (*t*) rectum.

Fig. 11. Termination of one of the lateral tracheæ.

Fig. 12. Alimentary canal in *Perla.*

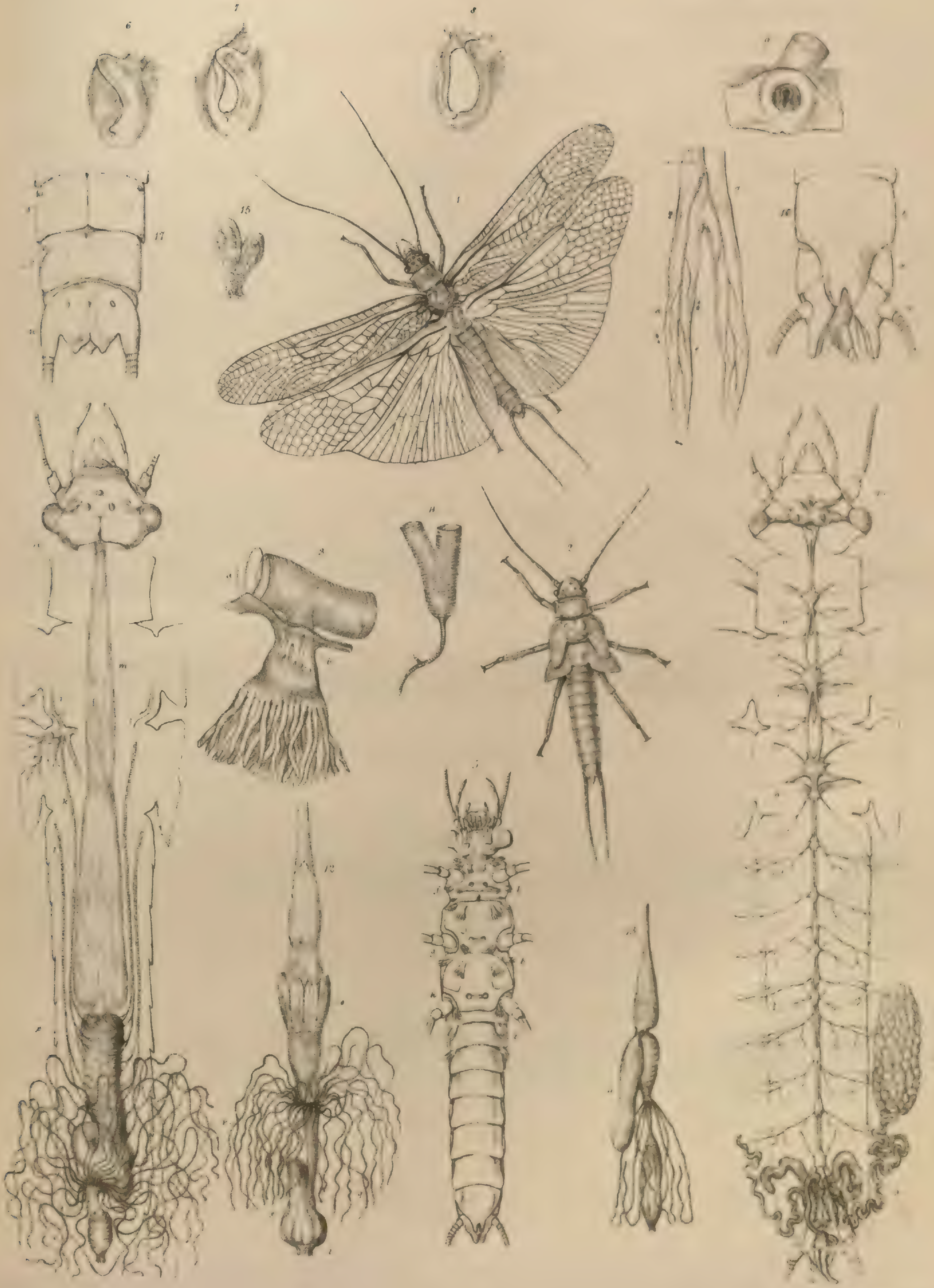
Fig. 13. Alimentary canal in *Sialis.*

Fig. 14. Nervous system : (*u, v, w*) entofurca, (*x*) testis and duct, (*y*) vesiculæ seminales, (*z*) ductus ejaculatorius and penis.

Fig. 15. Testicular follicles.

Fig. 16. Inferior surface of the abdominal segments in the male.

Fig. 17. Inferior surface of the abdominal segments in the female.



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XXVIII. *Descriptions of some new Species of* Athyreus, *a Genus of Lamellicorn Beetles.* *By* J. O. Westwood, *Esq., F.L.S.* &c.

Read February 1st, 1848.

THE genus *Athyreus* was first proposed by Mr. W. S. MacLeay, in the appendix to the 'Horæ Entomologicæ,' for the reception of three Brazilian species, *A. bifurcatus, tridentatus* and *bidentatus,* and was placed in the family *Geotrupidæ,* with the remark (p. 53), that "by way of proof that the *Geotrupidæ* are principally confined to temperate climates, I may observe that the tropical insects of this family principally belong to the extreme genera, such as *Athyreus* and *Hybosorus,* the former of which approaches to the *Scarabæidæ* and the latter to the *Dynastidæ*;" the relation of *Athyreus* to the *Scarabæidæ* being again alluded to in p. 123, in the observation, "Genus admodum singulare, capite neglecto a *Copride* haud distinguendum, sed ab *Elephastomo* quoque haud longè distat."

The characters of the genus as laid down by Mr. MacLeay do not however give a clear idea of its peculiarities; neither are the species, which he has too briefly defined, to be identified with proper precision. The mandibles (Tab. XXII. fig. *a, a*), for instance, instead of being flat on the upper surface are quite concave, the lateral and apical portions not being covered by the labrum; and as each is of a different shape, a single description will not apply to them. I have given a delineation of them in the accompanying figures, and must here only allude to the black, horny, flattened molar plate at the base on the inside, which is destitute of those curious transverse ridges which are seen in the *Melolonthidæ*; this peculiarity being an important one, bearing directly upon the nature of the food of the insects, which is ground by these two hard parts of the mandibles being brought together by the action of the strong muscles inserted near the outer base of the jaws, close to the deep notch which will be seen near the small ball that fits into the socket of the head where they are attached.

The maxillæ (Tab. XXII. fig. *b*) also exhibit an interesting structure in *Athyreus orientalis* which I have not seen in other Lamellicorn insects: the upper lobe terminates in a broad piece, having a sharp point at its angle within the mouth; whilst the lower lobe has two horny processes; the upper one is broadly-truncate and flat, occasionally, as appears from the figures of Klug and Curtis, bidentate, but in the species which I examined scarcely emarginate; the lower lobe is also flat, but its side is furnished with a series of about seven very short thick bristles pressed together, which must evidently be of peculiar use in the act of mastication. The structure of the lower parts of the mouth has been entirely misdescribed by Mr. MacLeay; the mentum (Tab. XXII. fig. *c*), instead of being deeply emarginate, has the middle of its fore margin advanced further than the lateral angles; the scapes, to which the three-jointed labial palpi are attached, are slightly prominent and furnished with short bristles, and the whole of the underside of this organ is densely clothed like the rest of the body with very long bristles.

Other peculiarities of the present genus consist in the very great width of that part of the metasternum which occurs between the two middle feet (Tab. XXII. fig. *d*)*, which are thereby inserted much more widely apart than the hind-feet; the very short abdomen, which causes the hind-feet to appear as if placed almost at the extremity of the body; and the great length of the hind tibiæ and tarsi. The figure given by M. Guérin Méneville of the underside of the body of *Athyreus castaneus*, in the 'Iconographie du Règne Animal,' in order to exhibit these peculiarities, is far from correct, the metasternum being marked both with transverse and longitudinal lateral incisions which do not exist in nature, and which consequently lead to a very incorrect idea of the real structure of the underside of the body.

On comparing these peculiarities of organization with those of *Geotrupes*, the typical genus of the family to which *Athyreus* has been referred, we are bound to admit the correctness of Mr. MacLeay's observation, that this genus is one of its extreme forms. We here find indeed, in common with *Geotrupes*, a porrected upper lip and laterally exposed horny mandibles, but the structure of the maxillæ and mentum is very different; and entomologists need not be reminded that it is to these latter organs especially that they look for the indication of the nature of the food and the consequent variations

* This and the other figures of generic details are derived from *Athyreus orientalis*.

of habit in the animal. In *Geotrupes* especially, the maxillæ are terminated by large membranaceous lobes instead of the horny points with which they are armed in *Athyreus*; and the mandibles in *Geotrupes* are represented by Mr. Curtis in his 'British Entomology,' pl. 266, as destitute of the flat molar plate which I have noticed in *Athyreus*.

Our knowledge of the habits of the species of *Athyreus* is however too slight to enable us to determine the amount of influence which these forms have upon their modes of life; Lacordaire and Von Martius, our two authorities on the habits of the insects of Brazil, stating but little relative to the *Athyrei*.

M. Lacordaire (Mémoire sur les habitudes des Coléoptères de l'Amérique Méridionale, p. 81; Ann. Sci. Nat. tom. xx.) observes of *Odontæus*, "Les mœurs des deux espèces que j'ai observées, *O. globosus* et *rotundatus*, Dej., sont absolument semblables à celles des *Copris*. On les trouve comme eux dans les bouses, et ils s'enfoncent profondement dans la terre;" adding, "Les *Athyreus*, que Mr. MacLeay a séparés de ce genre et dont j'ai rapporté deux espèces, *A. furcicollis* et *foveicollis*, Dej., n'en diffèrent en rien sous le même rapport. Ces insectes ne paraissent pas communs au Brésil." Dr. Perty observes on the habits of these and other allied genera, "*Hyboson* in Brasiliâ Bonariâque præsertim in stercore humano degunt, sulcos imprimunt sese tamen non infodiunt, sæpissimè et præsertim interdiù volitant. Mores *Odontæi globosi* et *rotundati* Dej. *Copridum* simillimi sunt. *Athyrei* quos cl. MacLeay ab *Odontæis* (*Bolboceris*, Kirby) separavit quoad mores nullo modo recedunt. Species generum duorum præcedentium in Brasiliâ rariores, in Bonariâ nondum inventæ (*Odontæi* species plures in graminibus et ligno putrido mensibus Septembri et Januario inveniebantur). Vespere velocissimè volitant.—*Acanthocerus æneus*? MacL. mense Majo in floribus degit: *A. MacLeayi*, Perty, totum per annum in ligno putrido reperitur." (De Insectorum in Americâ Meridionali habitantium vitæ genere, &c. Monachii 1833, fol. p. 10.)

From these remarks we perceive that the relationship of *Athyreus* with *Copris* depends not only on the general form of the body and the position of the feet (to which may be added the resemblance of the radiated head arising from the strong notches of the outer margins of the exposed mandibles of some *Athyrei*), but also on the similarity of habits, that is, so far as dependence may be placed on M. Lacordaire's short statement. It is proper however not to overlook the evident resemblance which exists between the structure of the maxillæ and mentum, &c. of *Athyreus* and that of several genera amongst the aberrant *Trogidæ,* of which I have published an ample analysis in the fourth volume of the 'Transactions of the Entomological Society;' in fact, so strong does this relation appear to me, that I have but little doubt that ultimately it will be found that the true relation of *Athyreus* is towards these aberrant *Trogidæ.*

A few words are necessary with reference to those external characters in these insects which are to be considered as indicating the distinction of sex, and which, as in many of the Lamellicorn beetles, consist in tubercular or horny processes of the prothorax and head in the males, which are either obliterated or but very slightly developed in the opposite sex. It is to be regretted however that we possess very few positive indications in this matter, and even here we find such a want of uniformity in the characters assigned to the distinction of sex in a few of the larger species, and such an apparent want of external sexual distinctions in some of the smaller species, that we are not yet able to speak with confidence on the subject, which is rendered still more difficult by the great rarity of the larger species.

In some of the larger species the head of the male is elongated in front, the occiput terminating conically in a more or less elevated horn, the point of which extends over the labrum, and sometimes even reaches to a short distance in front of the head. The underside of this horn or tubercle is strictly formed of the clypeus. In the species which Dr. Klug has figured as *Ath. bifurcatus*, the conical clypeus reaches to the front of the labrum, terminating in a slightly-raised tubercle; the mandibles are very large and broad, extending beyond this point. The front of the prothorax is very retuse, and is furnished with two somewhat triangular tubercular processes of moderate size. The female of this species (which Dr. Burmeister has sent to Mr. Hope under the name of *Ath. furcicollis*) has the head quite differently formed; the occiput terminates in a transverse raised suture just in front of the insertion of the antennæ, having its lateral angles and middle elevated into three small conical tubercles; beyond this appears the quadrate clypeus, the short labrum, and the smaller mandibles. (It is to be regretted that Dr. Klug has not represented the mandibles of both sexes in magnified figures, as they are so much unlike each other in both male and female.) The front of the prothorax in this sex is also armed with two small conical tubercles.

The insect figured by Dr. Klug under the name of *A. tridens* of Castelnau (but which appears to me to answer to Mr. MacLeay's description of *A. tridentatus*) has the front of the occiput produced into a long conical elevated horn extending beyond the mandibles, and the middle of the prothorax has a large erect horn, hollowed in front, each of its oblique sides having a small supplemental tubercle. The head of the female of this species, which is contained in Mr. Hope's collection under the name *A. Laportei*, has the occiput terminated transversely, just in front of the insertion of the antennæ, with three elevated points, one at each anterior angle and one in the middle.

The males of *A. æneus* and *A. cyanescens*, figured by Dr. Klug, have the head similarly produced into a long conical elevated horn, the front of the prothorax very concave, the sides of the concavity beyond the middle raised into two broad truncated elevated plates, each of which in the latter species is armed in front with an erect horn; but the outline figures which Dr. Klug has given as representing the head and prothorax of the female of this species, exhibit the occiput angularly produced and extended as far as the front of the labrum (just as in the male of *A. bifurcatus*), whilst the prothorax is represented as exhibiting the characters of the other sex partially developed. If Dr. Klug be correct in giving this as a female insect, we find that the form of the head offers no certain indication of sex. I should however be rather inclined to suspect that this supposed female is a male with the external characters of sex but partially developed, a circumstance of very common occurrence in the cornuted Lamellicorns.

With such considerations, I have but little hesitation in giving the insects subsequently described under the names of *A. gigas*, *A. armatus*, and *A. tuberculatus* as males, although the last-named insect has been considered to be a female, and *A. subarmatus*, *A. Bilbergii* and *A. rotundus* as females, although the two former have the prothorax as strongly marked as some male insects. If there be this difficulty among the larger insects, it is much greater with the individuals of the small species, since some of these, which from the armature of the prothorax must be males, have the occiput terminated transversely; and in others, the specific instead of the sexual character seems to be found in the straightness or angulated form of the occiput, and this is especially the case with the smallest and commonest of the Brazilian species.

With the exception of one or two Indian and African species, the greater portion of the *Athyrei* are natives of Brazil, Guiana, Columbia, Cuba, Mexico, and other parts of Tropical and South America.

Mr. MacLeay's three species, *A. bifurcatus, A. tridentatus,* and *A. bidentatus* (*op. cit.* p. 124), inhabit Brazil; *A. ferrugineus*, Pal. Beauv. Ins. Afr. et Amer. p. 90 col. tab. ii. 6. fig. 3, is from South Carolina; *A. Bilbergii*, Gray in Griff. An. Kingd., from Demerara; *A. xanthomelas* and *A. hirtus*, Wiedemann (Zool. Mag. ii. St. 1. p. 7 & p. 9), from Java; *A. herculeanus* and *A. vicinus*, Laporte, from Brazil; *A. bifurcatus*, Lap., from Paraguay; *A. furcifer* and *A. Juvencus*, Dej. Cat., from Cayenne; *A. furcicollis*, Dej. Cat., from Brazil; and *A. subfurcatus*, Chevrolat in Dej. Cat., from Mexico.

In addition to the preceding species, Dr. Klug has published descriptions of the following: *Athyr. bifurcatus* [MacLeay? the female of which is *A. furcicollis*, Dej.], from Brazil; *A. tridens*, Lap. [*A. tridentatus*, MacLeay?. ♀ *A. Laportei* in Mus. Hope], from Brazil; *A. tridentatus*, MacLeay [?] (*A. foveicollis*, Dej. Cat., and *A. castaneus*, Guérin, Iconogr.), from Brazil; *A. trituberculatus*, Klug, from Brazil; *A. excavatus*, Klug, from British Guiana; *A. lanuginosus*, Klug, from Columbia; *A. angulatus*, Klug, from Cuba; *A. Mexicanus*, Klug, from Mexico; *A. bicolor*, Laporte, from Brazil; *A. cyanescens*, Klug, from Brazil; *A. æneus*, Klug, from Brazil; *A. Corinthius*, Klug, from Brazil; *A. anthracinus*, Klug, from Bahia; *A. violaceus*, Klug, from Brazil; *A. orientalis*, Lap., from Bengal; *A. Kordofanus*, Klug, from Kordofan; and *A. porcatus*, Lap., from Senegal.

In addition to the preceding species, I now beg leave to offer to the Linnean Society descriptions and figures of a number of new and remarkable insects belonging to the same genus, the greater portion of which have been kindly placed in my hands for description by the Rev. F. W. Hope, in whose collection they are preserved.

1. Athyreus gigas, *Hope* (Tab. XXII. fig. 1); castaneus, elytris magis rufis, capite glabro anticè 3-cornuto, mandibulis magnis externè acutè dentatis, pronoto utrinque

excavatione profundâ discoque cornubus duobus crassis acutis divergentibus, elytris tenuissimè striato-punctatis.—Long. corp. unc. 1 (mandibulis inclusis).

Hab. In Brasiliâ. *In Mus. D. Hope.*

Caput magnum, porrectum, suprà nitidum, læve, angulis lateralibus ante oculos acutis, verticeque cornubus tribus anticè armato intermedio majori; inter oculos tubercula 2 minima distinguuntur; mandibulis magnis, porrectis, suprà concavis, apice acuto curvato denteque parvo sub basin posito, margine externo dentibus tribus etiam armato dente antico majori acuto; antennæ clavâ luteâ. Prothorax subpentagonus, anticè et ad latera valdè deflexus, obscurè castaneus, regione dorsali sub lente tuberculis minimis instructâ luteoque setosâ; margine antico valdè sinuato et in medio elevato; utrinque excavatione profundâ nitidâ laterali circulari cornubusque duobus magnis acutis elevatis et divergentibus in medio disci positis; lateribus subangulato-dilatatis, luteo-setosis; pone cornua lineâ dorsali tenui impressâ in carinas duas minutas subobliquas desinente. Elytra rufo-castanea, prothorace angustiora, sub lente tuberculis minimis nigris obsita, præsertim ante medium, striis circiter 7 in singuli elytri disco lævibus relictis, ad latera haud striata; tuberculis humeralibus et subapicalibus ordinariis elevatis nitidis. Corpus subtùs concolor, luteo valdè setosum. Pedes longi; tibiæ anticæ 6-dentatæ.

Fig. 1 *a*. Prothorax et caput a latere visa.

2. Athyreus armatus, *Hope* (Tab. XXII. fig. 2); piceo-niger, prothoracis lateribus mandibulis pedibusque rufescentibus, mandibulis magnis singulâ extùs 2-dentatâ dente antico magno, pronoto utrinque carinâ deflexâ medioque cornu suberecto, elytris elevato-striatis.—Long. corp. lin. 9.

Hab. In Americâ meridionali. *In Mus. D. Hope.*

Caput magnum, punctatum, vertice anticè angulato, tuberculo parvo in medio marginis antici angulisque posticis subtuberculatis; angulis lateralibus ante oculos acutis; mandibulæ magnæ, porrectæ, apice parvo acuto curvato denteque parvo sub apice mandibulæ dextræ, singulâ externè dentibus duobus elevatis planis instructâ, dente antico magno, subacuto, porrecto. Prothorax lateribus subdilatatis et parum angulatis; utrinque excavatione profundâ nitidâ ovali, suprà carinâ magnâ deflexâ cinctâ; cornu suberecto versus disci medium anticè posticèque excavato, lineâ tenui impressâ a cornu ferè ad marginem posticum extensâ, pronoti parte posticâ tuberculis minutis elevatis granulatâ, setisque brevibus obscuris instructâ. Elytra subopaca, tuberculis minutis setiferis granulata, striis longitudinalibus 7 lævibus inter humeros et suturam relictis. Pedes piceo-rufi; tibiæ anticæ extùs 5-dentatæ. Corpus subtùs piceo-rufum, setis fulvis obsitum.

Fig. 2 *a*. Caput et prothorax a latere visa.

3. Athyreus subarmatus ♀ (Tab. XXII. fig. 3); suprà obscurus nigricans, labro mandibulis prothoracis lateribus pedibusque piceo-rufis tenuissimè granulosis, clypeo margine antico parùm reflexo posticè carinâ elevatâ in medio tuberculo instructo, antennis luteis, pronoto carinis duabus brevibus mediis in spatio medio ovali lineâ elevatâ circumcincto instructo.—Long. corp. lin. $8\frac{1}{2}$.

Hab. In Americâ meridionali. *In Mus. D. Hope,* sub nomine *A. armatus* ♀.

Corpus suprà obscurum, sub lente tuberculis minutissimis undique obsitum. Caput mediocre; clypeo margine antico recto parùm elevato, margine postico magis elevato subcarinato tuberculo medio instructo, angulis anticis ante oculos acutis; mandibulæ mediocres subconcavæ, singulâ incisione angulatâ in marginis externi medio, dextrâ extùs apice magis angulato-porrectâ. Prothorax anticè valdè emarginatus; disco lineis duabus elevatis brevibus medianis posticè parùm convergentibus lineâque elevatâ continuâ spatium ovale includente posticè apertâ; lateribus excavatione parvâ rotundâ versus angulos posticos instructis. Elytra striis septem elevatis lævibus inter humeros et suturam, lateribus apicibusque obscuris. Pedes castanei; tibiæ anticæ dentibus 4 vel 5 obtusis armatæ.

Fig. 3 *a.* Caput et prothorax a latere visa.

4. Athyreus tuberculatus, *Hope* (Tab. XXII. fig. 4); obscurè piceus, sub lente tenuissimè granulosus et setosus, antennis luteis, clypeo conico anticè in cornu parùm elevato desinente, pronoto tuberculis duobus contiguis ante disci medium positis, elytris sublineatis, tibiis anticis 5–6-dentatis.—Long. corp. lin. $8\frac{1}{2}$.

Hab. In Brasiliâ. *In Mus. D. Hope.*

Corpus suprà opacum, undique sub lente tuberculis minimis granulosum. Caput mediocre. Clypeus margine antico deflexo truncato, disco magis elevato conico, tuberculo parvo antico in carinam parvam posticè extenso; angulis lateralibus ante oculos acutis. Mandibulæ mediocres, suprà subconcavæ, singula extùs ante apicem subtruncatum incisione angulatâ instructa. Prothorax lateribus et anticè declivis; tuberculis duobus nitidis approximatis ante disci medium positis; lateribus impressione parvâ versus angulos posticos. Elytra lineis longitudinalibus tenuibus elevatis circiter 7 (in singulo), lateralibus versus basin obliteratis. Corpus infrà cum pedibus rufo-piceum, tibiæ anticæ extùs 5–6-dentatæ, dentibus posticis 1 vel 2 subobliteratis.

Fig. 4 *a.* Caput et prothorax a latere visa.

To this insect is attached a label indicating it to be a female, probably from the small development of the armature of the prothorax. It agrees, in fact, with Dr. Klug's sketch of the female of *A. cyanescens*; but I apprehend that it as well as Dr. Klug's supposed female are males, with the external sexual characters only slightly developed.

5. ATHYREUS ROTUNDUS, *Hope* (TAB. XXII. fig. 5); suprà obscurus piceo-rufus, sub lente undique tuberculis minimis obsitus, clypeo margine antico truncato et parùm elevato; margine postico carinâ tuberculis tribus acutis instructo, pronoto tuberculis duobus contiguis ante medium elytrisque læviter striatis.—Long. corp. lin. 10.

Hab. In Brasiliâ. *In Mus. D. Hope.*

Corpus suprà opacum, piceo-rufum; antennæ luteæ. Caput carinâ elevatâ ad basin clypei tuberculis tribus acutis, intermedio majori; mandibulæ sat parvæ, margine externo pone medium incisione angulatâ instructæ. Anguli laterales ante oculos acuti. Pronotum setis brevissimis indutum, utrinque excavatione parvâ rotundâ versus angulos laterales lineâque brevi tenuissimâ politâ prope marginem posticum humeris elytrorum oppositâ. Elytra striis 7 lævibus tenuibus elevatis longitudinalibus inter humeros et suturam instructa, lateralibus versus basin minùs conspicuis. Pedes magis castanei: tibiæ anticæ dentibus 5 acutis extùs armatæ.

Fig. 5 *a*. Caput et prothorax a latere visa.

This insect appears to me to be probably the female of *A. tuberculatus*.

6. ATHYREUS BELLATOR (TAB. XXII. fig. 6); piceo-niger, capite et pronoto (marginibus exceptis) sublævibus; hujus marginibus lateralibus pedibusque rufis vel fulvis, clypeo in dentem acutum elongato, pronoto dente elevato bifido pone medium armato.—Long. corp. lin. $10\frac{1}{2}$.

Athyreus bifurcatus, *Laporte, An. Art.* iii. p. 102. pl. 7. f. 3. (*nec* A. bifurcatus, *Klug, nec* A. bifurcatus, *MacL.*)

Athyreus furcifer, *Dej. Cat. et Laporte, An. Art.* l. c. (*teste Mus. Gory.*)

Hab. In Brasiliâ et Cayennâ. *In Mus. D. Hope.*

Corpus suprà magis læve quam in præcedentibus. Caput porrectum; clypeo in spinam os obtegens suprà carinatam elongato, angulis lateralibus ante oculos acutis; vertex concavus; mandibulæ margine externo pone medium angulariter inciso, et pone incisionem truncato; antennæ luteæ. Pronotum anticè subretusum, spinâ elongatâ erectâ apice bifidâ pone disci medium armatum, impressionibus duabus ovalibus versus angulos posticos lineâque tenui abbreviatâ elevatâ lævi utrinque versus marginem posticum humeris elytrorum oppositâ. Elytra sub lente tenuissime scabra et setosa, striis 7 longitudinalibus distinctis elevatis at angustis inter humeros et suturam instructa. Pedes castaneo-fulvi; tibiæ anticè spinis 5 acutis nigris armatæ.

Variat dentibus spinæ thoracis plus minusve elongatis et divergentibus.

Fig. 6 *a*. Caput et prothorax a latere visa.

Obs. The description given by MacLeay of his *A. bifurcatus* agrees with neither Klug's nor Laporte's species so named.

The present species stands in Mr. Hope's collection as the male of *A. Bilbergii.*

7. Athyreus Bilbergii, *Gray in Griffith An. Kingd.* (Tab. XXII. fig. 7); piceo-niger, tuberculis minutis scaber, clypei margine antico recto postico carinato et 3-tuberculato tuberculo intermedio magis elevato, capitis angulis lateralibus ante oculos acutis, pronoto margine antico parùm elevato; disco tuberculis duobus lævibus lineisque duabus curvatis elevatis.—Long. corp. lin. 10.

Athyreus furcicollis, *Dej.* (*teste Mus. Gory, nunc Hope.*)

Hab. In Demerarâ et Cayennâ. *In Mus. D. Hope.*

Individuum typicum, cujus figuram in *op. cit.* delineavi, hic describo. Corpus suprà saturatè piceo-nigrum, tuberculis parvis glabrum; prothoracis lateribus magis piceis; pedibus parùm castaneis; antennis luteis. Caput suprà subconcavum, margine tenui elevato. Pronotum lateribus tuberculis minùs numerosis at magis distinctis, tuberculis duobus glabris in disci medio subconnexis lineâ vix impressâ et ad marginem posticum pronoti extensâ divisis; utrinque lineâ tenui elevatâ parùm sinuatâ, posticè convergenti, ante marginem anticum et posticum abbreviatâ; impressione parvâ ovali versùs angulos prothoracis laterales lineisque duabus parvis glabris obliquis versus marginem posticum humeris elytrorum oppositis. Elytra striis 7 tenuibus parùm elevatis instructa; scutellum suturaque elytrorum setis fulvis obsita. Tibiæ anticæ dentibus 5 armatæ, dentibus anticis magnis et acutis.

8. Athyreus Pholas, *Buquet MS.* (Tab. XXII. fig. 8); piceo-castaneus, prothoracis elytrorumque lateribus pedibusque rufescentibus, scabriusculus, clypeo anticè angustato margine antico bituberculato, vertice concavo, prothoracis lateribus dilatatis disco excavatione subquadratâ spinâ erectâ anticâ lateribusque acutè tuberculatis.—Long. corp. lin. 6.

Athyreus trituberculatus, *Gory in Mus.*

Hab. In Columbiâ, Santa Fè de Bogota. *In Mus. D. Hope.*

Caput suprà parùm concavum, scabrum, marginibus clypei paullò elevatis et convergentibus, apice angustiori et bituberculato; mandibulæ mediocres, lateribus pone medium incisis; antennæ luteo-fulvæ. Pronotum lateribus dilatatis, margine postico valdè sinuato, disco excavatione magnâ subquadratâ glabrâ cujus margo anticus spinâ erectâ armatus, lateribus anticè in tubercula duo conica elevatis; margine postico semicirculari lineâ tenui lævi circumcincto, quæ in discum paullò utrinque extenditur; lateribus versus angulos impressis. Elytra subscabra setosa, striâ suturali alterisque nonnullis vix ultra basin extensis. Pedes castaneo-fulvi; tibiæ anticæ extùs 5-dentatæ.

Fig. 8 *a*. Caput et prothorax a latere visa.

9. Athyreus purpureipennis (Tab. XXII. fig. 12); cyaneo-niger subtùs fulvo-testaceus, elytris lætè purpureis, pronoto lineâ longitudinali impressâ, utrinque spatio convexo lævissimo nigro versus angulos anticos furcato.—Long. corp. lin. 6.

Hab. In Americâ meridionali. *In Musæo Britannico.*

Cyaneo-niger, subtùs fulvo-testaceus luteo-setosus, metasterno castaneo, elytris lætè purpureis. Caput punctatum vertice in angulum supra clypeum producto, mandibulæ extùs profundè sinuatæ, antennæ clava fusca, articulis basalibus, labro palpis pedibusque luteo-testaceis. Pronotum magnum, elytris parùm latius, lateribus subserrulatis, punctatum scabriusculum lineâ longitudinali impressum, utrinque spatio convexo lævissimo nigro, versùs angulos anticos pronoti, furcato, furcæ divisione externâ longiori et ad marginem lateralem extensâ, margine antico tuberculo parvo conico, lateribus in medio etiam impressione rotundatâ et utrinque inter hanc et scutellum lineâ obliquâ parùm elevatâ glabrâ. Elytra punctata, tuberculo lævi humerali, spatio irregulari inter suturam et striam primam juxta suturam. Tibiæ anticæ extùs 4-dentatæ.

Fig. 12 *a*. Caput et pronotum a latere visa.

10. Athyreus centralis (Tab. XXII. fig. 13); testaceo-fulvus, capitis vertice anticè 3-dentato, pronoto carinâ abbreviatâ centrali lineis duabus parùm elevatis obliquis alteràque utrinque prope angulos posticos, elytris impresso-striatis striis longe ante apicem evanescentibus.—Long. corp. lin. 6½.

Hab. In Novâ Granatâ, Rio Magdalena, Ibaque. *In Musæo Britannico.*

Testaceo-fulvus subtùs pallidior, luteo-setosus, capite punctato, spatio verticali subconcavo et ferè lævi, anticè tridentato. Mandibulæ extùs profundè sinuatæ. Pronotum latum; lateribus obtusè angulatis, angulis posticis subemarginatis. Dorsum tenuissimè granulatum, carinâ tenui abbreviatâ centrali longitudinali, lineis duabus parùm elevatis lævibus obliquis ferè ad marginem posticum extensis, alteràque utrinque minori versus angulos posticos, punctoque intra angulum lateralem utrinque impresso. Elytra tenuissimè punctata, impresso-striata, striis longe ante apicem evanescentibus. Tibiæ anticæ extùs 5-dentatæ.

Fig. 13 *a*. Caput et prothorax a latere visa.

11. Athyreus Tweedyanus (Tab. XXII. fig. 14); testaceus, pronoto maximo lateribus obtusè angulatis et sinuatis, medio disci depresso lævi et lineâ obliquâ parùm curvatâ e lateribus separato lineâque alterâ abbreviatâ utrinque versus angulos posticos.—Long. corp. lin. 5¾.

Hab. In Insulâ Hayti, Indiæ occidentalis. *DD. Tweedy et Hearne. In Muss. Soc. Ent. Londin. et Hope.*

Punctatissimus et setosus. Caput mediocre, vertice parùm concavo, carinâ tenuissimâ transversâ e clypeo separato. Clypeus transversus, brevis, angulis anticis rotundatis, medio in angulum parvum producto. Mandibulæ extùs sinuatæ. Pronotum maximum, lateribus angularibus, angulis posticis obtusis, anticè valdè declive, tuberculo parvo conico elevato in medio juxta marginem anticum; carinæ duæ obliquæ curvatæ ferè ad marginem posticum extensæ, spatio interjecto lævi concavo lineâ profundiori mediâ ad scutellum ductâ, lineâ alterâ breviori obliquâ utrinque angulis humeralibus elytrorum oppositâ; impressione rotundatâ juxta angulos laterales pronoti. Elytra brevia, semicircularia, tenuissimè punctata striisque impressis præsertim ad basin instructis; humeris elevatis striâque suturali magis distinctâ. Tibiæ anticæ extùs 7-dentatæ.

Fig. 14 *a.* Caput et pronotum a latere visa.

From the very incomplete manner in which the Count De Castelnau described many of the insects in M. Gory's collection, I have thought it useful to add figures of the head and thorax of the three following species described by him, from the type specimens now in Mr. Hope's collection.

Athyreus excavatus, *Laporte, An. Art.* ii. p. 103 (Juvencus, *Dej.*). Cayenne.
Tab. XXII. fig. 9. Caput et pronotum supra visa.

Athyreus bicolor, *Laporte, An. Art.* ii. p. 103. New Grenada.
Tab. XXII. fig. 10. Caput et pronotum supra visa.

Athyreus 6-dentatus, *Laporte, An. Art.* ii. p. 103. Paraguay..
Tab. XXII. fig. 11. Caput et pronotum supra visa.

Obs. *Athyreus recticornis*, Guérin, Iconogr. du Règne An. Ins. p. 83, from Swan River (*Mus. Gory*), is identical with *Bolboceras hastifer*, Bainbridge.

Obs. The insect placed in M. Gory's collection, with the label of *Athyreus porcatus*, De Laporte, Anim. Artic. t. ii. p. 103. no. 6, (*Athyreus Senegalensis*, Dejean,) is a new species of *Bolboceras*, from Senegal.

Species added subsequent to the reading of the Paper.

12. Athyreus fossulatus (Tab. XXII. fig. 15); piceo-niger minutissime granulatus, capitis disco plano margine antico in cornu acutum super clypeum porrecto angulis lateralibus acutis, pronoto fossulâ mediâ profundâ lævi lateribusque granulatis; parte fossulatâ carinis duabus elevatis angustis glabris posticè parum incurvis marginatâ;

marginibus lateralibus integris, elytris minutè longitudinaliter granulatis; singulo sub lente striis tribus longitudinalibus angustissimis impresso.—Long. corp. lin. 5.

Hab. In Brasiliâ, apud Pernambuco. *In Mus. D. Reichii, Parisiis.*

Fig. 15 *a.* Caput et pronotum a latere visa.

This species appears to approach near to *A. bicolor*, Klug. It is entirely covered with very minute granulations, those of the elytra being elongated and almost confluent. It is black, with a pitchy tinge at the sides, and is clothed beneath with pale brown hairs. The disc of the head is neither impressed nor tuberculated; the angles in front of the eyes are very acute, and the front of the disc is produced into an acute and porrected conical point, the anterior angles in front of the antennæ being also acute; the mandibles have a strong notch at the sides, the margin of each division formed by the notch being rounded. The middle of the pronotum is deeply excavated, the excavation being somewhat oval; its deepest part is smooth, but the sides are granulated; the sides of the excavation are edged with a narrow raised polished carina on each side, which converge towards each other behind, and are rather angulated outwardly near the middle: there is no oblique, polished, thin raised line between each of these two polished edges and the hinder angle of the pronotum, the lateral margin of which is entire, having a small impression on each side near the margin. The elytra are but slightly setose, the shoulders and a spot near the apex of each are polished, and each is marked (when seen through a lens) with a very slender raised line close to the suture, and two others impressed on the disc, which are more distinctly visible at the base. The underside of the body and legs is pitchy, thickly clothed with pale yellowish brown hairs.

13. Athyreus Reichii (Tab. XXII. fig. 16); piceo-castaneus, lateribus prothoracis marginibus lateralibus elytrorum antennis pedibusque fulvis, capitis margine antico in angulum acutum supra clypeum producto; disco excavatione rotundâ inter oculos, pronoti angulis posticis prominentibus; tuberculo ovali ante medium carinis duabus obliquis lateralibus lineisque duabus lævibus ante angulos posticos, elytris substriatis.—Long. corp. lin. $4\frac{1}{2}$.

Hab. In Novâ Granatâ. *In Mus. D. Reichii, Parisiis.*

Fig. 16 *a.* Caput et pronotum a latere visa.

This species is at once distinguished from all the allied smaller species of the genus by the raised tubercle on the front part of the pronotum being placed towards the middle, instead of close to the anterior margin. The upper side is pitchy chestnut, with the front of the head broad, the margin of the prothorax and narrow edges of the elytra fulvous red; the underside of the body and legs are also fulvous red, with fulvous hairs. The head is covered with very fine tubercles, having the front margin nearly semicircular, the centre produced into an angle advanced over the clypeus, and the two anterior angles in front of the antennæ are scarcely prominent. Between the eyes is a rounded polished excavation. The prothorax is also covered with very minute tubercles; and at a little distance in front of the centre is a raised oval tubercle, from which extends a slightly-impressed longitudinal line reaching to the scutellum; from this line the sides are slightly raised, the raised part on each side being bounded by an oblique, slender, raised and polished line, from which, near the base, extends inwardly a small transverse and not very distinct spur. Between this line and the hinder angle is another much shorter and more oblique raised shining line, and towards the lateral margin, opposite to the notch above the base of the fore-legs, is a small circular excavated spot. The elytra are finely rugose and setose, substriated, the striæ being deeper towards the base of the elytra, and almost vanishing before reaching the apex. The fore tibiæ have five obtuse teeth.

EXPLANATION OF TAB. XXII.

Fig. 1. *Athyreus gigas*, Hope, MS. 1 *a*. Head and thorax of ditto, detached.
2. ——— *armatus*, Hope, MS. 2 *a*. Head and thorax, detached.
3. ——— *subarmatus* ♀, Westwood. 3 *a*. Head and thorax, detached.
4. ——— *tuberculatus*, Hope, MS. 4 *a*. Head and thorax, detached.
5. ——— *rotundus*, Hope, MS. 5 *a*. Head and thorax, detached.
. ——— *bellator*, Westwood. 6 *a*. Head and thorax, detached.
7. ——— *Bilbergii*, Gray. (Head and thorax, seen from above.)
8. ——— *Pholas*, Buquet, MS. 8 *a*. Head and thorax, detached.
9. ——— *excavatus*, Laporte. (Head and thorax, seen from above.)
10. ——— *bicolor*, Laporte. (Head and thorax, seen from above.)
11. ——— *sexdentatus*, Laporte. (Head and thorax, seen from above.)

Fig. 12. *Athyreus purpureipennis,* Westwood. 12 *a.* Head and thorax, detached.

13. ——— *centralis,* Westwood. 13 *a.* Head and thorax, detached.

14. ——— *Tweedyanus,* Westwood. 14 *a.* Head and thorax, detached.

15. ——— *fossulatus,* Westwood. 15 *a.* Head and thorax, detached.

16. ——— *Reichii,* Westwood. 16 *a.* Head and thorax, detached.

a, b, c, d. Details of *Athyreus orientalis.*

a. Mandibles. *b.* Maxilla. *c.* Mentum, labium and labial palpi. *a.* Metasternum and basal portion of the middle and hind legs.


a
c
b
d

XXIX. *Some Account of an undescribed Fossil Fruit.* By Robert Brown, *Esq., D.C.L., F.R.S., V.P.L.S.*

Read June 15th, 1847.

THE following imperfect account of a singularly beautiful and instructive silicified Fossil has been hastily drawn up, to supply in some measure the possible want of any other memoir for the present Meeting.

The remarks which I am enabled to make, from detached memoranda, on so short a notice, will principally serve to explain the accompanying drawings, which I have carefully superintended, and which exhibit a very satisfactory microscopic analysis of its structure, and do great credit to the artistical talent of Mr. George Sowerby, jun.

The only specimen of this Fossil known to exist, was brought to London in 1843 by M. Roussell, an intelligent dealer in objects of natural history. His account of it was, that it had been in the possession of Baron Roget, an amateur collector in Paris, for about thirty years; that after his death it was brought to public sale with the rest of his collection, but no offer being made nearly equal to the sum he paid for it, which was 600 francs, it was bought in. It was purchased here from M. Roussell jointly by the British Museum, the Marquis of Northampton and myself, for nearly 30*l.* It seems to have entirely escaped the notice of the naturalists of Paris. Nothing else is known of its history, but from its obvious analogy in structure and in its mineral condition with *Lepidostrobus,* it may be conjectured to belong to the same geological formation.

The specimen is evidently the upper half of a Strobilus very gradually tapering towards the top. As brought to England it was not quite two inches in length; but a transverse slice, probably of no great thickness, had been removed from it in Paris: the transverse diameter of the lower slices somewhat exceeded the length of the specimen; its surface, which was evidently waterworn, is marked with closely-approximated hexagonal areæ, of which the four lateral sides are nearly twice the length of the upper and lower; these hexagons, which are the waterworn terminations of the bracteæ of the Strobilus, becoming gradually smaller and less distinct towards the top.

A transverse section of the Strobilus exhibits a central axis, from which radii directly proceed, constantly thirteen in number, resembling, when perfect, the spokes of a wheel, but several of them being always more or less incomplete. These radii alternate with an equal number of oblong bodies, also radiating, of a lighter colour, and which are not directly connected with the axis: beyond these twenty-six radiating bodies a double series of somewhat rhomboidal areolæ exist. These appearances not readily indicating the actual structure in the transverse, are satisfactorily explained by the vertical section.

From the vertical section it appears that the Strobilus is formed of a central axis of small diameter compared with the parts proceeding from it, which consist,—

1. Of bracteæ densely approximated and much imbricated: the lower half of each of these stands at right angles to the axis, while the imbricating portion, of about equal length with the lower, and forming an obtuse angle with it, is gradually thickened upwards: these form the spokes and external rhomboidal areæ of the transverse section.

2. Of an equal number of oblong bodies of a lighter colour and more transparent, each of which is adnate and connected by cellular tissue with the upper surface of the supporting bractea. These bodies are sections of *Sporangia* filled with innumerable microscopic *sporules*, originally connected in threes (very rarely in fours), but ultimately separating, as shown in Tab. XXIV. fig. G.

From this triple composition or union of sporules, which differs from the constant quadruple union in tribes of existing plants, namely *Ophioglosseæ* and *Lycopodiaceæ*, which, from other points of structure, may be supposed most nearly related to the fossil, I have called it *Triplosporite*, a name which expresses its fossil state, the class or primary division to which it belongs, and its supposed peculiarity of structure.

The structure of the *axis*, which is well preserved in the specimen, distinctly shows, in the arrangement of its vascular bundles, a preparation for the supply of an equal number of bracteæ. These vascular fasciculi are nearly equidistant in a tissue of moderately elongated cells.

The vessels are exclusively scalariform, very closely resembling those of the recent Ferns and *Lycopodiaceæ*; and among fossils, those of *Psarolites*, *Lepidodendron*, and its supposed fruit, *Lepidostrobus*, as well as several other fossil genera; namely, *Sigillaria*, *Stigmaria*, *Ulodendron*, *Halonia*? and *Diploxylon*.

The coat of the sporangium appears to be double; the outer layer being densely cellular and opake, the inner less dense, of a lighter colour, and formed of cells but slightly elongated.

On the lower or adnate side of the sporangium this inner layer seems to be continued, in some cases at least, in irregular processes to a considerable depth. I cannot, however, find that the sporules are actually formed in this tissue, but in another of somewhat different appearance and form, of which I have only been able to see the torn remains.

The minute granular bodies which accompany the sporules in the drawing TAB. XXIV. fig. G. are probably particles of the mother cells, and are neither uniform in size nor outline.

The whole specimen has suffered considerable decay or loss of substance, which is most obvious in the sporangia from their greater transparency, but equally exists in the opake bracteæ, in which radiating crystallization occupies the space of the removed cellular substance.

I cannot at present enter fully into the question of the affinities of *Triplosporite*. I may remark, however, that in its scalariform vessels it agrees with all the fossil genera supposed to be Acotyledonous. In the structure of its sporangia and sporules it approaches most nearly, among recent tribes, to *Lycopodiaceæ* and *Ophioglosseæ*; and among fossils, no doubt, to *Lepidostrobus*, and consequently to *Lepidodendron*.

The stem structure of *Lepidodendron*, known to me only in one species, *Lepidodendron Harcourtii*, offers no objection to this view, the vascular arrangement of the axis of its stem bearing a considerable resemblance to that of *Triplosporite*. To the argument derived from an agreement in structure between axis of stem and of strobilus I attach considerable importance, an equal agreement existing both in recent and fossil *Coniferæ*.

In conclusion I have to state, that very recently (since the drawings were completed, and as well as the specimens seen by such of my friends as were interested in fossil botany) Dr. Joseph Hooker has detected in the sporangia of a species referred to *Lepidostrobus* sporules, and those also united in threes. There are still, however, characters which appear to me sufficient to distinguish that genus from the fossil here described.

To the brief account here given of *Triplosporite* it is necessary to add a few remarks on some nearly-related fossils, chiefly *Lepidostrobi*, whose structure is now more completely known than it was when that account was submitted to the Society.

On the affinities of *Lepidostrobus* to existing structures, respecting which various opinions have been held, it is unnecessary here to advert to any other than that of M. Brongniart, which is now very generally adopted, namely, that *Lepidostrobus* is the fructification of *Lepidodendron*, and that the existing family most nearly related to *Lepidodendron* is *Lycopodiaceæ*. The same view is in great part adopted in my paper. But I hesitated in absolutely referring *Triplosporite* to *Lepidostrobus*, from the very imperfect knowledge then possessed of the structure of that genus. The specimens of *Lepidostrobus* examined by M. Brongniart were so incomplete, that they suggested to him an erroneous view of the relation of the supposed sporangium to its supporting bractea, and of the contents of the sporangium itself they afforded him no information whatever.

In concluding my account of *Triplosporite*, I noticed the then very recent discovery of spores in an admitted species of *Lepidostrobus* by Dr. Joseph Hooker, who, aware of the interest I took in everything relating to *Triplosporite*, the sections and drawings of which he had seen, communicated to me a section of the specimen in which spores had been observed, but which in other respects was so much altered by decomposition, that it afforded no satisfactory evidence of the mutual relation of the parts of the strobilus. The appearances however were such, that I hazarded the opinion of its being generically different from *Triplosporite*, an opinion strengthened by M. Brongniart's account of the origin of the sporangium.

Since the abstract of my paper was printed in the Proceedings of the Society, the second volume of the Memoirs of the Geological Survey of Great Britain has appeared, which contains an article entitled "Remarks on the Structure and Affinities of some *Lepidostrobi*." The principal object of Dr. Hooker, the author of this valuable essay, is from a careful examination of a number of specimens, all more or less incomplete, or in various degrees of decomposition and consequent displacement or absolute abstraction of parts, to ascertain the complete structure or common type of the genus *Lepidostrobus*; but the type so deduced is in every essential point manifestly exhibited, and in a much more satisfactory manner, by the single specimen of *Triplosporite*. This does not lessen the value of Dr. Hooker's discovery and investigation, but it gives rise to the question whether *Triplosporite*, which he has not at all referred to, and therefore probably considered as not belonging to *Lepidostrobus*, be really distinct from that genus; and although there are still several points of difference remaining, namely, the form of the strobilus in *Triplosporite*, confirmed by a second specimen presently to be noticed, and in *Lepidostrobus* the more limited insertion of sporangium, and the very remarkable difference in the form of the unripe spores, hardly reconcilable with a similar origin to that described in *Triplosporite*, I am upon the whole inclined to reduce my fossil to *Lepidostrobus* until we are, from still more complete specimens of that genus, better able to judge of the value of these differences. The name *Triplosporites* however is already adopted, and a correct generic character given, in the second edition of Professor Unger's 'Genera et Species Plantarum Fossilium,' p. 270, published in 1850, who at the date of his preface in 1849 was not aware of Dr. Hooker's essay on *Lepidostrobus*, the character of which he has adopted entirely from M. Brongniart's account.

In October 1849 M. Brongniart showed me a fossil so closely resembling the *Triplosporite*, both in form and size, that at first sight I concluded it was the lower half of the same strobilus. On examination however it proved to be of somewhat greater diameter. It was nearly in the same mineral state, except that the crystallizations consequent on loss of substance were rather less numerous; it differed also in the central part of the axis being still more complete; in the bracteæ being more distant and of a slightly different form: but the spores in composition, form, and apparently in size were identical. This specimen had then very recently been received from the Strasburg Museum, but nothing was known of its origin or history.

May 5, 1851.

EXPLANATION OF THE PLATES OF TRIPLOSPORITE.

Tab. XXIII.

The figures A, B, C, and D are of the natural size.

Fig. A. A portion of the surface of the Strobilus, showing the hexagonal areolæ.

Figs. B. & C. Transverse sections, exhibiting different appearances of the bracteæ and sporangia.

Fig. D. A vertical section of fig. A.

The remaining figures, E, F, G and H, are all more or less magnified.

Fig. E. A transverse section of the axis.

Fig. F. A more highly magnified drawing of a portion of fig. E, to show the arrangement and proportion of the vascular and cellular tissues.

Fig. G. A horizontal section of a sporangium, made probably near its origin.

Fig. H. A portion of the outer wall of a sporangium or bractea.

Tab. XXIV.

All the figures magnified.

Fig. A. A vertical section of the axis, near, but not exactly in the centre, showing the ramifications of the central cord of the axis going to the circumference of the axis, and connected or supported by a loose cellular tissue at *a a*.

Fig. B. A small portion of the axis, from which proceeds a bractea cut vertically through its centre, showing its vascular cord, and bearing on its lower and horizontal half a vertical section of an adnate sporangium, of which the base is cellular, rising irregularly and without spores,—probably a rare occurrence.

Fig. C. A small portion of the axis, to show the scalariform vessels with the slightly elongated surrounding cells.

Fig. D. A similar portion, from the central axis of the bractea of fig. B.

Fig. E. A similar portion, from the line of union between the bractea and sporangium of fig. B.

Fig. F. A small portion of a sporangium, sufficiently magnified to show the arrangement and composition of sporules.

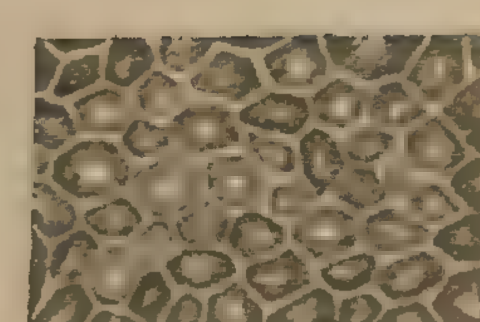
Fig. G. Several sporules, both in their compound and simple state, still more highly magnified, with the minute granular matter which usually accompanies them.

B

D

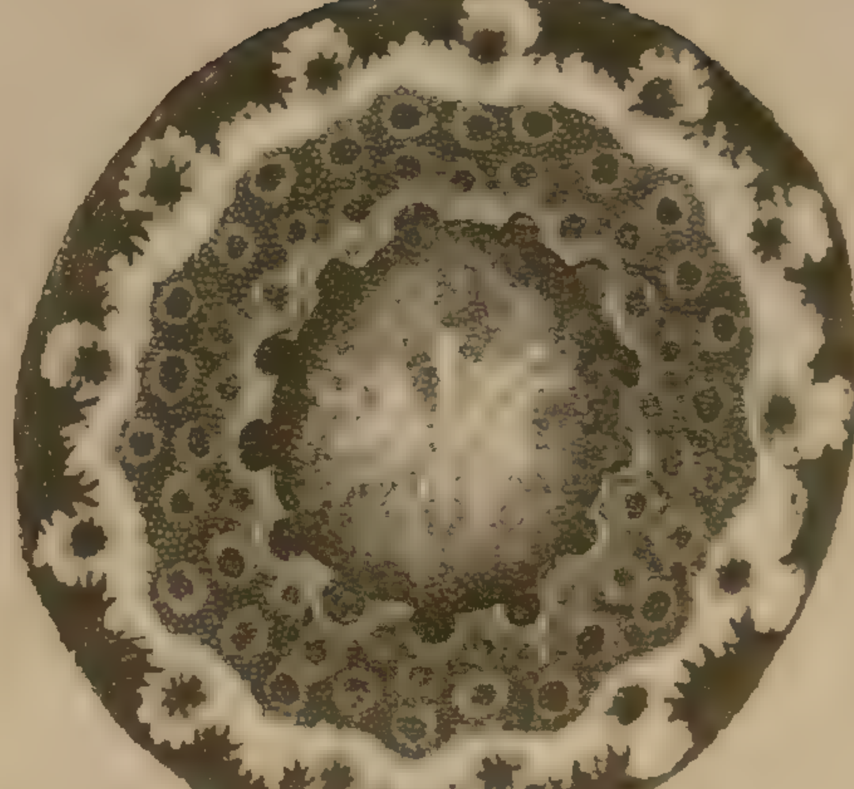
A

C



H

G

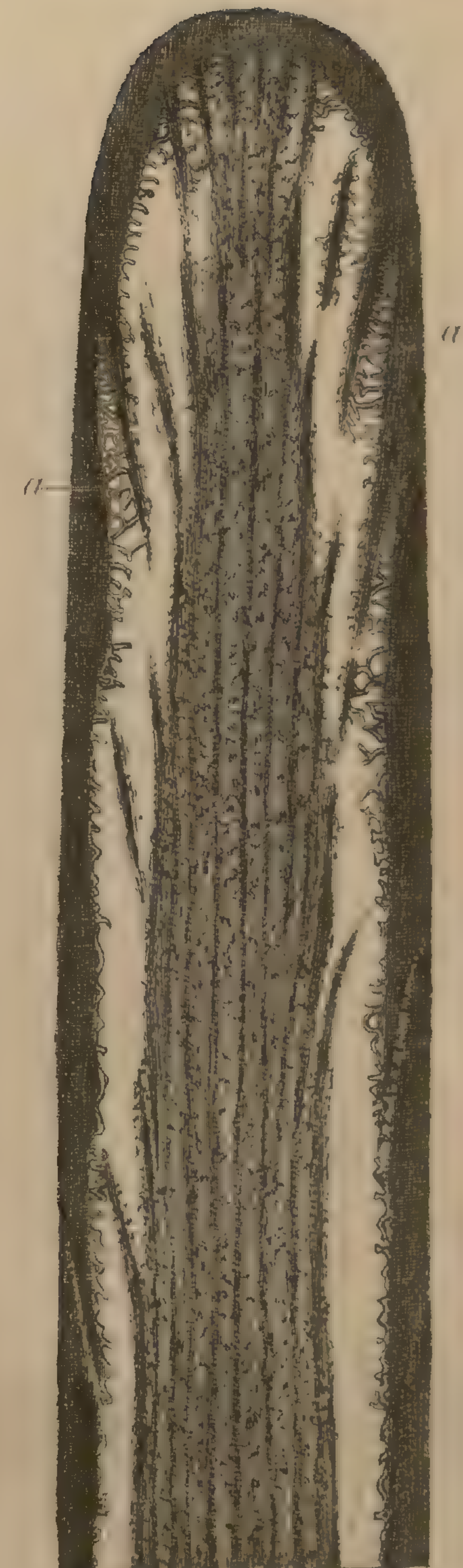


E

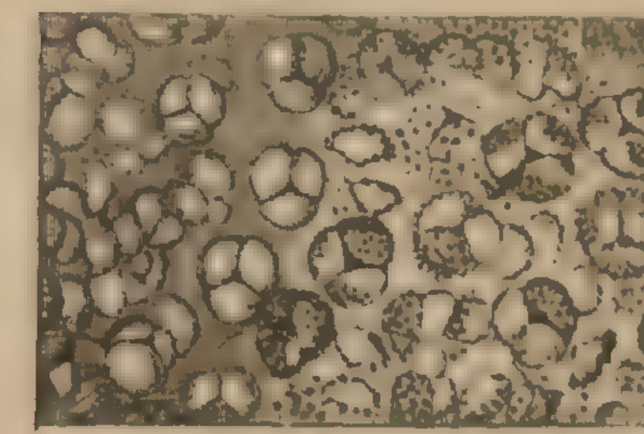
F

G.B. Sowerby Jun^r.
Delin 1846. Sculp 1847

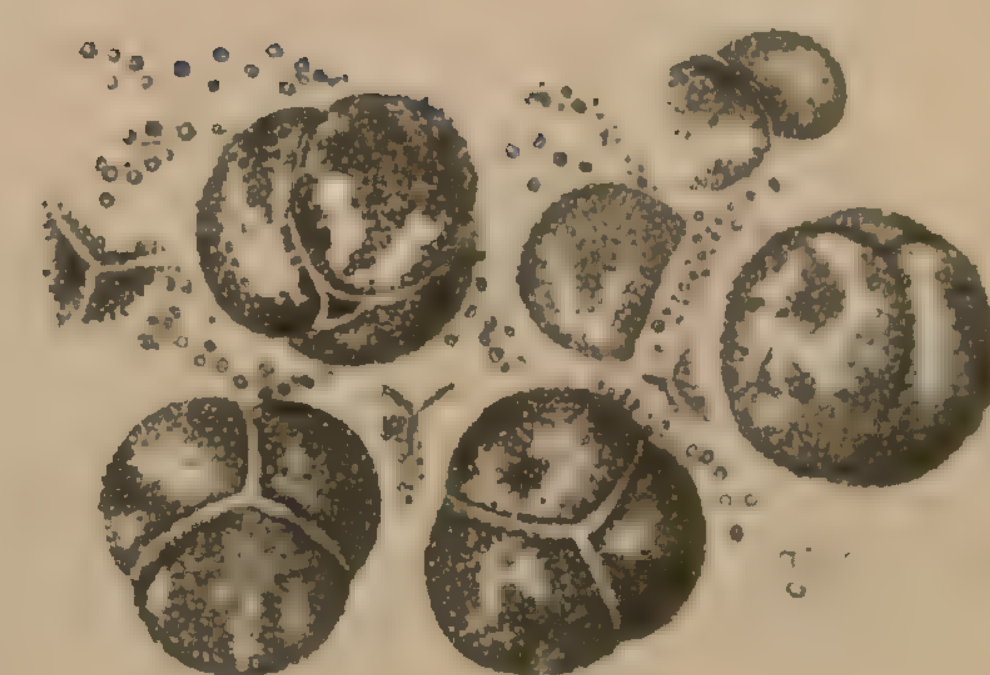
C



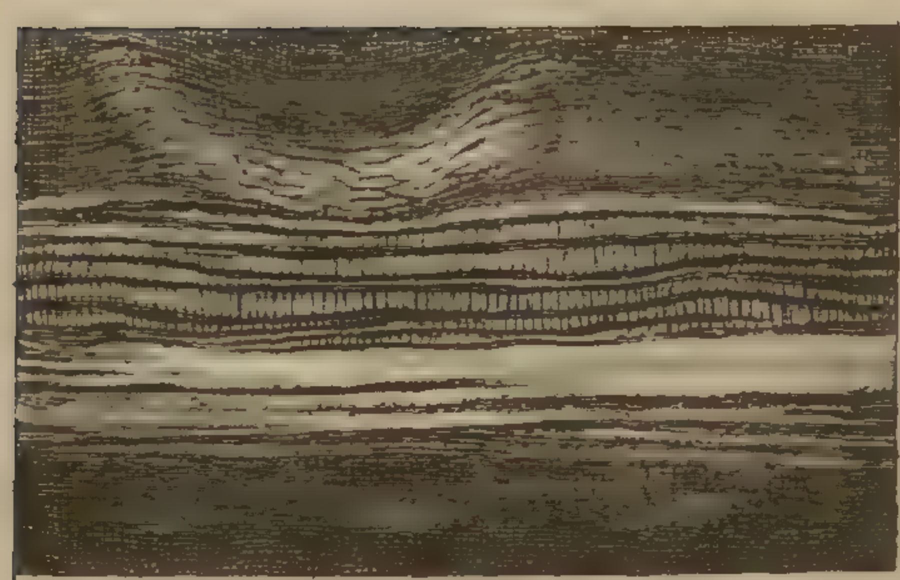
A



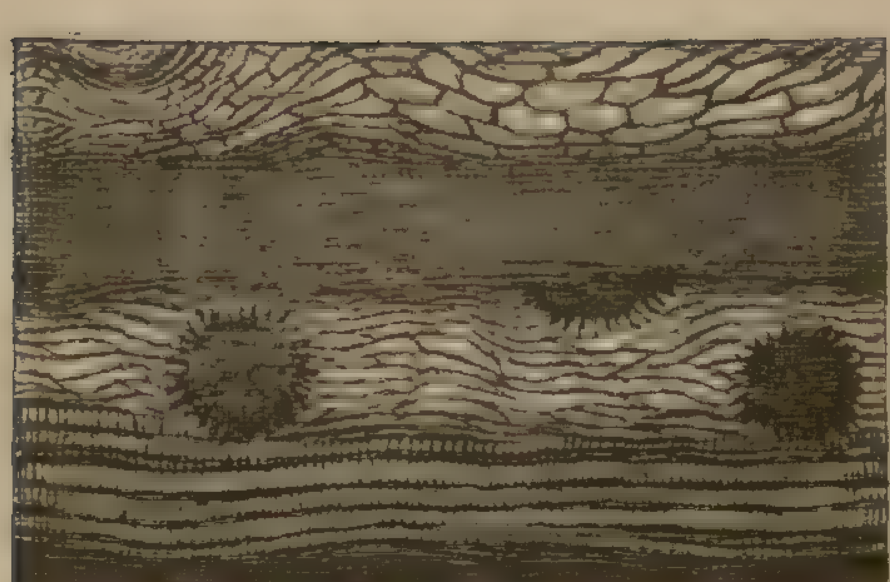
F



G



D



E


B

G. B. Sowerby del.

XXX. *Extracts from the* Minute-Book *of the* Linnean Society *of* London.

1845.

Nov. 4. THE special thanks of the Society were ordered to be presented to Joseph Janson, Esq., for his present of three additional Cabinets for the Society's Collection of Dried Plants.

1846.

May 24. The Secretary announced that the late Joseph Janson, Esq. F.L.S., had bequeathed to the Society a Legacy of £100.

1847.

Jan. 8. At a Special General Meeting convened by the Council in the terms of the following circular:—

"Linnean Society, 32 Soho Square,
December 28th, 1846.

"Sir,

"You are requested to attend a Special General Meeting of the Society, on Friday the 8th of January next, at two o'clock in the afternoon *precisely*, to consider the subject of the following Statement and Resolution of Council.

"The late Edward Rudge, Esq., F.L.S., who died on the 3rd of September last, has in his will made the following bequest:—

'I give and bequeath to the President and Council for the time being of the Linnean Society of London, the sum of Two Hundred Pounds, in trust, to invest the same in the names of Trustees, in the purchase of 3 per cent. Consolidated Bank Annuities, and from time to time, as occasion may require, out of the Dividends thereof, to purchase a Gold Medal, to be called 'The Linnean Medal,' to be awarded by the President and Council of the said Society, at their discretion, to the Fellow of the said Society who shall write the best communication in each volume which after my decease shall be published by the said Society, in either of the four departments of Natural History, every such Gold Medal to contain the Profile Bust of Linnæus in his full dress, encircled by his name and the dates of his birth and death on the one side, and the engraved name of the Fellow of the said Society to whom such Medal shall be awarded, encircled by a wreath of the *Linnæa borealis*, on the obverse.'

"The Council has repeatedly had the subject and terms of this bequest under its serious consideration, and has, after much patient and anxious deliberation, unanimously come to the following resolution:—

'Resolved,—That in the opinion of this Council, on a full consideration of the terms of the bequest of the late Edward Rudge, Esq., of the interest of a sum of £200, for the purpose of establishing a Medal 'to be awarded by the President and Council of the (Linnean) Society, at their discretion, to the Fellow of the said Society who shall write the best communication in each volume which after his (the testator's) decease shall be published by the said Society, in either of the four departments of Natural History,' it is inexpedient to accede to the liberal intentions of the testator under the conditions expressed in his will.'

'That this Resolution be submitted to a Special Meeting of this Society.'

"This Resolution, which has received the entire concurrence of the President and of every Member of the Council, was chiefly founded on the following considerations:—

"The great object of the Linnean Society, as of all other bodies similarly constituted, is the production and publication of such essays as tend to the advancement of that branch of science which it cultivates. The principal question therefore in reference to Mr. Rudge's bequest, is the manner in which its acceptance would operate on the Society's publications, and the Council has arrived at the conclusion that its tendency would be prejudicial rather than favourable; inasmuch as while the Medal would offer no inducement to some of those Members who have hitherto been in the habit of communicating papers which have had a place in the 'Transactions,' they might, on the contrary, be unwilling to submit their future communications to this new ordeal; and it does not appear probable that the Medal would prove a stimulus to the production of more valuable Essays from any other class of the Society. On the other hand, it is probable that dissatisfaction would arise in the minds of some of those Members, who after contributing papers to more than one volume of the 'Transactions,' should fail in obtaining the award of a Medal.

"A second objection to the acceptance of the bequest arises from the absence of any discretionary power of withholding the Medal, which is necessarily to be awarded to the best paper in every volume, and consequently to papers of very unequal value, thereby lowering the character of the Medal, and consequently affecting the scientific reputation of the Society itself.

"Differences of opinion, and consequent dissatisfaction, would also be not unlikely occasionally to arise in deciding upon the comparative merits of papers in botany and zoology, the two branches of natural history, of which, for many years past, the Transactions of the Society have exclusively consisted.

"Another point may still be noticed as decidedly unfavourable to the acceptance of the bequest, namely, the not improbable award of the Medal by the Council, in some cases to one of its own body, in strict conformity with the conditions of the will; conditions which neither the Council itself, nor (as it appears from the tenor and provisions of the will) any other party has the power to modify.

"These objections have appeared to the Council so important as not to admit of any other course but that of respectfully declining to accept a bequest, the operation of which would in all probability be injurious to the best interests of the Society, by lowering the character of its publications, and endangering the continuance of that harmony which has hitherto prevailed in all essential points. The Council is at the same time deeply sensible of the kind and liberal intentions of Mr. Rudge, and entertains a sincere regret that the express terms of his will should have rendered the acceptance of his bequest liable to such grave objections.

"I have the honour to be, Sir,

"Your most obedient humble Servant,

"John J. Bennett, *Secretary.*"

It was moved, seconded and carried unanimously, that the Society concur in the Resolution of Council, and that the thanks of the Society be given to the Council for the mode in which they have submitted the question to the consideration of the Society.

1847.
Feb. 16. A Paper was read entitled, "On the Structure and Comparative Physiology of *Chiton* and *Chitonellus*." By Lovell Reeve, Esq., F.L.S. &c. &c.

Mr. Reeve remarks on the paucity of species of *Chitonidæ* known to Lamarck so lately as 1819, and the very large number (amounting to between two and three hundred) now known to inhabit the western coast of South America, the shores of New Holland and New Zealand, and other localities explored by recent voyagers; and states that he is enabled by the kindness of Mr. Cuming and Capt. Sir Edward

Belcher to offer a few observations on the structure of *Chiton* and such remarks on *Chitonellus* as, in his opinion, will leave no doubt of their claim to generic distinction. He notices the successive additions made to these genera by Mr. Frembly, by Mr. Cuming, by M. Quoy, by Capt. Belcher in the voyages of the Blossom, the Sulphur and the Samarang (and especially in the latter in company with Mr. Arthur Adams), by the Rev. Mr. Hennah, by Dr. Dieffenbach, by Mr. Earl, by Mr. Ronald Gunn, by Mr. Ince, by Dr. Gould, by Mr. Courthony, and by Prof. Edward Forbes and Mr. M'Andrew; and then enters into an examination of the views of authors with reference to their affinity, adopting that first promulgated by Adanson and now generally adopted, that they are immediately related to *Patella*. A description of the animal is then given, and the differences between it and the animal of *Patella* pointed out, as well as the modifications to which it is subject in different species. The distinctions between the shells and animals of *Chiton* and *Chitonellus* are more particularly insisted on; and the author proceeds to point out a marked difference in the habits of the two genera. He states, on the authority of Mr. Cuming, that while the Chitons live attached to stones and fragments of shells in deep water, or more frequently under masses of stone and on exposed rocks about low-water mark, the *Chitonelli* dwell in holes and cavities, either of natural formation or bored by other *Mollusca*, into which they thrust themselves by attenuating their bodies in a surprising manner, sometimes turning completely at right angles and at angles again. Those which were only partially imbedded were found to have entered holes too small to contain them, and the posterior part of their bodies remained suspended externally, fat and swollen, and constantly separating from the anterior half when any attempt was made to draw them forcibly from their retreats. These remarks apply to *Chitonellus fasciatus*, collected by Mr. Cuming in the Philippine Islands in great abundance and of extraordinary dimensions, extending frequently to a foot or more in length. Capt. Sir E. Belcher and Mr. Adams collected the same species in the Korean Archipelago, where they were found in company with Chitons and noticed to be of locomotive habits; the *Chitonellus* seeking retirement in a hole or cavity, but crawling away from its attachment on being disturbed, at about the pace of the common garden snail.

For these reasons, although Mr. Reeve does not regard the other subdivisions proposed in the genus *Chiton* as of greater value than sectional, he considers *Chitonellus* as entitled to rank equally with *Chiton* in its most extended form, being in his opinion clearly distinguished both in structure (as regards the condition of the mantle and its system of calcification) and in habit.

CATALOGUE

OF THE

LIBRARY OF THE LINNEAN SOCIETY.

Continued from page 527 of Vol. XIX. of the Society's Transactions.

N.B. To Books which are Continuations of Works included in any of the former Parts of the Catalogue, the original Numbers are here affixed; and the other Books are numbered in regular progression.

2755. Adams (A.) Ed.—Zoology of the Voyage of H.M.S. Samarang, under the command of Capt. Sir E. Belcher, C.B., F.R.A.S. and G.S., no. 1. London, 1848, 4to.

2756. Adams (C. B.) First and Second Annual Reports on the Geology of the State of Vermont. Burlington, 1845—6, 8vo.

2757. Allison (J. J.) Observations relative to Lymphatic Hearts. Philadelphia, 1838, 8vo.

2758. Ansted (D. T.) Geology, introductory, descriptive and practical, 2 vols. London, 1844, 8vo.

2759. ———— The Geologist's Text-Book. *Ib.* 1845, 12mo.

2760. ———— Geology as a branch of Education. *Ib.* 1845, 8vo.

2761. ———— On the methods of working and ventilating the Coal-Mines of the North of England, with reference to the accidents that occur in such Mines from the explosion of Fire-Damp. *Ib.* 1846, 8vo.

2762. ———— Facts and Suggestions concerning the Economic Geology of India. 1. Coal-Fields of India. 1846, 8vo.

2763. ———— The Ancient World, or Picturesque Sketches of Creation. London, 1847, 12mo.

2764. Avé-Lallemant (J. E. L.) Tulbaghiæ species quæ hucusque innotuerunt (lu le 19 Avril, 1844). 8vo.

2765. Babington (C. C.) Synopsis of the British Rubi. London, 1846, 8vo.

2766. Barlow (T. W.) The Field-Naturalist's Note-Book. London, 12mo.

2767. Barnéoud (F. M.) Mémoire sur le Développement de l'Ovule, de l'Embryon, et des Corolles anomales, dans les Renonculacées et les Violacées. (*Extr. des Ann. des Sciences Naturelles, Nov.* 1846.) 8vo.

2768. Barratt (J.) Geology of Middletown and vicinity. Middletown, Connecticut, 1846, half-sheet.

2769. Bellardi (L.) Monografia delle Pleurotome fossili del Piemonte. Torino, 1847, 4to.

1982. Bentham (G.) Plantæ Hartwegianæ, pp. 153—284. Londini, 1840—46, 8vo.

1647. Bertoloni (A.) Flora Italica, vol. 5. fasc. 2—5; and vol. 6. fasc. 1—4. Bononiæ, 1842, 8vo.

2385. ———— Miscellanea Botanica, nos. 2—5. *Ib.* 1843—6, 8vo.

2770. Bertoloni (J.) De Botyde Silaceali deque Damno quo afficit Cannabim sativam, *L.* Bononiæ, 1842, 4to.

2771. ———— De duobus Insectis Ulmo campestri et Pyro Malo infensis. *Ib.* 1844, 4to.

2772. Berzelius (J.) Årsberättelse om Framstegen i Kemi och Mineralogi. Stockholm, 1844—6, 8vo.

2773. Biasoletto (B.) Viaggio di S. M. Federico Augusto, Re di Sassonia, per l' Istria, &c. Trieste, 1841, 8vo.

2774. ———— Escursioni botaniche sullo Schneeberg (Monte Nevoso) nella Carniola. *Ib.* 1846, 8vo.

2775. Bojer (W.) Planches relatives au genre *Gærtnera.* 1847, 4to.

2776. Bonaparte (C. L.) Catalogo metodico dei Mammiferi Europei. Milano, 1845, 4to.

2777. ———— Catalogo metodico dei Cyprini d' Europa, e Rilievi sul vol. 17 dell' Istoria naturale dei Pesci del Sig. Valenciennes. *Ib.* 1845, 4to.

2778. ———— Specchio generale dei Sistemi erpetologico, anfibiologico, ed ittiologico. *Ib.* 1845, 4to.

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2780. Botto (G. D.) Catechismo Agrologico: ossia Principii di Scienza applicata all' Agricoltura. Torino, 1846, 8vo.

2781. Bouton (L.) Travaux de la Société d'Histoire naturelle de l'Ile Maurice, du 6 Octobre 1842 au 24 Août 1846. Maurice, 1846, 4to.

2782. Braim (T. H.) History of New South Wales, from its settlement to the close of the year 1844, 2 vols. London, 1846, 8vo.

2783. Brandt (J. F.) Fuligula (Lampronetta) Fischeri, nova Avium Rossicarum species. Petropoli (1847), 4to.

2784. Brightwell (T.) Sketch of a Fauna Infusoria for East Norfolk. Norwich, 1848, 8vo.

2785. Burmeister (H.) Beiträge zur nähern Kenntniss der Gattung *Tarsius.* Berlin, 1846, 4to.

2407. ———— Handbuch der Entomologie, 5ter band. Berlin, 1847, 8vo.

2786. Cantor (T.) Catalogue of Mammalia inhabiting the Malayan Peninsula and Islands. Calcutta, 1846, 8vo.

2787. ———— Catalogue of Reptiles inhabiting the Malayan Peninsula and Islands. *Ib.* 1847, 8vo.

2788. Charlesworth (E.) Ed.—London Geological Journal, nos. 1—3. London, 1846—7, 8vo.

2789. Clark (J. D.) Address delivered at the Anniversary Meeting of the Berwickshire Naturalists' Club on the 3rd of September 1845. 8vo.

2790. Clarke (H. G. C.) Address to the Members of the Berwickshire Naturalists' Club, read at the Anniversary Meeting held at Alnwick September 22nd, 1847. 8vo.

2416. Cosson (E.) & Germain (E.) Flore descriptive et analytique des Environs de Paris, partie 2. Paris, 1845, 12mo.

—— ———————— Atlas. *Ib.* 1845, 12mo.

2791. Couch (J.) Illustrations of Instinct, deduced from the Habits of British Animals. London, 1847, 8vo.

1158. Curtis (W.) Botanical Magazine, *Third Series*, by Sir W. J. Hooker, vols. 1—3. London, 1845—7, 8vo.

1407. Cuvier (G.) & Valenciennes (A.) Histoire naturelle des Poissons, tomes 18—20. Paris, 1846—7, 8vo.

2427. Dahlbom (A. G.) Hymenoptera Europæa præcipue borealia. Lund, 1844—5, 8vo.

2792. Dana (J. D.) On certain Laws of Cohesive Attraction. (*From Amer. Journ. Sci., 2nd Series, vol.* 4.) 1847, 8vo.

2793. ———— Conspectus Crustaceorum, in Orbis Terrarum circumnavigatione, Carolo Wilkes duce, collectorum. Cantabrigiæ, 1847, 8vo.

2794. Daubeny (C.) Memoir on the Rotation of Crops, and on the quantity of inorganic matter extracted from the soil by various plants under different circumstances. London, 1845, 4to.

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