XIX. *Contributions to the Natural History of the Passifloraceæ.* By M. T. MASTERS,
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(Plates LXIV. & LXV.)

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IN studying the species of the order *Passifloraceæ* with the view of describing those members of the group which are natives either of tropical America or of tropical Africa, I have necessarily passed in review the great majority of the hitherto described forms. The technical descriptions of these species will be found in a future part of the 'Flora Brasiliensis' (inaugurated by the late Von Martius, and continued under the superintendence of Dr. Eichler), and in the second volume of the 'Flora of Tropical Africa' (drawn up by my friend Professor Oliver)*.

In this place I propose, with the permission of the Society, to place on record some remarks of a general character, which may serve to illustrate the natural history of the group. In order the better to illustrate the morphology and affinities of the group, I take the order *Passifloraceæ* as it stands in Bentham and Hooker's 'Genera Plantarum'†, though, for reasons hereafter to be assigned, I should prefer to remove the tribes *Modeceæ*, *Achariæ*, and *Papayaceæ* from *Passifloraceæ* proper.

My remarks have reference to the outward conformation, the internal structure, the mode of development, and the physiological history of certain selected representatives of the order in question. In commenting on the affinities of the group, I shall introduce some general considerations on the nature and value of the evidence upon which species, genera, orders, &c. are founded and arranged. I also subjoin a list of the species of *Passifloraceæ* proper, together with some remarks on their geographical distribution. Owing to the kindness of my friends and fellow workers I have been enabled to examine all the specimens of the order *Passifloraceæ* belonging to the collections at Kew, the British Museum, to the herbaria of Munich, Berlin, and Paris, those contained in the herbaria of the late Von Martius, as well as in many collections of less magnitude. Moreover

* Both these works are passing through the press (May 1871).

† Vol. i. p. 808.

I have availed myself of every opportunity of examining fresh specimens that has presented itself; and for this privilege I have specially to thank the Director and Curator of the Royal Gardens at Kew, as well as a large number of friends and correspondents who have from time to time furnished me with specimens for examination.

ORGANOGRAPHY.

Root.—The root offers few characters worthy of special comment, and, moreover, it is rarely or never seen in herbarium-specimens. It is probably very uniformly fibrous throughout the group, though in some cases, as in *Passiflora quadrangularis* and *Machadoa*, it is said to be tuberous*. Whether these tubers are truly root-formations or subterranean forms of stem I have had no means of ascertaining.

Stem.—We are so apt to consider a climbing-habit a necessary feature in all Passion-flowers, that it seems strange at first to find that at least half the genera of the order consist of erect herbs or shrubs destitute of tendrils. Even in the genus *Passiflora* itself certain of the species are trees with no indication of a climbing-habit. The minor characters afforded by the form and superficial peculiarities of the stem and branches afford, in some instances, useful marks whereby to discriminate species.

Leaves.—The leaves in this order are arranged alternately, and in $\frac{2}{5}$ order; they present great variations in form and size. Almost every conceivable form of simple, lobed, and divided leaves may be met with; but true compound leaves are confined to the genus *Deidamia*, of which I have seen no representative. Some of the species of *Passiflora* are distinguished by the presence of leaves of very unusual form such as:—the transversely elliptical leaf of *P. coriacea*, Juss.; the lunate leaves of *P. lunata*, Sm.; the wedge-shaped or semicircular leaves of *P. Vespertilio* L.; and the singular two-lobed leaf of *P. perfoliata*, resembling in some degree the head of a slug—the two diverging lobes representing the tentacles, the small intermediate process corresponding to the head of the creature, whence Bory de St. Vincent's name of *Cephaleima*.

Most of these peculiar forms are consequent upon the arrested growth of the central lobe, or on the disproportionate development of the two lateral ones.

P. Berteriana has a much divided leaf, not unlike that of a *Thalictrum*; other species have pedate leaves, like those of *Helleborus* or *Arum Dracuncululus*. Some of the species of *Passiflora* exhibit leaves of various forms on the same plant at the same time—a circumstance that has given rise to the establishment of several untenable species.

The absence or presence of glands is a character of some importance in distinguishing species of *Passiflora*. When present they are almost always sessile, orbicular, and situated on the under surface, often in the angle between the divergent nerves; very frequently they are scattered irregularly over the lamina, as in the species "*foliis ocellatis*."

The nervation of the leaf is unicostate or palmicostate; in the latter case the number and size of the diverging costæ correspond to that of the lobes; if the latter are of about equal size, the nerves are equal likewise; if the central lobe is the largest, the corresponding nerve has the preeminence over the lateral ones, while in the bilobed leaves, where the central lobe is rudimentary or altogether wanting, the two lateral nerves are

* Young plants of *P. quadrangularis* do not show this form of root.

larger than the central one. Frequently the nerves project beyond the margin of the leaf in the form of a small mucro.

The variations in the colour of the leaf afford useful characters as well as add considerably to the beauty of the plant in special instances. The diversities in amount and quality of pubescence are of little value for specific purposes, though it may be incidentally remarked that stellate pubescence is very rare in the order, nor is it at all customary to meet with the very shaggy investment we sometimes find in other plants, though a covering of glandular hairs is characteristic of certain species, *e. g.* *Passiflora fetida*.

Petiole.—The leaves of this order are usually stalked, the stalk itself generally presenting one feature which, though not absolutely peculiar to the order, is nevertheless very characteristic of it—the presence of glands. These glands present sundry diversities: in some species they are sessile, in others they are stipitate, disposed with tolerable regularity or, in other instances, irregularly scattered; small in some species, in others they attain to considerable dimensions. That they are true glandular organs in some species is evident from their secretion and from their internal structure, while their morphological nature is elucidated by a study of their development, and by various species of *Tacsonia*, in which the glands appear as so many miniature leaf-lobes emerging from either side of the petiole towards the upper surface.

In some species the glands are represented by small thread-like processes, as in *P. ligularis*. The petiolar glands in their typical state are therefore laminar processes, structurally adapted for the purpose of secretion. In other instances they do not appear to secrete and are then present in the form of small leaf-lobes or of thread-like processes. The study of their development shows not only that they are relatively larger in the juvenile stage, but that their functions are more actively carried on at that time than subsequently. Too much stress must not be laid on their number or their position. Thus in *P. edulis* and other species the petiolar glands are at the very apex of the stalk in young leaves, while in adult ones they are nearly $\frac{1}{4}$ of an inch below it. The number, too, is confessedly variable, even on the same plant.

Stipules.—The existence of these organs is universal in the order. Varying much in size and external configuration, and to a less degree in internal structure, they often afford useful means of discrimination between one species and another. In some cases they are small linear threads, as insignificant in appearance as purposeless in action. In other cases they are large, and by their size and structure are enabled to fulfil the double purpose of protection to the young leaf and of respiration. In form they vary considerably in different species, and thus afford useful means of discrimination. Whatever form they assume, they are very generally more or less inequilateral, the obliquity resulting from the impeded development of that side of the stipule nearest to the stem, the larger portion of the stipule being always furthest away from the supporting axis. The venation of the stipules is either multicostate or unicostate; in the former case the nerves always converge to the apex, in the latter instance the midrib frequently extends beyond the margin in the form of a mucro. In both the smaller veins break up into an intricate network. The difference in the venation points to a different morphological

nature; the multicostate stipules represent probably the sheath of the leaf, the unicostate stipules correspond to the laminar portions.

Shoots.—In those instances where a leaf-bud and an inflorescence or tendril emerge from the same axil, will be found that the leaf-shoot arises from the axis in a line with, but above the tendril and flower-stalk.

Inflorescence. Tendrils.—Speaking in general terms, the inflorescence may be called mixed. It pertains to the indefinite type as far as the axillary position of the main flower-stalk is concerned; but as regards the disposition and arrangement of the secondary flower-stalks the inflorescence is cymose or definite, as is obvious in the species with many-flowered inflorescence. The peculiarities of form, relative size, &c. of the flower-stalk afford occasionally useful points of distinction between one species and another*.

The inflorescence of a new species of *Barteria* (*B. fistulosa*, Mast.) is so peculiar that it is necessary to allude to it in this place. In this plant the flowers are sessile, or on very short, scaly stalks, and densely packed in a single somewhat semilunar series in the axil of the leaf.

The tendrils are classed with the inflorescence because it is obvious from their axillary position, structure, and specially their mode of development, that they are to be regarded as flowerless subdivisions of the peduncle. They are simple or branched; and in some cases, as in *Modecca*, they bear flowers. In *Passiflora holosericea* the main peduncle sometimes terminates in a flowerless tendril, while the lower branches of the cyme bear flowers.

Bracts.—The existence of three bracts on the flower-stalk below the flower, is almost constant throughout the order. They may be very small, or so large as entirely to conceal the flower. They may be entire or excessively divided, as in *Passiflora*, § *Dysosmia*. Usually sessile, in *P. picturata* they are stalked. In most points they correspond to the stipules; but there are certain points with reference to them which call for notice, such as, for instance, their number (almost invariably three), their position (usually approximate to each other, and not far removed from the base of the flower, so close, indeed, as to constitute an involucre or epicalyx); but in some species, especially when the bracts are minute, they are comparatively widely separate from each other and from the base of the flower.

In *Passiflora silvestris*, and also in *P. tetraden*, the bracts are remarkable for their irregularity of size and their remoteness one from the other. In some cases the bracts remain 'coherent' to a greater or less extent, the apparent cohesion being the result of imperfect separation. Of the three bracts the lowest is placed somewhat laterally as regards the main axis, but anteriorly as regards the tendril, and the remaining two antero-laterally. The inferences to be derived from this arrangement will be stated hereafter.

Flower-tube.—This term is here used as one to the employment of which no morphological objection can be raised. By most writers it is described as the calyx-tube; but this term, I believe, conveys a wrong impression as to the real nature of the organ in

* Cf. Wydler, Berner naturwiss. Mittheil. June 1852.

question. Others might possibly object to the term "receptacular tube," a denomination which appears to the writer to be correct, from the conformation, structure, and mode of development, as well as from the consideration of the nature and number of the parts that are attached to, or rather which emerge from it. These are points which will receive further comment under other headings. Looked at as a means of discriminating species, the flower-tube presents valuable 'characters.' Its form, consistence, and size are all subject to variation in different species: thus it is flat and saucer-shaped, or bell-shaped, or tubular, or funnel-shaped, and so on; thin and membranous, or thick and fleshy; sometimes rounded at the base, in other species umbilicate, from the excessive growth of some portions as contrasted with others. The phrase so often made use of in describing these plants (*tubus basi intrusus*) must be taken conventionally, and not literally.

Calyx-lobes. Sepals.—These are usually five in number, quincuncially imbricated in the bud, and so placed that two are anterior or nearly so in relation to the axis that bears them, two lateral, and one posterior. They are almost invariably vaginal in their venation (multicostate, convergent); but not unfrequently they present a trace of a petiole, in the shape of a small horn-like projection from the upper end of the dorsal surface, just below the apex. They are often thick in substance, except at the margins, which frequently retain the traces of the overlapping that occurs in the bud in their thinner texture and petaloid coloration; thus the two sepals that are overlapped on both sides by the edges of the adjoining sepals have their margins thin and petaloid, while those sepals which are only overlapped on one edge have one thin margin only.

Corolla.—The petals are occasionally wanting, but more generally they are present, and originate, with the sepals, from the upper edge of the flower-tube, within and alternately with the calyx-lobes. In the bud they are quincuncially imbricated, one of the petals being completely external, one completely internal, and the remainder partly external, partly internal. They are usually multicostate; but in *Paropsia* each petal has a single costa.

The petals are usually equal in size and regular in form; but in a genus (*Atheranthera*) of which a description and illustrations will be found further on, and of which only male flowers exist in Dr. Welwitsch's collection of Angola plants, the five petals are unequal in size, quincuncially imbricated, the two innermost much larger and more concave than the rest. This inequality of size is probably not congenital, but manifests itself during development. As a consequence, some of the sepals are more widely separated one from another than the rest.

The calyx and corolla of *Ceratiosicyos* and *Acharia* require passing notice, as they have been differently described by different authors. In *Ceratiosicyos* the five sepals are spreading, linear, much shorter than the corolla, to the base of which they are adherent. The corolla is somewhat bell-shaped, and consists of five united petals. In *Acharia* there are four distinct, ovate, leafy sepals, free from adhesion to the corolla, which latter is bell-shaped and gamopetalous. If the female flower of *Acharia* be examined first, or to the exclusion of the male, which is rarer in herbaria, the presence of four small glands, opposite to the lobes of the inner bell-shaped part of the flower, is liable to lead the

observer to conclude that the bell-shaped organ is a calyx, the outer segments being in that case referable to bracts; but in the male flower, where the perianthial whorls have the same form as in the female flower, the fertile stamens are alternate with the lobes of the corolla, and the glands are opposite to them, showing that the glands are to be regarded as the representatives of a second row of stamens.

In *Ceratiosicyos* there are five awl-shaped staminodes in the situation of the tubercles of *Acharia*, the five fertile stamens being alternate with the petals. On the whole, then, the evidence is in favour of considering the outer envelope in these two genera a calyx, the inner a corolla, though the latter is gamopetalous, an exceptional feature in the order, but one shared by the male flowers of the *Papayaceæ*.

A. L. de Jussieu, who was the first to propose the establishment of *Passifloreæ* as a separate order, held the opinion that true Passion-flowers (*Passiflora*) had no true petals, but rather a double calycine whorl, the inner segments of which are petaloid. He based his opinion on the circumstance that the sepals and petals are confounded at the base, that they wither together, and are not separated one from the other*. But this opinion is quite opposed to the analogy with other genera described since the time of Jussieu, and is also not in accordance with organogeny, which shows that the sepals are developed successively, while all five petals appear simultaneously after the production of the sepals. Nevertheless there are some species of *Passiflora* (tribe *Cieca*), in which the petals are constantly suppressed, as also in the genus *Tryphostemma*.

Corona.—Under this general head is included all that series of rings, scales, or threads intervening between the petals and the stamens. From their almost universal presence in the species of the order, their variety of form, and the part they play in the physiological functions of the flower, considerable interest attaches to them. Sometimes there is but one ring; at other times there are a great number, lining the whole of the interior of the flower-tube. The corona is met with in greatest complexity in some species of Passion-flower, and in the greatest simplicity in *Malesherbiæ*. It may therefore be of interest to trace the gradual advances in complexity in the various genera, beginning with those in which the structure is simplest, and passing on to those in which it is most complex.

In *Malesherbiæ* the corona exists as a thickened rim or, at most, as a series of tubercles projecting from the margin of the tube. In some species of *Gynopleura* there is a similar coronal rim, but of somewhat larger size, and partly deflexed. In *Smeathmannia* the corona is but little more developed than it is in *Malesherbiæ*. In *Paropsia* the corona also consists of a single ring, emerging from the throat of the flower-tube (here very short), and divided into a number of ciliated laciniae. In *Crossostemma* the corona consists of a single row of threads, encircling the base of the staminal tube. In *Tacsonia* the corona is for the most part twofold, consisting of an upper series of tubercles or threads emerging from the mouth of the tube, and of a lower membranous outgrowth projecting from near the base of the tube, and usually bent downwards and inwards. In *Barteria* the corona is also twofold, the two series being near together; the outermost is membranous, the inner one tubercular. In *Tryphostemma* and *Basa-*

* Juss. Ann. Mus. Hist. Nat. vi. p. 100. Jussieu's views were supported by St.-Hilaire in Mem. Mus. v. p. 304.

nanthe the corona is similarly arranged in two rows: the outer one is in the form of a membranous tube or sheath, surmounted by long threads; the inner one is also membranous, but shorter and entire at the top. To the inner surface of this second corona the five stamens are congenitally adherent, or, more correctly speaking, not separate from it.

In the genus *Passiflora* the form and arrangement of the rings of the corona vary in the different subgenera, and may, indeed, sometimes be used to distinguish species from each other. In *Passiflora bilobata*, Juss., the flower is described as destitute of corona, on which account it was made the type of a genus *Astephananthes* by Bory de St.-Vincent. Mr. Sowerby, in the second volume of the 'Transactions of the Linnean Society'*, has given accurate figures and descriptions of the arrangement of the corona in several species of the genus. In *Passiflora quadrangularis*, in which the coronal filaments are in greatest abundance, he describes the following series, going from above downwards, or from without inwards:—1, perfect rays, consisting of two or three rows of distinct threads; 2, imperfect rays, consisting of a variable number of short and, as it were, imperfect or rudimentary threads; 3, a membranous ring, the "false operculum" found in *P. quadrangularis*, and in one or two other species only; 4, a membranous sheath called the "operculum," which shuts off the nectary proper from the upper part of the flower-tube, and below which is sometimes to be seen, 5, a thickened rim projecting from the side of the nectary, and partially dividing it into two compartments, an upper and a lower; lastly, at the base of the gynophore is often to be seen, 6, a shallow membranous or thickened cup.

Such an arrangement as that just mentioned pertains especially, with certain variations in individual species, to the subgenus *Granadilla*. It may be remarked that the several rows are often closely approximate, so that almost the whole inner surface of the flower-tube is lined with these outgrowths.

In the other subgenera the number and arrangement of the parts of the corona are different. Mr. Sowerby's divisions are strictly accurate in the case of the species mentioned by him, and apply very well to a large number of other species also; but, from the difficulty in some instances of ascertaining the exactly corresponding rows in different species, it is simpler to employ such terms as outer or inner, faucial, median or basilar, according to their position—or filamentous or membranous, according to the nature of the outgrowths in question.

In the subgenus *Astrophea* the corona consists of two or three rows of filaments springing from the upper portion of the tube; of these the uppermost or outermost are considerably the longest, and are usually more or less dilated and sickle-shaped at the extremity. The innermost corona, the "operculum," emerges from near the base of the tube, at some distance from the outer ring, and consists either of a membranous tube or of a row of short filaments; in the former case the membrane is often inflexed.

In the subgenus *Plectostemma*, Mast., including the sections *Cieca*, *Dysosmia*, *Polyanthea*, *Distemma*, and *Decaloba* of other writers, the flower-tube is usually short and saucer-shaped; the rings of the corona emerge from the mouth of the tube; the outer

* Trans. Linn. Soc. ii. p. 19, t. 3, 4, 5.

series are filamentous and widely spreading, while the inner row consists of a shallow folded membrane, the upper edge of which is often inflexed and crested or fimbriated. Within this is a small projecting rim, surrounding the base of the gynophore, and at some distance from it. In the subgenus *Murucuia* the membranous corona springs from the mouth or from the middle of the tube, and is either bent downwards or erect.

Although considerable differences in the form, position, and number of the coronal series exist in the genus *Passiflora*, it will be seen, from what has been before stated, that these characters are readily grouped under a few heads, such as:—the nature of the corona—filamentous, membranous, tubular, or annular; its position—faucial, median, and basilar, with regard to the flower-tube and its form. The form and position of the membranous corona or operculum is particularly worthy of notice. In one division of the genus it is flat, in another crumpled and folded; in the latter case it invariably arises from the throat of the flower-tube, while in those cases where it is flat it may proceed from the middle or from either extremity of the tube. It is important also to observe whether the membranous corona (the operculum of Sowerby) be erect or slightly inflexed, or whether it be decidedly deflexed. These points have been made by some writers the bases of distinct genera. I cannot, however, consider them of more than subgeneric importance; but, as will be seen in the remarks on the classification of the species of *Passiflora*, I attribute considerable importance to the short, crumpled, and often fringed corona, which characterizes a large proportion of the species*.

The most complicated arrangement of the corona is that which occurs in some species of *Modecca* ♀ e. g. *M. tamnifolia* (Pl. LXV. figs. 1–3). In this plant there are two sets of staminodes—an outer series, of five distinct liguliform capitate segments placed opposite to the sepals (figs. 2, 3c), and an inner series, of five subulate antherless filaments connected together at the base and also placed in front of the sepals (figs. 2, 3b). The corona is membranous, and springs from the tube of the flower at the same point as the petals. As seen in the mature flower, the corona is attached on either side of each petal, thus connecting these organs together, and sending processes inwards to each side of the inner staminodes, so as to form a series of closed pouches, enclosing the outer staminodes (figs. 2, 3f). The true nature of this extraordinary arrangement cannot be understood till fresh flowers have been examined in all stages of development. The illustrations on Plate LXV. show the arrangement of the corona and staminodes. The subulate inner staminodes are clearly the representatives of the perfect stamens in the male flowers; but the nature of the outer staminodes is not so clear. They may be seen also in the male flowers of some species in the same situation (superposed to the sepals), and are sometimes spoken of as “glands of the disk,” a convenient expression, as involving no definite assertion as to their real morphological nature. Something like the curious pouches of this *Modecca* may be seen in some species of *Eutoca*; but these are simpler.

Andræcium.—In the tribe *Passifloreæ*, as also in *Malesherbiæ*, the flowers are usually hermaphrodite. *Passiflora tetrandra*, however, a New-Zealand species, by some referred to a separate genus *Tetrapathæa*, has unisexual flowers; and the same separation of the

* Illustrations of most of the forms of the corona will be found in my monograph of the American *Passifloraceæ* in Von Martius and Eichler's ‘Flora Brasiliensis’.

sexes characterizes the tribes *Modeceæ*, *Achariæ*, and *Papayacæ*. When, by exception, in these last-named groups the flowers are bisexual, the stamens are perigynous, and not hypogynous as in true Passion-flowers.

The staminal whorl presents considerable diversities in different genera of the order. In the genus *Passiflora* itself the andrœcium becomes complicated by apparent adhesion to, *i. e.* imperfect separation from, the gynophore.

Taking the simplest case first, we have merely five stamens opposite to the sepals, inseparate to a slight extent at the base, and springing directly from the receptacle (hypogynous). Such a condition of things exists in the male flowers of *Ophiocaulon* and in the male flowers of *Passiflora tetrandra*, as well as in the hermaphrodite flowers of *P. multiflora*.

Usually the stamens, like the pistil, are, after a time, raised above their original level by the formation of a stalk or gynophore. In *Tryphostemma* the stamens spring from the inner surface of the inner corona, and are not raised upon a gynophore. The stamens in this case are rather perigynous than hypogynous. In *Crossostemma* the stamens are apparently ten in number, five fertile and five sterile. The filaments form at the base a cup, from the edge of which proceed the five anther-bearing filaments and five teeth (representing the sterile stamens). *Machadoa* has a similar arrangement. In *Barteria* there are very numerous stamens arising from the edge of a membranous tube also disconnected from the gynophore. *Smeathmannia* is chiefly remarkable, so far as its andrœcium is concerned, for the great number of its stamens. Probably these are true "compound stamens;" but this cannot be stated with certainty till their mode of development is known. The filaments are generally flat and ribbon-like; but in *Physena*, *Smeathmannia*, *Barteria*, *Basananthe*, and some others they are thread-like.

Throughout the order the anthers are bilocular: in most cases the filament is attached to the back of the anther; but in some of the genera, and especially in the tribe *Modecca*, the anthers are basifixed. The anthers of *Modecca* are remarkable for their linear form, and for their prolonged connective, which forms a long, slender mucro above the antherlobes. In *Atheranthera*, already referred to, the filaments are flat and ribbon-like, twisted on themselves at the top, so that the dorsifixed anthers, which were originally introrse, become extrorse by the curvature of the filaments. The anthers appear to be one-celled, and provided with a mucro continuous with the filament, and which may either represent an abortive half anther or stand in the place of the connective. In *Passiflora* and *Tacsonia* the anthers are versatile, and completely change their position as the flower is matured. Originally pressed up against the ovary, against which their face is applied, they ultimately turn in the reverse direction, so as to open extrorsely by two longitudinal clefts. This change in position is facilitated by the peculiar mode in which the filament is attached to the anther. The filament is flat, and traversed by a central nerve, which is prolonged beyond the rounded apex of the filament in such a way that the anther is attached by a fine thread only.

Gynœcium.—The most constant feature of the whole group is the possession of a superior or non-adherent one-celled ovary, with three or four parietal placentas, to which are attached in two or four longitudinal rows a number of horizontal anatropal

ovules. In the beginning the ovary is sessile; but in most of the genera of the order it becomes, after a time, stalked by the gradual elongation of the central portion of the receptacle, which pushes up not only the pistil, but also the stamens, and has hence received the name of gynandrophore, or gynophore. In *Passiflora multiflora* the ovary is sessile. The minor peculiarities of the ovary do not call for special comment.

The processes often met with in the lower part of the gynandrophore demand passing notice, inasmuch as they, in conjunction with one of the innermost rings of the corona (the operculum), frequently separate, as by a diaphragm, the true nectary, or honey-secreting surface of the flower-tube, from the upper portion.

The species included in the section *Granadilla* of the genus *Passiflora* are the most remarkable for these processes of the gynandrophore, which there form a kind of pulley-like projection, into the groove of which fits the lowest ring of the corona. In other species, as in *P. elliptica*, the same purpose seems fulfilled by a spindle-shaped dilatation in, or below, the centre of the stalk of the pistil, and which is covered with fine hairs.

The styles, usually three in number, project from the apex of the ovary; but in some of the *Passifloræ* (sect. *Astropheæ*) the ovary is somewhat cuboidal in outline, flattened at the top, and the styles project from the angles at the top of the ovary.

In *Malesherbiæ* the styles project from the dorsal surface of the ovary at some distance from the summit, and thus recall the corniculus or horn-like projection from the backs of the sepals.

The genus *Barteria* is remarkable for the connation of its styles, which thus form an undivided column surrounded by a large mushroom-shaped stigma. The stigmatic ends of the styles are usually large, more or less reniform or three-lobed.

The *fruit* is usually more or less baccate, but is in some genera capsular and dehiscent by three valves. No special comment appears necessary, except to point attention to the curious manner in which the capsule opens in the *Malesherbiæ*. In this suborder the seed-vessel splits septically into three valves, each valve bearing a style or a remnant of that organ at some distance below the summit of the dorsal surface. Ultimately the valves split at the top along the dorsal sutures, the separation extending as far as the base of the style. The result is that in the mature fruit there are three valves, each valve cleft at the summit, and bearing the persistent style in the central notch. At the base of the fruit or of its stipes are the persistent, withered remnants of the flower.

Ovules.—These are generally indefinite in number, horizontal, anatropal, and funiculate, with two coats and a central nucleus. The funicle is transversely articulated above the middle; and from the joint proceeds, subsequently to fertilization, an arillus, which forms a pulpy investment growing from below upwards till it covers the seed. The ovules are generally arranged in four, rarely in two or six, vertical ranks along the placentas.

Seeds.—The seeds are usually ovoid, obcordate, or heart-shaped, enclosed within the pulpy aril just mentioned. The testa is hard and bony, often more or less pitted. In the centre is a horny albumen surrounding a straight embryo, with flat leafy cotyledons, and whose radicle points towards the hilum.

GERMINATION.

A germinating embryo of *Passiflora* shows a conical radicle, a long cylindrical caulicle, a pair of opposite-stalked leafy cotyledons of oblong or suborbicular outline with three convergent primary ribs. The succeeding leaves are alternate, provided with stipules, and, in the species with lobed leaves, generally show indications of lobing from the first.

ORGANOGENY.

Development of the leaf and tendril &c.—In a very early stage of the development of the leaf in *Passiflora quadrangularis* may be seen on the side of the axis two small tubercles, one next the axis, slightly depressed at the summit—and close to it on the distal side another, similar prominence, which speedily becomes marked out into two lateral and an intermediate central tubercle: the two lateral projections are the nascent stipules; the central one is the beginning of the leaf; while the depression in the centre of the tubercle next to the axis indicates the subsequent separation of the tendril and the flower-stalk (Plate LXIV. fig. 1). The tendril, therefore, is unquestionably, in the beginning, a portion of the flower-stalk, as, indeed, is evident in many cases in the adult condition. The blade of the leaf, immediately subsequent to its initial stage, consists of a linear-oblong, blunt tubercle protruding from the axis by the side of the tendril (fig. 2); it speedily manifests a central groove on the side next to the tendril; this groove gradually extends (fig. 3) till the leaf assumes a conduplicate appearance. It is thus clear that the conduplicate arrangement is not, as the term would imply, the result of a folding process, but of a disproportionately rapid development of the margins or side portions of the leaf as contrasted with the central parts. It would appear as if the depression in this early stage of development had some reference to the tendril, which is partially concealed in the groove thus formed.

In the palmately divided leaves of *P. cærulea* the central leaflet is the first to appear, followed by the stipules, which latter, however, speedily overtake the leaf. The side-lobes of the leaf follow next in order from above downwards, and then the glands on the petiole. The glands on the leaf-stalk in this species are late in their development, while in *P. quadrangularis* they are early, the lower pair appearing first (fig. 6). The notches on the margin of the leaf precede the formation of the veins. Vascular tissue in the form of spiral vessels first shows itself in the midrib, and, as Griffith long since remarked, is not extended from the vessels of the stem. Indeed this independent formation of vascular tissue seems to be the general rule in all cases.

Development of the bracts.—The bracts in *P. quadrangularis* are three in number, and developed successively (fig. 7, *a, b, c*). The one first developed (fig. 7, *a*) is placed anteriorly as regards the tendril (fig. 7, *d*)—that is to say, somewhat laterally as regards the main axis; the two others are lateral in relation to the tendril. The relative position of the several parts of the flower will be more fully spoken of under another section.

Development of the flower.—In the earliest stage of development in a garden-variety of *P. quadrangularis* the flower consisted merely of a small subglobose tubercle (Plate LXIV. fig. 7, *e*) already encircled by the bracts. In the next stage examined by me,

three of the five sepals were already marked out (fig. 8). In a bud still further advanced all five sepals were observed surrounding a pentagonal disk (fig. 9); and it was further noticeable that the sheath or lower portion of the sepal was the part first protruded, and that the little corniculus on its dorsal surface near the apex was not formed till subsequently. The corniculus appears to be the analogue of the petiole. Payer states that two sepals are anterior or superposed to the primary bract (*i. e.* sepals 1 and 3, numbered in the order of their development), two lateral (4 and 5), while sepal no 2 is posterior; but I have reason for doubting if this is the exact order in all cases, as will be subsequently explained.

In a flower-bud still more fully developed the sepals were larger, but retained their inequality of size. At the angles of the central pentagon were now to be seen five small tubercles, all of the same size and simultaneously developed; these correspond to the five petals (fig. 10). These tubercles gradually exchange their globular form for an oblong flattened shape. In a bud in a more advanced state of development the sepals and petals had increased in size; and five staminal tubercles opposite to the sepals were visible, the central disk remaining as before, flat and pentagonal (fig. 11). Next in succession appear three small tubercles on the central disk; these represent the three styles or the upper portion of the carpels. They are at first perfectly separate one from the other, and leave between them in the centre a slight depression (fig. 12). As growth goes on, the three tubercles lengthen from below upwards; originally separate at the apex, disunion ceases after a little while, so that the carpels are congenitally inseparable below; while the upper edges, at first free, become confluent one with the other, so as ultimately to form a closed ovary, the styles remaining separate (fig. 13). Previously to the complete closure of the ovary, however, the ovules begin to make their appearance, as will be explained further on (fig. 16).

At this stage the anthers are fully sketched out, and even the filaments have made their appearance (fig. 14). Shortly after this the formation of the flower-tube, from the dilatation and gradual excavation of the thalamus below the sepals, becomes perceptible, and about the same time the corona also makes its appearance in the shape of a series of small tubercles protruding from the flower-tube immediately beneath the petals (fig. 15). The order of development of the succeeding rows of the corona seems, so far as I have ascertained, to be different in different species; thus, after the formation of the uppermost row of the corona in *P. quadrangularis* the median series or operculum is developed, and the intermediate rows subsequently. The urceolus or basilar corona at the base of the stamens is developed before the column or gynandrophore begins to lengthen. This latter organ, the stalk of the stamens and of the pistil, is the last of the floral organs to appear (fig. 18).

Ovules.—The ovules present themselves in the first instance as small conical papillæ projecting from the placenta (fig. 19); these speedily become invested, from below upwards, by a cellular tube, the secundine. As this tube grows, the primary nucleus becomes curved. After a little time a second envelope, the primine, is formed, so that the fully formed ovule is anatropal and invested by two coatings (figs. 20, 21). The arillus which surrounds the ripe seeds is not fully developed till after the fertilization of the ovule; but

even before that process occurs a small projection from the funicle at the joint may be seen near the inverted apex of the ovule (fig. 22). This gradually enlarges after the fertilization of the ovule, so as to enclose the seed in a membranous sheath, at first open at the top (figs. 23, 24), but ultimately closed (fig. 26). The pulpy matter intervening between the aril and the seed consists of large cells formed apparently from the inner surface of the aril.

It will thus be seen that my observations, so far as they go, are in accordance in all material points with those of Griffith* and Payer† as regards the development of the parts of the flower, and with those of Planchon on the arillus‡. With Schleiden's account of the development of the flower my observations agree in all points save the formation of the ovary. Schleiden§ describes and figures the commencement of the ovary in the form of a central depression or cavity in the axis, from the sides of which afterwards proceed the three tubercles which form the carpels. "In the centre," says Schleiden, "the axis is conspicuous as the germen (*cauligenum*), with a cavity, but as yet no trace of a style (carpellary leaf);" and again, "Three carpellary leaves are seen at the edges of the germen;" and at p. 370, "In *Passiflora* the superior germen arises from a cup-shaped axis, at whose edges the carpels arise, which form styles and stigmas." From this it will be seen that Schleiden evidently considered that the axis itself entered directly into the composition of the ovary. But, in all the buds of various species that I have examined with reference to this special point (and these have not been few), I have not been able to satisfy myself that any depression in the central disk of the flower takes place prior to the appearance of the three carpellary tubercles. In by far the great majority of cases the central disk remains in the form of a flattened or raised cushion-like mass until after the development of the three carpellary tubercles; and as these grow comparatively rapidly, while the central axis no longer developes, a central depression is very speedily produced.

But here arises a nice point. It has been previously stated that the carpels, originally separate, are afterwards seen to be united together at the base; and what we have now to determine is, whether this tubular portion at the base of the carpels is to be regarded as truly consisting of the inseparate bases of the carpels, or whether it is a process of the axis like the flower-tube. I do not think that organogeny *per se* is sufficient to decide this question; but, as a matter of opinion, I should, if it be considered necessary to adhere uncompromisingly to the alleged distinctions between axis and leaf-organ, regard the tubular structure just alluded to as foliar rather than axial; while, if foliar, it is the sheath of the leaf to which it must be compared; and between the sheath of the leaf and an axial structure the difference is very small. As in so many similar instances, this question seems to be very much a question of words; for who shall tell where axis ends and foliar organ begins? Holding, as I do, that there is no absolute fundamental difference between axial and foliar organs, and that those divergences which ultimately present themselves between the two sets of organs are secondary modifications or adap-

* Griffith, Notulæ, Part i. 1847, tab. 2.

† Payer, Organogénie, p. 396, t. 86, 87.

‡ Planchon, Ann. Sc. Nat. 3 ser. vol. iii. 1845, p. 275.

§ 'Principles of Scientific Botany,' Lankester's Translation, p. 597, tab. 4 et 5. figs. 6-8.

tations for the fulfilment of particular purposes, it seems to me a matter of very little consequence to determine in these transitional stages precisely where the line should be drawn between leaf-organ and axial organ.

Summary.—Recapitulating the main facts which the study of development brings to light, and noting the inferences that may be drawn from these facts, I may state briefly that the development of the leaves in *Passiflora* is basipetal, while that of the sepals, petals, and stamens is basifugal. The carpels, on the other hand, are basipetal in their mode of development.

In the mature flower the sepals and petals are imbricate in æstivation, although in the first instance both are valvate. It might be surmised that the imbrication of the sepals would result from the successive development of those organs; but the petals, which are equally imbricate in the bud, are developed simultaneously. The imbrication, then, of these organs is a secondary operation in point of time, and, however important as a means of discrimination for classificatory purposes, does not seem to have any special morphological significance beyond ensuring economy of space.

It has already been shown that the so-called 'conduplicate' arrangement of the leaf is due to increased development at the margins as contrasted with the central portions of the leaf.

The tube of the flower is an expansion of the receptacle formed after the foundations of the flower are laid. The corona also is a late formation, its constituent filaments or membranes emerging from the inner side of the flower-tube at a late period of the formation of the flower, and being referable neither to the petals nor to the stamens. The corona, then, is an organ *sui generis*, developed, as it would seem, for the fulfilment of a special purpose, as will be hereafter shown. As to the nature of the corona, it is important to quote here Griffith's significant words*. Alluding to the conflicting opinions as to the morphological nature of this series of organs, and to the notions held by Lindley†, who considered the coronal filaments to be rather of petaloid than of staminal nature, because the normal metamorphosis of the flower is centripetal, Griffith remarks, "Observation, which does not rely on making lucky conjectures, and which argues from things seen by the eye, not from things imagined (seen by the mind), proves that they are neither the one nor the other."

The gynophore, as before stated, is a secondary production, formed by the elongation of the thalamus subsequent to the formation of the other portions of the flower.

The only other point in the development that it seems worth while again to allude to is the dichotomy of that axillary tubercle which ultimately forms on the one side a tendril, on the other a peduncle. The branching here, as might have been anticipated, is not due to the formation of a new growing point or bud, but to a dichotomy or subdivision of the primary tubercle.

TERATOLOGY.

Several cases of deviation from the ordinary structure have come under my observation in certain species of *Tacsonia* and *Passiflora*. To some of these it may be interesting to refer. In a flower of the garden hybrid $\times P. Belottii$ there were six sepals, six petals, six

* *L. c.*

† Veg. Kingdom, p. 333.

stamens, and a one-celled ovary with three styles. To what cause this augmentation was due, whether to an absolute development of six tubercles instead of five, or to a subdivision of one into two, I had no opportunity of ascertaining.

A transition from the verticillate to the spiral arrangement was seen in a flower of *P. alata*; or, rather, it may be said that the distance between the sepals was greater than it usually is. Thus, of the five sepals two were smaller, and on a lower level than the remaining three. The petals of this flower were six in number, four free, two united the one to the other. Considering the successive manner in which the sepals are developed under ordinary circumstances, it may be held that the unusual interspace between them was occasioned by an excess of development in the receptacle of the flower, which lengthened more than usual during the development of the sepals. On the other hand, the sepals themselves, from their smaller size, seem to have experienced an arrest of development. The sixth petal, from its position between two other petals, and in front of a sepal, may be considered the sole member of a second row of petals.

In *Passiflora Raddiana* (*kermesina* of gardens) I have now frequently seen all the flowers on the plant presenting adventitious growths between the stamens and the ovary. The growths in question were like the filaments of the ordinary corona, and apparently emerged from the stalk of the ovary immediately above the spot whence the filaments separate from it, and as it were in the axils of the filaments, superposed to them in fact.

In the Kew Museum is preserved a similar specimen from the same plant; but in this instance some of the adventitious filaments bear an anther. Have we here a tendency to manifest the same polyandrous condition that is found in *Smeathmania* &c? Karsten founded a new genus (*Poggendorffia*) upon a similar adventitious production of thread-like growths above the ordinary stamens*.

In a garden-variety of Passion-flower, $\times P. hybrida floribunda$, I have met with the same malformation; and in other flowers of the same variety I have observed the connective of the anther to be prolonged into a crest as in *Violaceæ*. We can hardly lay much stress on an accidental case like this as an evidence of affinity between the two orders; nevertheless it at least adds to the acknowledged marks of relationship between the two.

To Mr. Miers I am indebted for a drawing of the fruit of *Passiflora quadrangularis*, wherein small flower-buds were found springing from the placentas intermixed with the seeds. These flowers were monstrous in character. A similar production of flowers within the fruit occurs occasionally in Crucifers†, and has been also previously recorded in *Passiflora*.

But the most remarkable deviation is that described in the Transactions of this Society by Mr. S. J. A. Salter, in which the ovules of a species of *Passiflora* were found to contain pollen‡.

* Karsten, Flor. Columb. Spec. Select. i. t. 15. f. 29.

† Masters, Vegetable Teratology, p. 137; Bernouilli, Bot. Zeit. 1869, p. 19, durchwachsene Frucht von *Passiflora*.

‡ Trans. Linn. Soc. xxiv. 143, t. 24. See also 'Vegetable Teratology,' p. 185, f. 99; and Seemann's Journ. Bot. 1867, t. 72, for a similar instance in *Rosa*.

MORPHOLOGY OF PASSIFLORA.

Having briefly adverted to the conformation of the flower in the several genera of the order and traced its mode of evolution in *Passiflora*, I am now in a position to offer some remarks on the morphology of *Passiflora* itself, taking that genus as the most complex one of the order. In a flower of the section *Granadilla*, where the bracts are well developed and approximate to the flower, there are three bracts formed successively, five sepals also formed successively, five petals formed simultaneously, alternating with the sepals and with them raised upwards on the edge of a tube, which is not developed until the other parts of the flower are well developed, and which is therefore to be considered a tubular prolongation of the thalamus or receptacle. Alternating with the petals are five stamens, formed simultaneously and strictly hypogynous. Three carpels constitute the pistil, which is at first sessile, but which afterwards becomes raised by the elongation of the central portion of the receptacle; the latter in its upward course bears not only the pistil but the stamens also. The various rings of the corona are not developed till after the formation of the other parts of the flower; and the date of their evolution corresponds with that of the receptacular tube, thus preceding that of the gynophore.

The three bracts in the unopened flower-bud are imbricated, one bract overlapping the other two. The sepals and petals are quincuncially imbricate, the stamens valvate and appressed against the pistil. The three carpels are also valvate, so that they form a one-celled pistil with three parietal placentas.

The position of the parts of the flower, in relation to the axis and to the floral leaf, in the axil of which the flower originates, remains to be considered; and as I have been led from my observations to form slightly different conclusions on this matter from those of Payer and others, it becomes necessary to explain in what way my interpretation differs from that of other botanists, and to suggest the probable cause of the slight divergence of opinion. The flower-stalk of a Passion-flower is formed in the axil of a leaf; and it has already been seen that the tendril is merely a flowerless branch originating from the same growing point as the peduncle. Between the leaf, then, anteriorly and the main axis posteriorly is the flower-bud, enveloped in its three bracts; and by the side of the bud is the tendril. In the early stages of the flower-bud the two stipules belonging to the leaf are relatively very large. In point of time of development they are far in advance of the leaf; and they are placed, not anteriorly like the leaf or leaf-stalk of which they are integral portions, but laterally; they are thus placed with their edges fore and aft, as regards the axis, and shut in the flower-bud and the tendril on the sides. In this early stage, then, the flower-bud and tendril are completely enclosed in a kind of case formed anteriorly by the leaf, laterally by the stipules, and posteriorly by the axis. Bearing in mind this arrangement of the parts in the axil of the leaf, the position of the bracts, sepals, &c. with regard to the anterior or posterior part of the flower may be readily understood.

Payer and most authors state that the odd bract is anterior, the two others lateral, as regards the main axis. I believe this to be an error, and consider the bracts to be placed laterally, as regards the axis—two on the side adjacent to the tendril (which fits into the

interspace between them), and one on the other side. One of the bracts might more correctly be described as antero-lateral rather than as strictly lateral; and its fellow on the same side is also slightly posterior as well as lateral.

The sepals are, as above stated, formed successively and in quincuncial order. The relative position of the sepals may be understood by numbering them and arranging the numbers in the order in which the sepals are placed, thus:—1, 3, 5, 2, 4. From this it may be seen that the sepal (3) which is third in the order of development, is placed in the cycle between that which is first developed (1) and that which is last formed (5), and so on. Payer and most authors state that sepals 1 and 3 are placed in front of the bract, which they consider anterior—in other words, that there are two anterior or antero-lateral sepals (1 and 3), one posterior (2), while sepals 4 and 5 are lateral or postero-lateral. According to my observations, sepal No. 1 is placed a little to the side of one of the bracts, sepal 3 is nearly anterior, sepals 4 and 2 postero-lateral, and sepal 5 lateral and nearly opposite to 1. The position of the several parts of the flower is shown in the accompanying illustrations.

Diagrams showing the arrangement of the parts of the flower: that to the left hand of the reader is after Payer; that to the right shows the arrangement as understood by the author: *st* are stipules, *br* bracts; the sepals are numbered 1–5, according to the order in which they are developed. The petals alternate with the sepals; then come the rows of the corona, and within them the stamens, erroneously represented in the left-hand figure as opposite to the petals instead of to the sepals. The double series in the pistilline whorl indicates the theoretical and the actual arrangement of the carpels; the theoretical arrangement is shown in the outer circle, the actual disposition is indicated by the central figure. The dotted outlines in the case of two bracts and two carpels indicate the position of the bracts and carpels assumed to be suppressed. The position of the tendril is shown at the side of each diagram.

The five petals are formed simultaneously; they alternate with the sepals, and are im-

bricate in æstivation, as has already been stated; hence, although the imbrication of the sepals may well be attributed to their successive formation one after the other, the oldest outermost, the most recent innermost, the others intermediate, yet the imbrication of the petals cannot be attributed to a like cause, but to a process of accommodation by which one part grows over the edge of its neighbour, and thus occupies less room. The five stamens are formed simultaneously opposite to the sepals (though, by oversight, they are represented as opposite to the petals in the left-hand diagram). The three carpels are, in my opinion, placed opposite to the three bracts, alternating, or nearly so, with sepals 1 and 4, 2 and 5, and 5 and 3 respectively. This, however, is not the position assigned to them by Payer, according to whom the three carpels alternate with the three bracts, and are placed opposite to the sepals 1, 3, 2. If Payer's version be true, the sepals, stamens, and carpels would all be superposed, as may be thus represented:—

3(5) Bracts.
 5 Sepals.
 5 Petals.
 5 Stamens.
 3(5) Carpels.

and we should have an exception to the usual rule of alternation, only to be explained on an assumption not supported by any evidence, viz. that a second or inner row of stamens is entirely suppressed. If the explanation here given be correct, we have no violation of the law of alternation, thus:

3(5) Bracts.
 5 Sepals.
 5 Petals.
 5 Stamens.
 3(5) Carpels.

The only deviation from the ordinary symmetry of a pentamerous flower would here consist in the absence of two bracts and of two carpels.

According to Payer's usual nomenclature the first-formed bract would be the "bractée mère;" the other two, lateral bracts. Wydler, also, in a passage pointed out to me by Prof. Eichler, of Grätz, adopts this view, but calls the first-developed bract the *bractea generatrix*, and says it belongs to the tendril. The lateral bracts are regarded by Wydler as *prophylla*. In the opinion, then, of these writers, the first bract belongs to an axis of a different and prior generation to that supporting the lateral ones. It appears to me, however, that there is no warranty for such an opinion. The course of development, as well as the position of the bracts in the adult flower, is sufficient to show that in *Passiflora* the three bracts are formed in succession from the same axis. In those species in which the bracts are more numerous than three and scattered, they are disposed in one continuous spiral series, and there seems no valid reason in this instance for dissociating the anterior or inferior one from the others.

Theoretically, then, we are justified in assuming that the flower of *Passiflora* is pen-

tamerous, with five bracts, five sepals, five petals, five stamens, and five carpels. The sepals and petals, at first hypogynous, become perigynous by the formation of the receptacular tube. The stamens are hypogynous in *Passiflora* and most of the genera of the order; the ovary, originally sessile, becomes, with the stamens, lifted up on a stalk by the elongation of the receptacle. The corona is an outgrowth from the sides of the receptacular tube, formed at a late period of the development of the flower, as already explained.

This view of the construction of the flower is theoretical only so far as regards the assumption of the potential existence and the relative position of two bracts and of two carpels, the growth of which is, moreover, assumed to be suppressed. According to Payer's explanation of the structure of the flower, it is the two posterior bracts, those nearest to the axis, that are wanting, and two lateral, or rather postero-lateral carpels opposite sepals 4 and 5. In my view, however, the defective bracts are one posterior corresponding to the interval between sepals 2 and 4, and one antero-lateral corresponding to the interval between sepals 3 and 5. The missing carpels would occupy a corresponding position.

I believe the discrepancy between the account given by Payer as to the relative position of the several floral organs and that which I am disposed to think, though not without some hesitation, is the more correct, arises from the circumstance that Payer considered the outer, larger bract to be at the *anterior* side of the flower, or opposite to the floral leaf. In reality, as has been before explained, the odd bract is *lateral* with regard to the *main* axis, though it is anterior as *regards the peduncle* on which it is placed, and therefore anterior to the tendril. This error, if error it be, of Payer's involves a dislocation from the real position amounting to two-fifths of the circumference of a circle. This displacement, taken in conjunction with the well-known faculty that organs have of occupying the spaces that would be filled by the now missing organs if no suppression had ensued, and thus of "closing up" the gaps, is amply sufficient to account for any discrepancy of opinion between myself and other observers.

It would be mere speculation to discuss the question whether the original type of *Passiflora* had five bracts and five carpels. Indeed I should be disposed to refer the existing deficiency not so much to any inherited tendency to suppression as to an accommodation process, if I so may term it, designed to obviate undue pressure and give more space. In this way the suppression of the posterior bract and the posterior carpel becomes specially significant, inasmuch as, from the comparatively unyielding nature of the axis opposite to which they would be placed, growth would be liable to be checked by the obstacle so afforded.

MINUTE ANATOMY.

The following observations are by no means complete; but they are perhaps sufficient to draw attention to the main features of the internal structure.

Tuber.—The fusiform tuberous root or root-stock of *Machadoa* consists of a mass of cells filled with large ovoid starch-grains, very unequal in size. Through the mass are irregularly distributed large barred ducts.

Stem.—In *Passiflora quadrangularis* and also in *Barteria nigriflora*, sections of the stem show the following tissues :—On the exterior is an epidermis of squarish cells destitute of chlorophyll, and thickened on the outer wall. Within the epidermis is a quantity of small-celled parenchyma filled with chlorophyll. The constituent cells of this cellular envelope vary in size according to the age of the stem. The liber-bundles consist of large fusiform, thick-walled, pitted wood-cells, arranged in masses which, when seen in section, have a kidney-shaped outline, the concavity being directed inwards towards the centre of the stem. Within these liber-bundles is more parenchyma investing the wood, which consists of ordinary wood-cells closely packed, and surrounding large pitted ducts and, towards the centre of the stem, spiral vessels. The middle of the branch is occupied with an abundance of pith, whose cells contain, at some seasons, starch-grains, and at all times conglomerate raphides. (See Plate LXV. fig. 6.)

Tendrils.—These are in structure similar to the branches, consisting of an epidermis surrounding a cellular envelope, in which are imbedded liber-cells arranged as in the branches. Within these is parenchyma with conglomerate raphides, and surrounding wood-cells, in which there are but few vessels. In the centre is the pith.

Leaf.—The structure of the leaf in Passion-flowers presents, so far as I have seen, no features of special interest; and hence the subject may be passed over with a brief reference to the epidermis and to the arrangement of the vascular bundles. The epidermis consists of flat cells with sinuous outline, between which are a great number of small oval stomata, bordered on each side by a semilunar guard-cell.

In some of those species, the lower surface of whose leaves is studded over with ocellate glands, the structure is as follows :—The ordinary epidermal cells are, in the species examined, less sinuous in their outline, and arranged concentrically around the circular gland. This latter is composed of a large number of very small hexagonal cells densely packed together, each cell being two or three times less in magnitude than the adjacent epidermal cells (Plate LXV. fig. 7).

Petiole.—In transverse section the petiole of *Passiflora quadrangularis* is boat-shaped. In structure it consists of the usual epidermis surrounding parenchyma in which are plunged eight large vascular bundles, and sometimes others of smaller size interposed. The usual arrangement is as follows :—Six large bundles disposed in a ring around the central parenchyma, the largest bundle being uppermost. Each of the bundles has in transverse section a deltoidal outline, the apex of the triangle being directed inwards towards the centre, while the broad base, consisting of cellular tissue and cambium-cells, is directed towards the circumference. The remaining bundles occupy each one of the upper corners of the leaf-stalk, and have their cambium-cells also directed towards the periphery, so that these wedge-like (in section) masses of woody tissue form a broken circle as in a branch, but are more interrupted (Plate LXV. fig. 8).

Midrib.—A transverse section of the midrib, in the centre of its course, shows a similar structure to that just described, but with only four woody bundles, placed one on either side, one at the top, and one at the bottom. The cambium-cells are external as in the petiole (Plate LXV. fig. 9).

Petiole glands.—In *Passiflora alata* these glands are cup-shaped, the concavity being

directed upwards. When a section is made through such a gland, the following appearances are presented from above downwards. Two layers of cubical, thick-walled epidermal cells, ordinary parenchyma, spiral vessels, more parenchyma, and below a single layer of epidermal cells.

Peduncle.—The structure of the peduncle is precisely similar to that of the tendril. At the upper part the woody bundles, which below form an incomplete ring, are approximated so as to form a continuous vascular circle. As the vessels pass upwards into the flower-tube, the bundles are so arranged as to form on transverse section a pentagonal outline, a disposition maintained throughout the whole length of the gynophore, as far as the point where the stamens are given off. Coupling this fact with the manner in which the stamens and gynophore are respectively developed, as before explained, the inaccuracy of the statement made in some descriptive works, to the effect that the stamens are adherent to the gynophore, becomes obvious. Above the point of emergence of the stamens the vessels are arranged in such a manner as to form, in transverse section, a triangular outline—a circumstance which, as it appears to me, militates against Schleiden's notion that the axis in *Passiflora* has direct concern in the formation of the ovary.

Flower-tube.—A longitudinal section of the receptacular tube of *Passiflora alata* shows, going from without inwards, an epidermis of thick-walled cubical cells, enclosing parenchyma of large oblong cells containing a little chlorophyll. This parenchyma is traversed by bundles of spiral vessels, slender wood-cells, and *vasa propria*. The epidermis in the interior of the tube presents a different character according to its position; thus in the upper portion, above the median or membranous corona (operculum), it has the ordinary characteristics, while below, in the nectary proper, it consists of a number of raised papilliform cells, immediately beneath which run at intervals solitary and very small spiral vessels.

Sepals.—The sepals on their lower or outer surface are covered by an epidermis, the cells of which are somewhat cuboidal, but sinuous in outline above, and thickened on their upper wall. They are interrupted here and there by oval stomata, bounded by two sausage-shaped guard-cells containing chlorophyll, a substance not met with in most of the other epidermal cells. The inner or upper epiderm of the sepals is of a similar character, and is likewise perforated by stomata. Some of these stomata are of an imperfect character, in that the separation into two guard-cells does not take place. The form of the aperture remains unaffected; but it is bounded by a single cell instead of by two.

According to Von Mohl, the stomata originate from the subdivision of a single cell, each of the subdivisions becoming a guard-cell. In the imperfect stoma above described there has been an arrest of development, as it were, and the sphincter of the stoma is formed of one cell instead of by a pair. Charles Morren*, who was the first to notice this condition of the stomata, mentions the existence in *Passiflora quadrangularis* of still more imperfect stomata on the calyx, consisting merely of one semilunar guard-cell, as if the fellow cell were suppressed. Morren states that he saw, in one case, an aperture, as of

* Dodonæa, part ii. p. 18.

an ordinary stoma, between the side of this solitary sphincter-cell and the adjoining epidermal cell. I have not myself seen these half stomata, probably because my observations have not been sufficiently extended.

Beneath the outer epidermis are three or four rows of spheroidal cells containing chlorophyll. Within this (in *P. alata*) there is a quantity of loose spongy cellular tissue, consisting of irregularly branching cells, between whose subdivisions are left large spaces or *lacunæ*. These cells contain little or no chlorophyll. Traversing this tissue are numerous bundles of slender spiral vessels. The inner epidermis consists of flattened polygonal cells with oval stomata.

Petals.—The outer or lower epidermis of the petals of *P. alata* consists of one layer of thickened, somewhat polygonal, scarcely sinuous cells, beneath which are numerous globular cells closely packed, except towards the inner surface, where there are a few *lacunæ*. The spiral vessels are of the same character as in the sepals. The inner epidermis consists, in the basal portion, of flattened cells; but above, where the petal becomes coloured, papular cells make their appearance.

The epidermis of the petals in the hybrid $\times$ *P. cæruleo-racemosa* consists also of sinuous cells, and this on both surfaces. It is perforated by few or no stomata. The colouring-matter is of a fluid nature, and is contained in the cells subjacent to the epidermis.

Corona.—A section through one of the larger rays in *P. alata* showed several bundles of spiral vessels traversing a quantity of cellular tissue, the outermost cells of which were filled with red colouring-matter. The epidermal cells are cuboidal in section, and either flat on the outer surface, or, in other cases, prolonged into conical points. There is probably some relation between the presence of this form of cellular tissue and colouring-matter or other secretion, since it is sometimes present, sometimes absent, both from the surface of the petals and from the rays of the corona*.

With reference to the spiral vessels by which the rays of the corona are traversed, I may remark that, while in the case of the larger rays there are sometimes several bundles in each, in the smaller rays there is only a single vessel; but not one, however small, seems to be destitute of its vessel. It is worth remembering this, as some stress is laid in certain cases, *e. g.* in Orchids, on the number and disposition of the spiral vessels as indicative of so many distinct, or potentially distinct, organs. It would surely not be correct to assume, from the presence of two or more bundles of vessels in one thread of the corona of a Passion-flower, that such thread is really of composite nature.

The annular rim which projects from the inner surface of the flower-tube below the “operculum” consists of a mass of globular cells, covered by a papular epidermis, and traversed by a solitary bundle of spiral vessels. In some of the cells may be seen conglomerate raphides.

Stamens.—The filaments present an epidermis of squarish thick-walled cells, destitute of stomata, enclosing cellular tissue of closely packed, oblong, cylindrical cells, enclosing a central bundle of fine spiral vessels. The disposition of the tissues in the excurrent

* I may here call attention to Mr. Tuffen West's remark in the *Journal of Microscopical Science*, 1859, p. 1, t. 1, as to the effect of this velvet-pile-like tissue in giving “air” and a transparent effect to coloured surfaces.

thread to which the anther is attached has been briefly but correctly described by Morren. It consists of a mass of densely packed, very slender, elongated and rather thick-walled cells, like those of the filament, but smaller, and through the centre of which passes a compact bundle of fine spiral vessels (Plate LXV. fig. 10). These vessels are directly continuous with those of the filament; and as they enter the connective of the anther they break up into numerous branches, destined for the supply of the anther-lobes. The connective, in the first instance, presents itself at the back of the anther, in the shape of two rounded fleshy lobes, with a central depression. These consist of globular, closely packed cells; the pollen-cavities are somewhat lateral, and leave between them in front a portion of untransformed tissue, with a straight edge. The structure of the anther-valves themselves I have not sufficiently examined. The fibrous cells are ovoid, and contain a much reticulated spiral fibre.

Pollen.—The pollen-cells of *Passiflora* and *Tacsonia* are beautiful microscopic objects. Their form is globose; and they are covered with a membrane which is raised into projecting ridges disposed in a netted manner. The grains open by four valves. For a full account of their structure, on which I have no observations of my own to relate, I may refer to Schleiden's account*.

Gynophore.—A transverse section of the gynophore below the lowest cup-like ring of the corona shows, going from the centre towards the circumference, an epidermis enclosing a parenchyma of spheroidal cells, then a ring of vascular tissue, within which is more cellular tissue, in which are plunged five bundles of vascular tissue which, on transverse section, show a semilunar arrangement, the concavity being directed inwards. These bundles seem to alternate with the angles of a pentagonal mass of vascular tissue and elongated cells; quite in the centre is more cellular tissue. Above the cup-like corona the gynophore exhibits the same appearances. A transverse section above the stamens reveals an epidermis encircling cellular tissue, in which is a broken ring of vascular bundles and spiral vessels, within these more cellular tissue and another interrupted ring of vascular tissue enclosing the central parenchyma.

Ovary.—A transverse section of the ovary shows the usual epidermis and parenchyma, through which latter run spiral vessels and long, thin-walled tubes. The spiral vessels ramify in all directions. Within these there is again parenchyma encircling six vascular bundles, three opposite to the placentas, three alternate with them. Each of the placental bundles divides into a number of smaller fascicles, destined for the supply of the ovules, which, in *Passiflora*, are usually arranged in four rows on the placentas, so that the walls of the ovary contain a network of vascular tissue. In other cases there is only a double row of ovules to each placenta; indeed, as the fruit ripens, it often happens that two rows of ovules on each placenta become obliterated. The styles are traversed by spiral vessels, which do not form a ring.

Stigma.—The stigmatic tissue consists of long, loosely packed cells, with conical ends overlying a mass of ordinary cellular tissue.

Ovules. Seeds.—But little need be said in addition to what has been before stated respecting the development of the ovule. The arillus is at first a mere sheet of oblong

* Principles of Scientific Botany (ed. Lankester), tab. 4, pp. 597, 598, and 356.

nucleated cells, from the inner surface of which a quantity of very large thin-walled nucleated cells are formed, constituting the pulp which invests the seed. The primine is also a mere sheet of cellular tissue, consisting of oblong, flattened, nucleated cells. The secundine is the layer which chiefly contributes to the thickness of the hard "testa" of the seed. In the young state it is thick and fleshy, presenting on the outside (in *P. alba*) numerous pits, which form conical elevations on the inner surface. These funnel-like processes appear at first to be pervious at the apex (see Plate LXIV. fig. 28), so that direct communication exists between the outer and inner portions of the ovule; but ultimately the perforation becomes closed at the inner end.

The constituent cells of the secundine ultimately become thickened by the formation of secondary deposits within them, so that, as before said, the mass of the hard testa of the seed, which retains its pitted appearance, is derived from the secundine.

FERTILIZATION OF THE FLOWER.

My remarks on this subject apply solely to the genus *Passiflora*, and refer chiefly to the functions exercised by the corona. Late in its development, and complicated in its arrangement, the series of parts constituting the corona seem to have some special office to fulfil in connexion with the fertilization of the flower. In the first place I may refer to the comparative rarity with which some of the species ripen their fruit unless assisted by art; and not only this, but it has also been observed that in some cases fruit is not formed unless the flower be impregnated with pollen of some other species! A summary of the evidence on this point is given by Mr. Darwin*, to whose remarks I would merely add that ripe fruit is often formed when perfect seeds are not. This is particularly observable in certain hybrid forms, such as $\times P. hybrida floribunda$ or $\times P. cæruleo-racemosa$.

That the tendency in Passion-flowers is against self-fertilization and in favour of cross impregnation might, I think, be inferred from the arrangement of the parts of the flower, even if the fact were not known practically.

* 'Variation of Animals and Plants,' ii. 137; Scott, 'Journ. Linn. Soc.' viii. (1864) p. 197. It is, however, certain that many species will ripen perfect fruit and seeds after fertilization by their own pollen. Some species (e. g. *P. alba*) do this without artificial assistance; and the common *P. cærulea* may be observed, in favourable seasons and localities, bearing ripe fruit and seeds out of doors. Mr. Ridout, a practical gardener of much experience, furnishes me with the following note on this matter:—"The extract from Mr. Darwin's 'Variation of Animals and Plants under Domestication' is not in accordance with my own experience. In one instance I have succeeded in fruiting *P. racemosa*, fertilized by its own pollen; the fruit swelled freely and evenly to the full size attained by that species; while, in the case of *P. quadrangularis*, for several years past I have been in the habit of setting, not a few fruit, but several dozens, entirely by its own pollen, and have at this time a plant of that species covering the roof of a small lean-to house, with upwards of 100 fruit on it, this being the third crop it has produced this year, the two former equalling the present in point of number. I impregnate them when there is a good number of flowers expanded at one time, after which the temperature of the house is allowed to rise from 5° to 10° for the remainder of the day; and it has always proved a rare case for one to fail; in fact, they set with much greater certainty than Melons. I know also that Mr. Mundell, of Hooley Hall, has been even more successful than myself; for he has annually excellent crops of the Granadilla, and fruit of *P. edulis*. Nor has his attention been confined to these alone; for three beautiful varieties, produced between species at that establishment, have already emanated from there."

In the young state the anthers are introrse and pressed up against the sides of the ovary and styles, the large stigmas of which project beyond the anthers. When the anthers become sufficiently matured to allow of the emission of the pollen, they undergo a change of position: the filaments spread more or less horizontally, and the anthers become extrorse; so that if the flower-stalk spread somewhat horizontally, as it does usually, or if it be erect, the pollen is likely to be shed on the corona, the styles at this stage being horizontal, with their stigmas quite out of reach of the pollen. In this manner the corona is often found dusted over with pollen; and in *Passiflora cincinnata*, Mast., and in other species it often happens that the stamens are bent downwards to such an extent as to come into direct contact with the corona (Plate LXV. figs. 4, 5).

The outermost rows of the corona, then, appear to attract insects, the smaller threads proceeding from the throat of the flower-tube catch the pollen, while the membranous or median corona (operculum) shuts off the upper portion of the flower from the nectar-secreting portion at the base. The peculiar pulley-like process of the stalk of the pistil in some Passion-flowers, and the substitutes for it in other species, have already been alluded to. In all cases the object seems to be to detain the insect in its passage to the nectar-secreting portions, and so to enable it the more surely to be dusted over with pollen. Now, when a Bee visits an expanded flower, it is easy to see how the insect favours cross fertilization. The insect alights on the rays of the corona; and if there be pollen on them, some of it must naturally adhere to the hairs on the insect's back. Moreover, if the insect be large, or the stamens, with their now extrorse anthers, be bent downwards, as they usually are at a late stage of the expansion of the flower, it is obvious that the back of the insect is very likely to come into contact (nay, does so, as I have frequently observed) and thus remove some of the pollen from them. In those cases where, from the pendulous position of the flower (*P. quadrangularis*, *P. macrocarpa*, &c.), the pollen cannot fall on the corona, which is now placed above the anthers, the pollen is removed by Bees in the manner just indicated. When the pollen-carrying insects alight on the corona of another flower it may so happen that the stigmas of that flower are so placed as to render them liable to come into contact with the insect, and to remove from its hairy thorax the pollen-grains with which it is bestrewn. The styles, which are erect all the time the anthers are introrse and so placed as to be liable to contaminate the stigmas, gradually assume a horizontal or even a deflexed position when the anthers are extrorse, or bent downwards, so as to render access of the pollen from them an improbable occurrence. All this may readily be seen by any one who watches the operations of a Humble-bee as he flies from flower to flower of any of our cultivated Passion-flowers; but it would seem probable, from the length of the gynophore, that in their native haunts the flowers of Tacsonias, for instance, are visited by some larger creatures than Bees. Indeed some travellers state that the honied flowers of the Tacsonias are very attractive to Humming-birds; and these elegant little creatures probably act as the carriers of pollen from one flower to another.

In connexion with the uses of the corona, I may here mention that, according to the late Prof. Morren, the corona is the seat of the perfume of the flower in *Passiflora*

*quadrangularis**—a fact which he considers proved by the anatomical structure of the coronal threads, as also by the circumstance that if the processes in question be early removed the flowers remain scentless.

In repeating this experiment, however, I have not been able to satisfy myself of the absolute correctness of this statement, though indeed it is one which would seem very likely to be correct. So far as I have observed, the chief seat of the perfume is in the nectary itself. Professor Morren attributes to the conical, pimple-like cells of the epidermis of the coronal filaments the formation of the odoriferous principle. These peculiar cells are found on the surface of the petals and in the nectariferous portion of the tube of the flower. The plant, says the Belgian professor, relieves itself of its excess of carbonaceous material by means of these two secretions, the sugary fluid or nectar and the aromatic principle. That these peculiar papilliform cells, constituting what was called by Prof. Morren conenchyma, are often associated with secreting surfaces, there can be no doubt; but as they occur on the surface of petals of flowers destitute of perfume, we must await further evidence before we assume that in the Passion-flowers these cells really secrete the odorant principle.

Movements of the Stamens, Styles, and Anthers.—The different positions assumed by the reproductive organs have been already referred to. I am not in a position to throw any light on the cause of these movements, of which, so far as I have seen, the minute anatomy offers no explanation. I can only surmise that the differences in position result, as they are known to do in other similar cases, from changes in the contractility or turgescence and consequent tension of certain cells as contrasted with the flaccidity of others. But this is a matter requiring much additional investigation.

The peculiar movement of the anther from introrse to extrorse has been attributed by some to gravity merely. The broad filament ends above in a fine thread, which is continuous with the anther below the centre of its dorsal surface. It was therefore assumed that on the expansion of the flower the superior weight of the upper portion of the anther, in conjunction with the fineness of the pivot on which it is poised, was sufficient to cause the anther to tilt over†. This explanation was combated by Morren, who adduced several reasons for rejecting this explanation, and considered that the fine point terminating the filament acts as a spring, which, under certain conditions, pulls the anther over. This explanation I believe to be correct, and in harmony with the singular structure of the organ in question and before alluded to.

It would be interesting to compare, in a fresh state, the anatomical structure of the filament at its point of attachment to the anther in those genera, such as *Modecca*, where the anther is basifixed and introrse.

Movements of the Tendrils, &c.—Under this head I need only refer to the valuable communication of Mr. Darwin, to whose observations I have nothing to add‡.

* *Dodonæa*, part ii. p. 21.

† St.-Hilaire, 'Leçons de Botanique, ou Morphologie Végétale,' p. 439; Morren 'Dodonæa,' part ii. p. 23.

‡ Darwin, *Journal of Linnean Society*, vol. ix. p. 89.

AFFINITIES OF THE GROUP.

The *Passifloraceæ* have been variously allocated by different authors. A. L. de Jussieu placed them near Cucurbits and Loasads—a position also assigned to them by Linnæus, the elder De Candolle, Agardh, Bentham and Hooker, and others. St.-Hilaire grouped them near to Loasads. The balance of opinion, indeed, seems to be in this direction. Du Petit Thouars placed them near *Violaceæ*, in which disposition he was followed by Lindley, who included them in his Violal Alliance. Adanson and Lamarck ranged them near to Capparids, Salisbury to Samyds. Others have pointed out their relation to Bixads and Resedas. Brongniart grouped them between Saxifrages and Hamamelids. Agardh has even suggested a resemblance to Bignoniads (*Cobææ*), but one which seems very remote.

Hence it will be seen that while some authors include the order among Perigynous Exogens, others rank it amongst the Hypogynous group, thereby laying greater stress on the one-celled ovary and parietal placentation, characters possessed for the most part by the orders above named, than on the superior or inferior condition of the ovary, or on the point of emergence of the sepals, petals, and stamens, even though these latter characteristics form the landmarks by which the main subdivisions of Exogens are known.

In estimating the affinities of *Passifloraceæ* (as of other groups), the characters upon which we found our estimate must be regarded from various points of view.

1. *Numerical importance*.—In the first place we have characters derived from the relative frequency of occurrence (in the orders under consideration) of a particular form or of a particular arrangement of organs. Such characters formed the basis of Adanson's system of classification*. They have the great advantage of being easily estimated; nevertheless it has been well objected that they are of little value unless associated with other points, such as invariability, physiological importance, and the like. To some extent, however, such an association must, from the nature of things, be a necessary coincidence.

In illustration of my meaning, I will take those families which have been considered by various authorities to be more or less nearly related to *Passifloraceæ*, excluding those in which the relationship seems very remote, and taking no heed of the exceptional forms which occur. These families are sixteen in number. In the next place I will enumerate the most striking structural characters of *Passifloraceæ*, and will indicate, by means of numbers, the relative frequency of occurrence of these characters in the orders under consideration. Thus, suppose we take the most prominent characters, and those which are almost universally present in true *Passifloraceæ*, and disregard the few exceptional cases, it will be seen that Turnerads agree with Passion-flowers in the possession of twelve of those characters, and differ from them in the absence of the remaining four. Cucurbits have seven points in common with Passion-flowers, and nine points of difference, and so on. This numerical relation between the several orders may be more fully shown as follows:—

* Adanson, Familles des Plantes. Paris, 1763.

TABLE 1.

Characters.	Number of orders in which present.	Characters.	Number of orders in which present.
One-celled ovary	16 (all)	Hypogynous stamens	9
Parietal placenta	16 „	Perigynous petals.....	6
Alternate leaves	14	Stipules	5
Straight embryo	15	Arillate seeds	5
Superior ovary	13	Climbing habit.....	5
Albuminous seeds	13	Gynophore	4
Free petals	10	Petiole glands.....	3
Flower-tube or perigynous calyx-lobes ..	9	Corona	3

These characters are arranged from above downward according to the relative frequency of their occurrence in the sixteen following orders:—

TABLE 2.

Names of orders.	Number of characters possessed by allied orders in common with <i>Passifloraceæ</i> .	Names of orders.	Number of characters possessed by allied orders in common with <i>Passifloraceæ</i> .
<i>Passifloraceæ</i>	16 (all)	<i>Loasaceæ</i>	9
<i>Turneraceæ</i>	12	<i>Bixaceæ</i>	8
<i>Malesherbiaceæ</i>	12	<i>Pangiaceæ</i>	8
<i>Sauvagesiaceæ</i>	10	<i>Papayaceæ</i>	8
<i>Samydaceæ</i>	10	<i>Frankeniaceæ</i>	8
<i>Violaceæ</i>	9	<i>Capparidaceæ</i>	7
<i>Droseraceæ</i>	9	<i>Cucurbitaceæ</i>	7
<i>Homaliaceæ</i>	9	<i>Bignoniaceæ</i>	4

The orders in the foregoing enumeration are placed from above downwards according to the degree of their affinity with Passion-flowers, as estimated by the occurrence of the characters mentioned in Table 1, without reference to other points—*Turneraceæ* and *Malesherbiaceæ* having the greatest number of points in common with *Passiflorads*, *Bignoniads* and *Cucurbits* the fewest, and so on.

If, then, we wish to ascertain what orders are most closely allied to *Passifloraceæ*, and to seek the greatest number of points of resemblance, as we should do when a synthetical arrangement is desired, we have merely to ascertain which orders are at the top of the list (Table 2), and which are the characters most frequently present (Table 1). If our object be analytical, or, in other words, if our desire is to discover points of divergence, then the foregoing list (Table 1) must be read from below upwards; for while the uppermost characters are common to the large majority of the members of the series, the lower ones are those which are peculiar, or nearly so, to Passion-flowers.

But although, from a numerical point of view, the alliance between certain orders may seem to be close, yet it must of course be remembered that a merely numerical relation may be outweighed by considerations of greater moment. We have, then, to appraise the value of these characters; and in so doing we avail ourselves of such points as the following:—

2. *Relative invariability*, a point on which deservedly much stress is laid, is to a great extent implied in the Table showing the relative frequency of occurrence of certain characters (Table 1)—but not wholly so; for instance, the number of petiolar glands and of rings of the corona is subject to variation even in the same species. It is a rare thing for them to be entirely absent; but it is common for them to be variable. Constancy of occurrence and invariability of form or arrangement do not necessarily go together. Nevertheless, as a general rule, it may be stated that those characters placed high in the list on account of their frequent occurrence, are also those which are least liable to variation in individual plants, or even species. Thus the one-celled ovary and the parietal placentation are not only characters of general occurrence, but they vary comparatively little in form in the individual members of a species. On the other hand, the corona and the petiolar glands, which are almost peculiar to *Passifloraceæ*, and which are therefore placed at the bottom of the list of characters, from the infrequency of their occurrence in other orders, are very liable to variation in individual plants.

3. *Developmental characters*.—A glance over the characters alluded to in the foregoing lists will suffice to show that some of them are “congenital,” and others “acquired.” Of course there is only a difference of degree between congenital and acquired characters; nevertheless the difference is an important one, and one readily recognized.

The acquired characters are necessarily subsequent to the others in the time of their appearance; they belong, as it were, to another stage of growth. If the illustration may be permitted me, I would compare the congenital characters to the “carcass” of a house, the acquired ones to its fittings.

The one set of characters are peculiar to, and perhaps different in, each individual, according to circumstances; the others (though also susceptible of modification) are common to all, or to a large number. Now, in the illustrations already given, it will be seen that those characters which are the most important in point of frequency of occurrence are precisely those which are congenital.

Again, it may be seen that those characters which are acquired, those which make their appearance later in the course of development, are those upon which stress is laid in distinguishing the lower groups, such as genera, sections, and species, one from another. Their use is in analysis chiefly, as that of the congenital characters is in synthesis. Moreover these acquired characters are taken from organs which, speaking generally, are those concerned in the carrying on the physiological actions peculiar or special to individual plants. But congenital characters are not merely of use synthetically, they may occasionally be used analytically, when they afford the means of discriminating, not only between large groups, but also between the members of the group itself. Thus the presence or absence of stipules affords congenital characters available for distinguishing both large and small aggregates from each other. At the same time the stipules are physiologically important as protectors to the young buds, or, in some cases, as secreting organs*.

* From their frequent very large comparative size in the young bud it is fair to infer that their office is one of greater importance in that stage of development than it is subsequently, when the leaves are fully developed.

The petiolar glands offer another instance of a congenital character serving for purposes of analysis—for distinguishing between small, as well as between large aggregates. These glands, too, seem to be more important in the young than in the adult condition of the leaf.

A similar remark may be made concerning the albumen—a congenital character usually common to all the members of large groups, and serving to bind their members together, and to discriminate them from others. This, too, is a character of high physiological importance; and yet it is one which sometimes serves to separate closely allied forms from each other. Thus in the genus *Sterculia*, in *Cassia*, &c. there are some species with, and others without albumen.

Congenital characters not only give us direct indications of existing affinities, but they are suggestive of the manner in which that affinity *may have been* brought about; in other words, they give a clue to the ancestry and parentage of existing forms. For instance, at a certain stage of development the flowers of a Passion-flower are almost precisely identical in the arrangement of their several parts with those of *Turnera*; so that we might either look upon *Turnera* as a Passion-flower arrested in its development, or upon a *Passiflora* as a *Turnera* of an exalted and more complicated type of organization. In so saying, I do not mean to assert dogmatically that existing Passifloras were evolved out of Turneras, or that Turneras are really degenerate Passifloras, I would merely infer that as both, at a certain stage of their existence, have the same arrangement of their floral organs, so they may have sprung, and probably did spring, from a common ancestor having a similar arrangement of parts.

The relative importance of congenital and of acquired characters in the sixteen orders previously mentioned is in a measure shown in the accompanying Table 3, in which

TABLE 3.

	Alternate leaves.	Opposite leaves.	Stipules.	Unisexual flowers.	Hypogynous calyx.	Hypogynous corolla.	Peri- or Epi- gynous calyx.	Perigynous corolla.	Gamopetalous corolla.	Polypetalous corolla.	Hypogynous stamens.	Perigynous stamens.	Corona.	Gynophore.	Superior ovary.	Inferior ovary.	One-celled ovary.	Parietal placenta.	Albumen.	Arillus.	Straight embryo.	Climbing habit.	Petiolar glands.
Passifloraceæ ...	*	.	*	.	.	.	×	×	.	*	.	.	×	×	*	.	*	*	*	×	*	.	*
Turneraceæ	*	.	.	.	.	.	×	×	.	*	.	×	.	×	*	.	*	*	*	×	*	.	*
Malesherbiaceæ	*	.	.	.	.	.	×	×	.	*	.	.	×	×	*	.	*	*	*	.	*	.	*
Sauvagesiaceæ...	*	.	*	.	*	*	.	.	.	*	.	.	.	.	*	.	*	*	*	.	*	.	*
Samydaceæ	*	.	*	.	.	.	×	×	.	*	.	×	.	.	*	.	*	*	*	×	*	.	*
Violaceæ	*	.	*	.	*	*	.	.	.	*	.	.	.	.	*	.	*	*	*	.	*	.	*
Droseraceæ	*	.	.	.	*	*	.	.	.	*	.	.	.	.	*	.	*	*	*	.	*	.	*
Homaliaceæ	*	.	*	.	.	.	×	×	.	*	.	×	.	.	.	×	*	*	*	.	*	.	*
Loasaceæ	*	*	.	.	.	.	×	×	.	*	.	×	.	.	.	×	*	*	*	.	.	.	.
Bixaceæ	*	.	.	.	*	*	.	.	.	*	.	.	.	.	*	.	*	*	*	.	.	.	.
Pangiaceæ	*	.	.	*	*	*	.	.	.	*	?	.	?	.	*	.	*	*	*	.	.	.	.
Papayaceæ	*	.	.	*	*	*	.	.	*	.	.	×	.	.	*	.	*	*	*	?	.	.	.
Frankeniaceæ...	*	*	.	.	*	*	.	.	*	*	.	.	.	.	*	.	*	*	*	.	.	.	.
Capparidaceæ...	*	.	.	.	*	*	×	.	*	*	.	×	.	×	*	.	*	*	*	.	.	.	.
Cucurbitaceæ ...	*	.	.	*	*	*	×	×	*	.	.	×	.	.	*	×	*	*	*	.	.	×	.
Bignoniaceæ ...	.	*	.	.	*	*	.	.	*	.	.	×	.	.	*	.	*	*	*	.	.	×	.

twenty-three characters, some of which are found in all the orders in question, are

enumerated. The * indicates congenital or primordial characters; the × those that are acquired or secondary. Of these twenty-three selected points of comparison Passion-flowers possess 16, 10 congenital, 6 acquired; Turnerads have 12 points of agreement with Passion-flowers, 8 congenital, 4 acquired, while they differ in 6, viz. in 2 congenital and 4 secondary characters. Samyds have 11 points (of the 23) in common with Passion-flowers, 7 primordial, 4 secondary; and 8 points of divergence, viz. 4 congenital and 4 acquired. This is more easily seen in the following Table 4†:—

TABLE 4.

	Points of Agreement.			Points of Disagreement.		
	Congenital.	Acquired.	Total agree- ment.	Congenital.	Acquired.	Total diver- gence.
Passifloraceæ	10	6	16	•	•	•
Turneraceæ	8	4	12	2	4	6
Malesherbiaceæ	8	4	12	2	2	4
Sauvagesiaceæ	11	•	11	3	6	9
Samydaceæ	7	4	11	4	4	8
Violaceæ	11	•	11	3	6	9
Droseraceæ	9	•	9	5	6	11
Homaliaceæ	7	4	11	3	6	9
Loasaceæ	7	4	11	5	6	11
Bixaceæ	10	•	10	4	6	10
Pangiaceæ	10	•	10	6	6	12
Papayaceæ	10	1	11	8	7	15
Frankeniaceæ	10	•	10	6	6	12
Capparidaceæ	8	1	9	6	5	11
Cucurbitaceæ	6	5	11	9	5	14
Bignoniaceæ	8	2	10	9	6	15

Congenital characters, then, are of cardinal importance in estimating affinity, from their frequency of occurrence, and from their relative invariability. The physiological importance of the organs furnishing congenital characters is also necessarily great, as upon the due fulfilment of their functions depend the life and reproduction of the plant. The manner in which those functions are fulfilled depends, as will be shown in the next paragraph, upon those organs which furnish special physiological characters.

In a case of doubt we should do well to lay greater stress (for purposes of synthesis) on the possession of these fundamental characters than on the cumulative force of number without reference to value, or on quality rather than on quantity. At the same time, as has been already stated, congenital characters occasionally furnish good means of discrimination between small groups, though their value in this respect is to some extent diminished by the greater tendency which, under such circumstances, the characters in question have to vary.

4. *Special physiological characters.*—These are attributes usually “acquired,” and not common to all plants, but only to certain genera and species. They are, of course,

† These Tables, like the preceding ones, must be taken as only approximately correct; for it is not certain in all cases what is a congenital, what an acquired character. Moreover the characters assigned to any particular order are by no means absolute: for instance, some Passion-flowers are unisexual, though not entered as such in the Table. Exceptions, indeed, are here disregarded.

inseparably connected with the work done by those particular plants; hence their value is not only physiological, but also analytical, because they furnish good marks whereby to discriminate one species from another. In a purely morphological sense these characters may often appear trivial; but if they are associated with a difference in physiological function, it cannot be said that they are unimportant. It is sufficient to mention, by way of illustration of this class of characters, all those diversified arrangements for favouring or preventing cross fertilization. Thus, in the case of the *Passifloræ*, it has been shown that the arrangement of the series of threads and membranous rings constituting the corona is of great value in separating species, or subsections of the genus, one from another. These organs are "acquired," they are formed late, and they have a special office in favouring cross fertilization, and in impeding or preventing self-impregnation. I call characters derived from such organs as these "special physiological characters," not only because they are peculiar to certain plants, but also because their office is special.

They are not essential organs (fertilization can and does take place without their aid); but they modify the action of the essential organs, and make them perform their office in a peculiar manner. The remarks that have been made on acquired characters apply then to those which are here termed special physiological.

It is not requisite in this case to say any thing concerning characters dependent on teratological phenomena or on those founded on varying geographical distribution of species. It would occupy too much space to treat of these subjects at length in such a communication as this; but, by way of summing up, I may add that, in estimating the value to be attached to certain characters or points of distinction, it is necessary to consider the purpose for which they are required. If the object be synthetical—if we are seeking points of resemblance, so as to group together a large number of forms into one or more large aggregates—we must, in the first instance, lay stress on the congenital characters, as serving to bind together the greatest numbers, and as being the most constant, the least variable, and the most physiologically important; then we must consider those dependent on frequency of occurrence and special physiological office, afterwards such others as may be available or forthcoming. If the purport of our investigation be analytical, if discrimination be our object, the special physiological characters first demand attention, then those which have the merit of frequency and invariability, and lastly those that are congenital.

It stands to reason that if a character be at once numerically important, congenital, and of high physiological value, it will be most valuable for synthetical purposes: for instance, in the large group Parietales, including Exogens with parietal placentation, the presence of albumen is a very constant feature (except in Cucurbits); hence then, as a character, albumen, in such a case, is numerically important, it is congenital, and physiologically of high importance. It is hardly necessary to add that the systematist cannot always act up to his own standard. Even the most experienced and sagacious botanists are not unfrequently inconsistent, often must be so from defective evidence. Individual cases have to be dealt with on their own merits, and consistency often has to give place to convenience or expediency.

From what has been previously said, it would seem as if the proper position of *Passi-*

floraceæ were among Hypogynous rather than Perigynous Exogens, that the nearest allies are the *Malesherbiæ* (included in *Passifloraceæ* by Bentham and Hooker), the *Turneraceæ*, as already suggested by Dr. Seemann *, the *Samydaceæ*, the *Bixaceæ*, and the *Violaceæ*. With other groups the alliance is more remote, and especially in the case of *Cucurbitaceæ*, with which the alliance is more apparent than real; or perhaps, as Agardh has suggested †, the two should be regarded as parallel or analogous series. The tribes *Modeceæ*, *Achariæ*, and *Papayaceæ*, included by Bentham and Hooker in *Passifloraceæ*, should either form a suborder or, preferably, a distinct order, intermediate between *Passifloraceæ* and *Cucurbitaceæ*—a plan followed by Lindley ‡. I am disposed to exclude them from *Passifloraceæ* proper by reason of their unisexual flowers, their perigynous stamens, the different attachment of the anthers, their want of corona, or, if present, its different nature, their usual lack of stipules, &c.

REMARKS ON THE GENERA OF THE TRIBE PASSIFLOREÆ.

DILKEA, nov. gen.

Under this name I propose the establishment of a new genus, the characters of which are hereinafter given. It differs from *Passiflora* and *Tacsonia*, to which otherwise it is closely allied, in the stamens being scarcely, if at all, removed from the base of the flower-tube, in the number of stamens and of styles (8 and 4 respectively), in the linear anthers, and the peculiar corona. In some respects it stands intermediate between *Passiflora* and *Smeathmannia*.

TACSONIA.

This genus was separated from *Passiflora* by Jussieu, and has been generally adopted by botanists, not without a suspicion, however, that it was too closely allied to *Passiflora* to be truly generically distinct. In truth there are a certain number of osculant forms which have been bandied about from one genus to the other to the great confusion of the synonymy. By relegating these intermediate forms (including the species generally referred to the sections *Psilanthus* and *Distephana*) to *Passiflora*, a much more compact genus is formed, one distinct morphologically as well as in point of geographical distribution, at the same time that *Passiflora* is by no means weakened as a genus. The main distinctive features of *Tacsonia*, then, reside in the elongated flower-tube (to which *T. manicata* offers an exception), in the faucial corona, consisting of tubercles or very short threads (to which *T. pinnatistipula* constitutes an exception), and in the short reflexed membranous corona nearly at the base of the flower-tube. True *Tacsonia*, as thus limited, have a peculiar *facies* not to be described in words, but one which is, in general, recognizable by the eye; and they are peculiar to the western side of the Andes, extending in some cases to great heights.

PASSIFLORA.

De Candolle and others have proposed a great number of sections of this genus, and

* Botany of the 'Herald,' p. 129. Turnerads differ, however, from Passiflorads in their fugacious, not persistent, petals, as remarked by Dr. Hooker, Gen. Pl. i. 806.

† Agardh, Theoria Syst. Veg. p. 386.

‡ Lindley, Veg. Kingd. 322.

have also adopted as distinct such genera as *Disemma* (potius *Distemma**), *Murucuia*†, *Tetraphæa*‡, not to mention smaller subdivisions proposed by Bory de St. Vincent or Roemer. It is not necessary to go into details on these points, the synonymy and references given in the subjoined lists being sufficient for the purpose.

I retain *Astrophea* as proposed by De Candolle, but raise it to the rank of a subgenus, and in it I include a small number of species mostly of erect habit (some even being trees), destitute of tendrils for the most part, with a many-flowered inflorescence, minute bracts, peculiar dilated coronal filaments, an oblong ovary somewhat flattened at the top, and from the angles of which proceed the three awl-shaped styles. To the species enumerated under this head by De Candolle I have added several which are more nearly allied to this group than to any others, though in some instances they differ somewhat in habit.

My second subgenus, *Plectostemma*, is so named from the circumstance that the membranous corona, instead of being flat, is almost universally folded into sharp folds, and frilled at the edge. Under this subgenus are included, as sections, *Tetraphæa*, *Cieca*, *Dysosmia*, *Decaloba*, *Polyanthea*, *Distemma*, to all of which, with the exception of *Distemma*, the same limits, though a lower rank, are assigned as by previous writers. I can find no valid reason for keeping up *Distemma* as distinct, inasmuch as in some cases the number of rings is more than two, while in those in which it is confined to that number it is not possible to separate the species from those included in *Decaloba* and *Polyanthea*. One or two of the Australasian species, indeed, have the corona flat, as in *Murucuia*; but these are exceptional cases.

The subgenus *Murucuia*, which was regarded as a genus by Tournefort, De Candolle, and others, I prefer to retain in *Passiflora*, and to strengthen it by the transfer of the species included by De Candolle under *Tacsonia*, section *Psilanthus*.

Granadilla forms in every way a well-marked subdivision, which I retain under the same limitations as De Candolle, Bentham and Hooker, and others, with the exception that I include in it the species forming the section *Tacsonioides* of De Candolle.

TRYPHOSTEMMA.

A genus founded by Harvey upon a single species, a native of Natal. I have added a second species, from Zanzibar, and am inclined to include Peyritsch's genus *Basananthe* under the same heading; but it is perhaps better to wait for further evidence before so doing, especially as the validity of *Basananthe* has been strengthened by the publication of Dr. Welwitsch, who further calls attention to the likeness of one of the species described by him to a *Viola*, and of the other to a *Sauvagesia*§.

* Labillard. Nov. Caled. 78, t. 79. DC. Prod. iii. 332. End. Gen. 5100.

† Tournefort, Inst. 215. Juss. Gen. 398. DC. Prod. iii. 333. Endlicher, Gen. Pl. 5099.

‡ Raoul in Ann. Sc. Nat. III. ii. 122.

§ Welwitsch, Trans. Linn. Soc. xxvii. p. 29.—“*Basananthe litoralis* habitu *Sauvagesiam erectam* simulat, dum *B. nummularia* habitum *Violæ æmulat*, adeoque genus hoc affinitatem inter *Passifloreas* et *Violarieas*, ab Endlichero aliisque auctoribus, inprimis ex fructus structura indicatam, etiam habitu ambarum specierum indigitat.”

PAROPSIA

is remarkable for containing species some of which are found in West Tropical Africa, others in Madagascar, and others in the Malayan peninsula and islands.

BARTERIA.

A genus peculiar in the consolidation of its styles. One species was previously described; and I have added a second, whose singular inflorescence has been before alluded to.

The remaining genera of the order I need not here further refer to; some, indeed, such as *Deidamia*, Thouars, *Thompsonia*, R. Br., *Physena*, Næronh., are almost wholly unknown to me, save from the descriptions in recognized text-books. To the genera constituting the tribes *Modeceæ*, *Achariæ*, and *Papayaceæ* of Bentham and Hooker I do not here make further allusion, because, for reasons before given, I consider them to form an order apart from true *Passifloraceæ*. Regarding the genera belonging to the tribe *Malesherbiæ*, viz. *Malesherbia* and *Gynopleura*, I have also nothing to add.

ENUMERATION OF THE GENERA AND SPECIES OF THE TRIBE *Passifloreæ*;
Benth. et Hook. fil. Gen. Pl. i. 808.

In the following list I have given the names and synonyms of the species included in the tribe *Passifloreæ*. The American species are described in my Monograph of American *Passifloraceæ*, included in Martius and Eichler's Flora Brasiliensis*. The African species are monographed in the second volume of Prof. Oliver's Flora of Tropical Africa†. Of the new species coming from other countries, descriptions are hereto appended, as also of two new genera of the order.

I. DILKEA. Genus novum.

Flores regulares dichlamydei hermaphroditi 4-8-meri. Floris tubus cylindricus coloratus. Sepala 4-5 oblonga integra subcoriacea. Petala 4-5 sepalis conformia subæqualia tenuiora cum iis e fauce tubi enata. Corona e medio tubi emergens basi membranacea tubulata ad faucem in filamentorum series 3-4 divisa, filamentis exterioribus liguliformibus planis petalis paulo brevioribus, filamentis intermediis numerosis externis brevioribus tenuioribus albidis curvatis, filis intimis setaceis. Stamina 8 hypogyna æqualia, filamenta gracilia erecta ima basi monadelpha. Antheræ ad filamenta dorso infra medium affixa erecta bilocularia, loculis ad latera rima longitudinaliter dehiscentibus. Ovarium stipitulatum ovoideum 1-loculare. Ovula ∞ anatropa funiculata horizontalia vel pendula

placentis parietalibus 4 serie duplici affixa. Stylus filiformis elongatus superne in ramos 4 stigmatosos divisus. Stigmata majuscula crassiuscula reniformia inclusa. Fructus globosus magnitudine aurantii parvi extus coriaceus evalvis?—Arbores vel frutices ecirrati? scandentes ("Sipo" Spruce). Rami teretes vel subangulati foliis delapsis cicatricibus magnis instructi. Folia petiolata alterna vel subopposita integra 1-costata. Petioli crassiusculi. Flores, ut videtur, in glomerulis axillaribus sessilibus vel pedunculatis aggregatis. Pedunculi vel pedicelli floribus breviores basi bracteis parvis subulatis instructi. Flores rubri.

Genus habitu, coronæ indole, nec non staminum, styli et carpellorumque numero ab affinibus diversum. De inflorescentia aliquantulum dubito. In memoriam amici beati Caroli Wentworth

* Now (May 1871) passing through the press.

† In the press, May 1871.

Dilke, Baronetti Angli, litterarum, artium, scientiarum, et præcipue horticulturnæ patroni munifici, indefessi, genus dicavi.

1. *D. RETUSA*. Mast. in Mart. et Eichl. Flor. Brasil. (Passifl.) tab. 106. Foliis oblongis subspatulatis apice truncatis retusis vel subbilobis; floris tubo quam sepala parum brevior.

Habitat in sylvis densis Barræ, in Brasiliæ prov. Rio Negro. *Spruce*, n. 1320^s!; in sylvis ad Ega, prov. Rio Negro, *Martius*!

2. *D. ACUMINATA*: Mast. *loc. cit.*, foliis oblongo-lanceolatis abrupte longiusculeque acuminatis; floris tubo quam sepala 5-6-plo brevior.

Hab. in sylvis densis Barræ et Panure, prov. Brasiliæ Rio Negro. *Spruce*, n. 1320^s!

II. TACSONIA, Juss. Gen. 398.

DC. Prod. iii. 333 (pro parte); Benth. et Hook. fil. Gen. Pl. i. 810. Mast. in Mart. Flor. Bras. (Passifl.) 535 ubi species sunt descriptæ.

Sectio 1. *EUTACSONIA*, DC. *Bractea libera*. (Sp. 1-12.)

§ 1. *Folia simplicia*, 1-nervia.

1. *T. ADULTERINA*, Juss. Ann. Mus. Hist. Nat. vi. 393. = *Passiflora adulterina*, Linn. fil. Suppl. 408.

Hab. Nov. Granata.

2. *T. LANCEOLATA*, Mast., sp. nov. in Flor. Brasil. *Hab.* Peruvia (Mathews, 1252).

3. *T. LANATA*, Juss. Ann. Mus. vi. p. 392, t. 59. f. 1.

Hab. Nov. Granata.

§ 2. *Folia lobata*, 3-5-nervia.

4. *T. GRACILENS*, A. Gray, Bot. U. S. Explor. Exped. 1854, 639.

Hab. Peru (Mathews, 915).

5. *T. PINNATISTIPULA*, Juss. Ann. Mus. vi. 393. = *Passiflora pinnatistipula*, Cav. Ic. v. 16, t. 428. *P. chilensis*, Miers, Travels, ii. 522. *Poggendorffia rosea*, Karsten, Linnæa, xxviii. 438, et Plant. Columb. Spec. Sel. t. 15. p. 29.

Var. *pennipes*, Smith in Rees, Cyclop. n. 48.

Hab. Peruvia, Chili, Columbia.

6. *VAN VOLXEMII*, Hook. Bot. Mag. 5571. = *P. antioquiensis*, Karst. Flor. Columb. t. 71.

Hab. Nov. Granata.

7. *T. JAMESONI*, Mast., sp. n. in Flor. Brasil. *Hab.* Quito (Jameson).

8. *T. FLORIBUNDA*, Mast. = *Rathea floribunda*, Karst. Flor. Columb. i. t. 38.

Hab. Nov. Granata.

9. *T. TRIPARTITA*, Juss. Ann. Mus. vi. t. 60.

Hab. Peruvia (Pavon).

10. *T. TRIFOLIATA*, Juss. Ann. Mus. vi. 393. = *Passiflora trifoliata*, Cav. Ic. v. 16, t. 427. *Tacsonia trigona*, DC. Prod. iii. 334.

Hab. Peruvia (Pavon, Gay, Matthews, 674, 675; Lobb, 20).

11. *T. MICRADENA*, DC. Prod. iii. 334.

Hab. Peruvia.

12. *T. MANDONI*, Mast., sp. n. in Flor. Bras.

Hab. Bolivia (Mandon).

Sectio 2. *BRACTEOGAMA*, DC. *Bractea basi conjunctim enatæ*. (Sp. 13-25.)

§ 1. *Folia simplicia*, 1-nervia.

13. *T. RUGOSA*, Mast., sp. n. in Flor. Brasil.

Hab. Nov. Granata (Schlim, 301).

§ 2. *Folia lobata*, 3-5-nervia.

14. *T. AMPULLACEA*, Mast., sp. n. in Flor. Brasil.

Hab. Ecuador (Jameson); Nov. Granata (Lobb).

15. *T. URCEOLATA*, Mast., sp. n. in Flor. Brasil.

Hab. Columbia (Lobb, 121).

16. *T. MATTHEWSII*, Mast., sp. n. in Flor. Bras.

Hab. Peruvia (Matthews).

17. *T. MANICATA*, Juss. Ann. Mus. vi. 393, t. 59. f. 2.

Hab. in Andibus.

18. *T. PEDUNCULARIS*, Juss. Ann. Mus. vi. 395. = *Passiflora peduncularis*, Cav. Ic. v. 15, 426.

Var. *Dombeyana*, DC. Prod. iii. 334.

Hab. Peruvia (Matthews).

19. *T. GLABERRIMA*, Juss. Ann. Mus. vi. 394.

Var. *cumbalensis* = *Tacsonia cumbalensis*, Karst. Linnæa, xxx. 161.

Hab. in Andibus.

20. *T. PARVIFOLIA*, DC. Prod. iii. 335.

Hab. in Andibus.

21. *T. ANASTOMOSANS*, DC. Prod. iii. 335.

Hab. in Peruviae montibus.

22. *T. TOMENTOSA*, Juss. Ann. Mus. vi. 394. =

Passiflora tomentosa, Lam. Dict. iii. 40, ex descript. nec Cav.

Hab. in Peruviae montibus (Matthews).

23. *T. BICORONATA*, Mast., sp. n.

Hab. in Nova Granata (Schlim, 418), an *T. mixta* potius varietas?

24. *T. MOLLISSIMA*, H. B. K. Nov. Gen. et Sp. ii. 144; Bot. Mag. t. 4187.

Var. *glabrescens*.

Hab. in Andibus.

25. *T. MIXTA*, Juss. Ann. Mus. vi. 394. = *Passiflora Tacso*, Cav. Diss. x. t. 277. *P. longiflora*, Lam. Dict. iii. 39.

Subspecies *TOMENTOSA*, mihi. = *Passiflora tomentosa*, Cav. Diss. x. t. 275, 276, nec Lam. *Tacs. longiflora*, Pers. Enchirid. ii. 223. *Tacsonia mixta*, var. β , DC. Prod. iii. 334. *Passiflora mixta*, Linn. f. Suppl. 408?

Var. *speciosa*, mihi, Mart. Flor. Bras. (Passiflor.) t. 128. f. 1. = *Tacsonia speciosa*, H. B. K. Nov. Gen. et Sp. ii. 143!

Subspecies *QUITENSIS*, mihi. = *Tacsonia quitensis*, Benth. Pl. Hartweg. 183; Bot. Mag. 5876.

Var. *eriantha*, mihi. = *Tacsonia eriantha*, Benth. Plant. Hartweg. 183; Bot. Mag. 5750. *T. serrata*, Karsten, Linnæa, xxx. 160.

Species exclusæ vel non satis notæ.

T. bilobata, Spreng. = *Passiflora bilobata*, Juss.

T. Buchananii, Lemaire. = *P. vitifolia*, H. B. K.

T. canaliculata, Juss. = *P. glandulosa*, Cav., var.

T. citrifolia, Juss. = *P. citrifolia*, Mast.

T. Fockeana, Miquel. = *P. glandulosa*, Cav.

T. glandulosa, Juss. = *P. glandulosa*, Cav.

T. ignea, Hort. = *T. manicata*, var.?

T. lævis, Benth. = *P. reflexiflora*, Cav.

T. Mansoi, Mart. = *P. Mansoi*, Mast.

T. pubescens, DC. = *P. quadriglandulosa*, Rodschd.

T. quadridentata, DC. = *P. quadriglandulosa*, Rodschd.

T. quadriglandulosa, DC. = *P. quadriglandulosa*, Rodschd.

T. reflexiflora, Juss. = *P. reflexiflora*, Cav.

T. Rohriana, DC. = *P. glandulosa*.

T. sanguinea, DC., Hook. (nec Sm.) = *P. quadriglandulosa*, Rodschd.

T. sanguinea, Benth. nec DC. = *P. vitifolia*, H. B. K.

T. spinosa, Poepp. et Endl. = *P. spinosa*, Mast.

T. splendens, Hort., mihi ignot.

T. Stoupyana, DC. = *P. quadriglandulosa*, Rodschd.

T. subcoriacea, Garcke. = *P. glandulosa*, Cav.

T. viridiflora, Juss. = *P. viridiflora*, Cav.

III. PASSIFLORA, Linn. Gen. n. 1021.

DC. Prod. iii. 322 (pro parte); Benth. et Hook. fil. Gen. Pl. i. 810; Mast. in Mart. Flor. Brasil. (Passiflor.) p. 542, ubi species omnes Americanæ descriptæ sunt.

Subgenus I. *ASTROPHEA*, DC. Prod. iii. *l. c.* (pro parte). (Sp. 1-13.)

Sectio 1. *Inflorescentia cymoso-paniculata; arbores vel frutices plerumque ecirratae.*

1. *P. ARBOREA*, Spreng. Syst. iii. 42. = *P. glauca*, H. B. Pl. Æquin. i. 76, t. 22.

Hab. Nov. Granat., Venezuela, Peruvia (Spruce, n. 6144; Goudot, 1; Fendler, 2548, &c.).

2. *P. EMARGINATA*, H. B. Pl. Æquin. i. 79, t. 23.

Hab. Nov. Granat. (Linden, 1409; Schlim, 585, 693, 1148); Venezuela (Fendler, 2548; Funck et Schlim, 1215).

3. *P. OVATA*, Martin in DC. Prod. iii. 322.

Hab. Nov. Granat. (Schlim, 285, 1142); Guiana, (Sagot, 210).

4. *P. CITRIFOLIA*, Mast. = *Tacsonia citrifolia*, Juss. Ann. Mus. Hist. Nat. vi. 392.

Hab. Guiana Gallica (Sagot, 1287 &c.).

Sectio 2. *Inflorescentia simplex. Frutices vel herbæ perennes, erectæ vel scandentes.*

5. *P. MANSOI*, Mast. = *Tacs. Mansoi*, Mart. Beibl. zur Flora, xxii. 7.

Hab. Brasilia (Martius, 276; Gardner, 3194; Warming, 1167; Pohl, 8, fol. tomentosus).

6. *P. CANDIDA*, Mast. = *Tacs. candida*, Poepp. Nov. Gen. et Sp. ii. p. 59, t. 180.

Hab. Brasilia (Poeppig, 2644).

7. *P. COSTATA*, Mast., sp. n. in Flor. Brasil.

Hab. Brazil (Spruce, 1670, 1676); Guiana (Apun, 2173).

8. *P. ELLIPTICA*, Gardner in Hook. Lond. Jour. Bot. i. 173.

Hab. Brazil (Gardner, 46, 3040; Burchell, 1838; St.-Hilaire, 135).

9. *P. HÆMATOSTIGMA*, Mart. mss. in herb.

Hab. Brasilia (Martius Obs. 1136; Sello, 310, 1105; Pohl, 3498).

10. *P. RHAMNIFOLIA*, Mast., sp. n. in Flor. Bras.

Hab. Brazil (Sello, 2148, 2125).

11. *P. PENTAGONA*, Mast., sp. n. in Flor. Brasil.

Hab. Brazil (Martius, 1221; Weddell, 1216).

Sectio 3. *Inflorescentia spicata. Pedunculi aggregati.*

12. *P. SPICATA*, Mast., sp. n. in Flor. Brasil.

Hab. Brazil (Martius).

13. *P. SPINOSA*, Mast. = *Tacsonia spinosa*, Poepp.

et Endl. Nov. Gen. ii. 59, t. 181.

Hab. Brazil (Spruce, 1394); Peruvia.

Subgenus II. *PLECTOSTEMMA*, Mast. in Flor. Brasil. (Passifl.) 545.

(*Passifloræ* sectt. *Cieca*, *Dysosmia*, *Decaloba*, *Polyanthea*, *Medusæa*, *Disemma*, *Tetrapathæa* auctororum.)

Sectio 1. *TETRAPATHÆA. Flores dioici.* (DC. Prod. iii. 323.)

14. *P. TETRANDEA*, Banks et Soland. = *Tetrapathæa australis*, Raoul, Ann. Sc. Nat. ser. 3. ii. 123.

Hab. Nov. Zelandia.

Sectio 2. *CIECA. Flores plerumque ebracteati, apetalæ.* (Sp. 15-26.)

15. *P. PANNOSA*, Sm. in Rees, Cyclop. 28.

Hab. Mexico.

16. *P. GRACILIS*, Jacq. Eclog. t. 168.

Hab. Brazil (Pohl, 1228); Venezuela.

17. *P. CORIACEA*, Juss. Ann. Mus. vi. 109, t. 39. f. 2. = *P. difformis*, H. B. K. Nov. Gen. et Sp. ii. 136. *P. clypeata*, Sm. in Rees, Cyclop. n. 20.

Hab. Mexico (Liebmann, nn. 3, 4, 5, 6, 7, 8, 9); Panama, N. Granat.; Venezuela, Peruvia ad Taro-poto (Spruce, 4213, 4522); ins. Antillan.

18. *P. BERTERIANA*, Balb. ex DC. Prod. iii. 325.

Hab. Ins. Cuba (Wright, 2604).

19. *P. TENUILOBA*, Engelm. Plant. Lindheim. p. 192.

Hab. Nov. Mexico (Wright, 117, 210).

20. *P. PÆPPIGII*, Mast. = *P. lunata*, Poepp. et Endl. N. Gen. et Sp. ii. 58, t. 178 (1830), nec Smith, nec Juss.

Hab. Peruvia.

21. *P. BILOBATA*, Juss. Ann. Mus. vi. 107, t. 37. = *P. Contrajerva*, Sm. in Rees, Cycl. n. 23.

Hab. Mexico (Pavon); St. Domingo.

22. *P. BAUHINIIFOLIA*, H. B. K. Nov. Gen. et Sp. ii. 132.

Hab. Quito.

23. *P. INAMÆNA*, A. Gray, Pl. Wright. part ii. p. 59.

Hab. Texas, Nov. Mexico (Wright).

24. *P. CERATOSEPALA*, Mast. = *Ceratosepalum parviflorum*, (Ersted, Fl. Cent. Am. t. 17, absque descript.

25. *P. SUBEROSA*, Linn. Amœn. Acad. i. 226. = *P. oliviformis*, Flor. Flum. ix. t. 83. *P. flexuosa*, Gardn. in Hook. Lond. Journ. Bot. i. 174. *P. pseudo-suberosa*, Fisch. ex Walp. Rep. ii. 934.

Var. *α. minima*. = *P. Walkeriæ*, Wight, Ill. Ind. Bot. ii. 39.

Var. *β. hirsuta*. = *P. hirsuta*, Linn. Amœn. i. 227. *P. villosa*, MacFadyen, Flor. Jam. ii. 151. *P. puberula*, Hook. fil. Trans. Linn. Soc. xx. 222. *P. littoralis*, H. B. K. Nov. Gen. et Sp. ii. 138. ? *P. hispidula*, Knowles et Westc. Flor. Cab. iii. 126. ? *P. nigra*, Jacq. Obs. ii. 27, t. 46. f. 3.

Subvar. *argentea*, Mast., foliis subtus argenteis.

Var. *γ. angustifolia*. = *Pass. angustifolia*, Swartz, Prod. 97. *P. heterophylla*, Jacq. Hort. Schœnb. ii. 181. *P. longifolia*, Lam. Enc. Méth. iii. 40. *P. tridactylites*, Hook. fil. Trans. Linn. Soc. xx. 222.

Var. *δ. pallida*. = *P. pallida*, Linn. Amœn. i. 218, excl. syn. *P. Warei*, Nutt. in Sillim. Journ. v. 297. ? *P. Kegeliana*, Gareke in Linnæa, xxii. 60.

Var. *ε. hederacea*. = *P. hederacea*, Cav. Diss. x. 448. *P. peltata*, Cav. Diss. x. 447. *P. Kohautiana*, Presl. *P. globosa*, Flor. Flum. ix. t. 85. *P. lineariloba*, Hook. fil. Trans. Linn. Soc. xx. 222.

Hab. per tropicos late diffusa. Miro modo

variat, varietates autem formis transitoriis pluribus conjunctæ sunt.

26. *P. LAWSONIANA*, Mast., sp. n. in Flor. Bras.
Hab. Brasilia austr. (F. Müller 179).

Species dubiæ mihi incognitæ.

P. DICTAMO, DC. Prod. iii. 324.

Hab. Mexico.

P. TRISETOSA, DC. Prod. iii. 324.

Hab. Mexico.

P. MACULATA, Scan. Cat. Hort. Bot. Coll. Hort. Rip. p. 101, ex DC. Prod. iii. 324.

Hab. Ins. Antill.

P. LIMBATA, Tenore, Ann. Sc. Nat. ser. 2, (1840) xiii. 380.

Patria incognita.

SECTIO 3. DYSOSMIA.

Bracteæ approximata bi-tripinnatisectæ, segmentis linearibus glanduloso-capitellatis. (Sp. 27-34.)

27. *P. ACERIFOLIA*, Schlecht. et Cham. Linnæa, v. 89. = *Dysosmia acerifolia*, Rœm. Syn. ii. 151.

Hab. Mexico (Liebmann, 72; Bourgeau, 3168, 3262); Venezuela (Fendler, 471; Moritz, 1719); Veraguas (Seemann, 1626); Nov. Granat. (Goudot).

28. *P. CLATHRATA*, Mast., sp. nov. in Flor. Brasil.

Hab. Brazil (Gardner, 3192; Lindberg, 6231, 3613; Warming, 1172; St.-Hilaire, 465, 2157; Sello, 2335; Claussen, 379).

29. *P. LEPIDOTA*, Mast., sp. nov. in Flor. Brasil.

Hab. Brasilia (Sello).

30. *P. PECTINATA*, Griseb. W. Ind. Flor. 294.

Hab. Ins. Antill.

31. *P. LIEBMANNI*, Mast.

Hab. Mexico (Liebmann, n. 41).

32. *P. VILLOSA*, Vell. Flor. Flum. ix. t. 87.

Hab. Brasilia (Burchell, 3989, 4143, 4316; Gaudichaud, 989; Warming, 1168, 1174; Sello, 5079).

33. *P. FÆTIDA*, Linn. Amœn. Acad. i. 288. = *P. hirsuta*, Lodd. Cab. t. 173 nec alior. *P. polyaden*, Flor. Flum. tom. ix. t. 92.

Var. *a. gossypiifolia*. = *P. gossypiifolia*, Desv. in Ham. Prod. Flor. Ind. Occ. p. 28. *P. fætida*, Lodd. Cab. t. 725, nec Linn. *P. obscura*, Lindl.

Trans. Hort. Soc. vii. 1. *P. hibiscifolia*, DC. Prod. iii. 331, nec Lam.

Var. *β. hirsuta*. = *P. Baraquiniana*, Lemaire, Ill. Hort. vii. t. 276 ex ic.

Var. *γ. nigelliflora*. = *P. nigelliflora*, Hook. Bot. Mag. 3635.

Var. *δ. hastata*. = *P. hastata*, Bertol. Flor. Guatim. 27.

Var. *ε. ciliata*. = *P. ciliata*, Ait. Hort. Kew. iii. 310. *P. hibiscifolia*, Lam. Enc. iii. 39, nec DC. ? *P. hirsuta*, Jacq. Eclog. 123.

Subvar. *quineloba*, Griseb. Cat. Plant. Cub.

Var. *ζ. vitacea*.

Hab. per tropicos late diffusa.

34. *P. Vellozii*, Gardn. in Hook. Lond. Journ. Bot. 1845, iv. p. 103. = *P. fætida*, Flor. Flum. ix. t. 86, fide Gardner.

Hab. Brasilia (Gardner, 427; ? Gaudichaud, 1026; St.-Hilaire, 239).

SECTIO 4. DECALOBA, Endl. Gen. 926 (pro parte).

Bracteæ parvæ, dissitæ, lineares. Flores petalis muniti.

§ 1. *Inflorescentia cymoso-paniculata.* (Sp. 35-45.) (*Polyanthea*, DC. Prod. iii. 323; *Medusæa*, Lemaire, Flore des Serres.)

A. Folia simplicia, 1-nervia.

35. *P. MULTIFLORA*, Linn. DC. Prod. iii. 323.

Hab. Ins. Antill. Cuba (Wright, 2598); Amer. Central.

36. *P. NEPALENSIS*, Wall. Tent. Flor. Nep. 20, t. 11.

Hab. Nepaul.

37. *P. HORSFIELDII*, Blume, Rumphia, 170. = *Disemma Horsfieldii*, Miquel.

Hab. Java; ins. Madura.

38. *P. MOLUCCANA*, Bl. Bijdr. 938; Rumphia, 169.

Hab. Ins. Ternate.

Var. *β. timorensis*, Bl. Rumphia, l. c.

39. *P. SUMATRANA*, Blume, Rumphia, 170.

Hab. Sumatra.

40. *P. SINGAPOREANA*, Wall. Cat. 1232.

Hab. Singapore (haud vidi).

41. *P. PENANGIANA*, Wall. Cat. 1233.

Hab. Penang (species mihi adhuc ignota).

42. *P. LIGULIFOLIA*, Mast., sp. nov. Foliis coriaceis glabris loriformibus 1-nerviis, apice emarginato-bilobis, basi in petiolum brevem apice biglandulosum angustatis; pedicellis axillaribus, geminis, petiolum 2-3-plo superantibus; floribus diametro expansis, 2-pollicaribus; floris tubo brevi; sepalis petalisque subæquilongis, oblongis; coronæ faucialis filamentis biserialibus, filis exterioribus radiantibus petala æquantibus, filis interioribus 4-plo brevioribus capitellatis; corona membranacea, præcedentibus approximata; gynandrophoro petalis dimidio brevior; ovario ovoideo, glabro.

Habitat in ins. Loong Kong, prope Hong Kong (Wright, N. Pacific Exped. 481!).

B. *Folia lobata*.

43. *P. SEXFLORA*, Juss. Ann. Mus. vi. t. 37. f. 1. = *P. floribunda*, Lemaire, Flore des Serres, iv. p. 335b; Walp. Ann. ii. 652.

Hab. Ins. Antill. Cuba (Wright, 200); Mexico, (Jurgensen, 796, 886; Liebmann, 22, 23, 24, 25, 31, 38).

44. *P. LESCHENAULTII*, Hook. Ic. Plant. iv. 353.
Hab. Ind. Or.

45. *P. CIRRIFLORA*, Juss. Ann. Mus. vi. t. 41.
f. 2. ? = *P. septenata*, DC. Prod. iii. 323.

Hab. Guiana Gallica.

§ 2. *Inflorescentia simplex* (Eu-decaloba).
(Sp. 46-101.)

A. *Folia simplicia vel obsolete lobata*.

46. *P. TORTA*, Mast., sp. n. in Flor. Brasil.

Hab. Brasilia (Spruce, 911⁴); Ins. S. Trinitatis.

47. *P. AURICULATA*, H. B. K. Nov. Gen. et Sp. ii. 131 (1817). = *P. appendiculata*, Mey. Esseq. 223 (1818). *P. Rohrii*, DC. Prod. iii. 326. *P. cyathophora*, Desv. in Ham. Prod. Ind. Occ. 48.

Hab. Brasilia (Spruce, 2222, 2962), Am. Centr. Ins. Antill., Guiana, Venezuela &c. (Schomburgk, 287; Fendler, 122; Appun, 870; Sagot, 385; Spruce, 6142).

48. *P. CINEREA*, Pöpp. Nov. Gen. et Sp. ii. 57, t. 177.

Hab. Peruvia.

49. *P. MICROPETALA*, Mart. mss. in herb.

Hab. Brazil (Martius 3078).

50. *P. POHLII*, Mast., sp. n. in Flor. Brasil.

Hab. Brasilia (Pohl, 2186; Weddell, 2896).

51. *P. TRUNCATA*, Regel, Gart. Flora, viii. (1859) 356.

Hab. Brasilia.

B. *Folia manifeste lobata*.

a. *Folia oblonga*.

* *Folia biloba*.

52. *P. ALNIFOLIA*, H. B. K. Nov. Gen. et Sp. ii. 136. = *P. bogotensis*, Benth. Pl. Hartweg. 184.

Hab. Nov. Granat., Ecuador.

53. ? *P. CUNEATA*, Willd. En. Hort. Berol. 696, ex DC. Prod. iii. 332.

Hab. Venezuela (Moritz, 1898; Fendler, 483), Panama.

54. *P. ICTHYURA*, Mast., sp. n. in Flor. Brasil.

Hab. Brasilia (Gardner, 3191; Sello, 2129, 2149).

55. *P. TUBEROSA*, Jacq. Hort. Schönb. iv. 49, t. 496. = *P. punctata*, Lodd. Cab. 101, nec alior.

Hab. Ins. Antill., Guiana Anglic. (Schomburgk, 642), Mexico (Hahn, 48, 41, 133).

56. *P. FURCATA*, Mast., sp. n. in Flor. Brasil.

Hab. Venezuela (Fendler, 484).

** *Folia apice triloba*.

57. *P. TRICUSPIS*, Mast., sp. n. in Flor. Brasil.

Hab. Brazil (Gardner, 1631; Burchell, 6988, 2; Weddell, 3025).

58. *P. ROTUNDIFOLIA*, Linn. DC. Prod. iii. 338, excl. var. et syn.

Hab. Brazil (Martius, 1452, 1220; Warming, 1160¹, 1160², 1160³; Burchell, 5904; Sello, 212, 2128), Ins. Antillan.

59. *P. HOLOSERICEA*, Linn. Amœn. Acad. i. 226.

Hab. Mexico (ab omnibus collectoribus fere reportata).

60. *P. MOLLIS*, H. B. K. Nov. Gen. et Sp. ii. 137.

Hab. Venezuela (Fendler, 478?), Nov. Granat.

Var. *INTEGRIFOLIA*.

Hab. Nov. Granat. (Goudot, n. 11).

61. *P. FUSCINATA*, Mast., sp. nov. in Flor. Brasil.

Hab. Mexico (Liebmann, 19).

62. *P. TRIFASCIATA*, Lemaire, Ill. Hort. t. 544.

b. *Folia semiorbicularia*.* *Folia biloba*.63. *P. ANDERSONI*, DC. Prod. iii. 326.*Hab.* Ins. Antillan.64. *P. INDECORA*, H. B. K. Nov. Gen. et Sp. ii. 134.*Hab.* Peruvia.65. *P. VESPERTILIO*, Linn. Amœn. Acad. i. t. 10. f. 11. = *P. hemicycla*, Meyer, Essequib. 225. *P. surinamensis*, Miquel, Linnæa, xviii. 363. *P. geminiflora*, DC. Prod. iii. 323.*Hab.* Brasilia (Burchell, 9885; Weddell, 3025; St.-Hilaire, 1955), Guiana Gallica (Hostmann, 1095; Sagot, 286), Guiana Anglica (Schomburgk, 38, (154), 664, 1095), Guiana Belgica (Wüllschlægel, 214), Peruvia.66. *P. RUBRA*, Linn. Amœn. Acad. i. 222, t. 10. f. 9. = *P. capsularis*, Lam. Enc. Méth. iii. 36, non Linn. *P. triquetra*, Lam. Enc. Méth. iii.*Hab.* Brasilia (Warming, 1161), Venezuela, Amer. Central, Ins. Antill., Peruvia, Mexico (Liebmann, 28), Ins. S. Trinit. (Sieber, 241).67. *P. CAPSULARIS*, Linn. Sp. 234. = *P. rubra*, Lam. Enc. Méth. iii. 35, non Linn. *P. piligera*, Gardn. Lond. Journ. Bot. i. (1842) 173. *P. bilobata*, Vell. Flor. Flum. ix. t. 78, nec Juss. *P. pubescens*, H. B. K. Nov. Gen. ii. 132. *P. lunata*, Vell. Flor. Flum. ix. t. 80.*Hab.* Brazil (St.-Hilaire, 18^{bis}, 704^{bis}, 716; Pohl, 3521; Gardner, 41; Peckott, 7; Burchell, 9061; Warming, 1159), Ecuador, Mexico (Liebmann, 29, 30), Nov. Granat. (Goudot, 2).68. *P. ORGANENSIS*, Gardn. in Hook. Lond. Journ. Bot. iv. p. 104. = ? *P. pertusa*, Vell. Flor. Flum. ix. t. 79. ? *P. obtusa*, Vell. Flor. Flum. ix. t. 81.*Hab.* Brasilia (Gaudichaud, 629, 990; Gardner, 428; Sello, 2127).Var. *marmorata*, Mast.*Hab.* Brazil (St.-Hilaire, 661).69. *P. LUNATA*, Willd. Sp. Pl. iii. 612. = *P. biflora*, Lam. Enc. Méth. iii. 36. *P. glabrata*, H. B. K. Nov. Gen. ii. 135.*Hab.* Mexico (Liebmann, 26, 27), Nov. Granat. (Goudot, 2), Amer. Central, Chagres (Fendler, 121), Venezuela, Ins. Antill.

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Var. *costata*, Mast.*Hab.* Guatemala.70. *P. SPATHULATA*, Mast., sp. n.*Hab.* Mexico (Liebmann, 13? 14).71. *P. MEXICANA*, Juss. Ann. Mus. vi. p. 108, t. 38. f. 2.*Hab.* Mexico.72. *P. JORULLENSIS*, H. B. K. Nov. Gen. et Sp. ii. 133. = *P. Medusæa*, Lemaire ex Bot. Mag. t. 4752.*Hab.* Mexico (Liebmann, 30; ? Ghiesbreght, 301).** *Folia apice triloba*.73. *P. LOBBII*, Mast., sp. nov. *loc. cit.**Hab.* Columbia (Lobb).74. *P. HISPIDULA*, Knowles et Westcott, Flor. Cab. iii. 126 (1840).*Hab.* Mexico.75. *P. ERYTHROPHYLLA*, Mast. *l. c.* ? = *P. TRISETOSA*, DC. Prod. iii. 324.*Hab.* Mexico; Nov. Granat. (Goudot, 2).76. *P. FILIPES*, Benth. Pl. Hartweg. 118.*Hab.* Guayaquil (Hartweg, 661), Mexico (Galettotti, 3656), Texas (Berlandier, 2265, 3046).77. *P. PENDULIFLORA*, Bert. ex DC. Prod. iii. 326.*Hab.* Ins. Antill.78. *P. OBTUSILOBA*, Mast., sp. nov. *loc. cit.**Hab.* Peruvia.79. *P. AFFINIS*, Engelm. in Bost. Journ. Nat. Hist. vi. 233.*Hab.* Texas (Lindheimer).80. *P. LUTEA*, Linn. Amœn. Acad. i. 224, t. 10. f. 13.*Hab.* Amer. Septent.81. *P. SICYOIDES*, Schlecht. et Cham. Linnæa, v. p. 89. = *P. odora*, Link et Otto, Ic. Pl. Rar. part i. p. 93, t. 47.*Hab.* Brazil (Sello, 3963), Mexico.82. *P. WARMINGII*, Mast., sp. n. *loc. cit.**Hab.* Brasilia (Warming, 1153; Sello, 3963).83. *P. BRYONOIDES*, H. B. K. Nov. Gen. et Sp. ii. 140. = *P. exsudans*, Zucc. Abh. math.-phys. Class. der K. Bayr. Akad. Wiss. ii. 342.*Hab.* Mexico.84. *P. MORIFOLIA*, Mast., sp. n. *loc. cit.**Hab.* Tucuman (Tweedie, 1174).

4 P

85. *P. KARWINSKII*, Mast., sp. n.
Hab. Mexico (Karwinski, 178).
- Species Australasica et Oceanica.* (Sp. 86-94.)
86. *P. BRACHYSTEPHANA*, F. Müll., Benth. Fl. Austr. ii. 312.
Hab. Australia.
87. *P. HERBERTIANA*, Ker, Bot. Reg. t. 737; Benth. Flor. Austral. iii. 311. = *Disemma Herbertiana*, DC. Prod. iii. 333.
Hab. Australia.
 Var. β . *Caleyana*, DC. Prod. iii. 333.
Hab. Australia.
88. *P. CINNABARINA*, Lindl. Gard. Chron. 1855, p. 724, c. ic. xylog.; Bot. Mag. t. 5911.
Hab. Australia.
89. *P. BANKSII*, Benth. Flor. Austr. iii. 312. = *P. coccinea*, Soland. in herb. Banks. *Disemma coccinea*, DC. Prod. iii. 332.
Hab. Australia.
90. *P. GLABRA*, Wendl. Coll. Plant. i. (1805) t. 17. = *P. adiantifolia*, Ker, Bot. Reg. t. 233. *Disemma adiantifolia*, DC. Prod. iii. 333.
Hab. Ins. Norfolk.
91. *P. AURANTIA*, Forst. Prod. 326; Cav. Diss. x. 457. = *Disemma aurantia*, Labill. Sert. Caled. t. 79.
Hab. Ins. Nov. Caledon.
92. *P. BAUERIANA*, Mast. = *Disemma Baueriana*, Endl. Prod. Fl. Norfolk. 123. *Murucua Baueri*, Lindl. Coll. t. 36.
Hab. Ins. Norfolk.
93. *P. BARCLAYI*, Mast. = *Disemma Barclayi*, Seemann, Flor. Vitiens. 96.
Hab. Ins. Viti.
94. *P. VITIENSIS*, Mast. = *Disemma vitiensis*, Seem. Flor. Vitiens. 96.
Hab. Ins. Viti.
 An huc *D. Storckii*, Seem. Fl. Viti. 96? Specimen haud vidi.
- C. Folia transverse oblonga, vel ovalia, biloba, lobis latissime divaricatis, lobo intermedio minore nonnunquam interjecto.* (Sp. 95-100.)
95. *P. MAXIMILIANA*, Bory, Ann. Gén. ii. 149, t. 24 (1819). = *P. discolor*, Link et Otto, Ic. Pl. Select. i. 13, t. 5. *P. retusa*, Hook. et Arnott, Bot. Misc. iii. 325. *P. Vespertilio*, Ker, Bot. Reg. t. 597, excl. syn.; Lemaire, Ill. Hort. 1869, Misc. p. 1, nec Linn.
Hab. Brazil (Spruce, 1629; Burchell, 4257; Tweedie, 179; Warming, 1158; Sello, 337, 368; St.-Hilaire, 2626).
96. *P. MISERA*, H. B. K. Nov. Gen. et Sp. ii. 136.
Hab. Nov. Granat.
97. *P. PUNCTATA*, Linn. Amœn. Acad. i. 10, f. 12.
Hab. Brasilia (Sello, 642; Miers, 4456), Peruvia, Ecuador.
98. *P. SWARZII*, Mast. = *Pass. rotundifolia*, Swz. Obs. Bot. 337. n. 16, non Linn.
Hab. Ins. Antill.
99. *P. MICROCARPA*, Mast., sp. n. *loc. cit.*
Hab. Brasilia (Sello, 2480, 2486).
100. *P. EXOPERCULATA*, Mast., sp. n. *loc. cit.*
Hab. In Andibus Boliviensibus (Mandon, 611).
- Species hujus sectionis vel Ciecæ non satis cognita.*
101. *P. FERRUGINEA*, Mast., sp. nov. *loc. cit.*
Hab. Peruvia ad Tarapoto, ubi legit Spruce (4901).

Subgenus III. MURUCUA.

Sectio I. *Corona membranacea ad faucem tubi sita, erecta vel deflexa* (Eumurucua). (Sp. 102-105.)

102. *P. MURUCUA*, Linn. Sp. Pl. ed 3, vol. ii. p. 1357. = *Murucua ocellata*, Pers. Enchir. ii. 222. *Passiflora orbiculata*, Cav. Diss. x. 286. *Murucua orbiculata*, Pers. Enchir. ii. 222.

Hab. Ins. Antillan.

103. *P. PERFOLIATA*, Linn. Willd. Sp. Pl. iii. 611. = *P. cephalima*, Bory, Ann. Gén. ii. 152, t. 22. *P. normalis*, Linn. Amœn. Acad. v. 408.

Hab. in ins. Antillan.

104. *P. OBLONGATA*, Swarz, Fl. Ind. Occ. ii. 1135. = *P. elongata*, Poiret, Enc. Méth. Suppl. ii. 839.

Var. *lyrifolia*, Tussac ex Griseb. W. Ind. Flor. 295.

Hab. Ins. Antill. Cuba (Wright, 165⁵, 198³, 1615; Wulfschlägel, 842).

105. *P. CUPREA*, Linn. Amœn. Acad. i. 219, t. 10. f. 3.

Var. *Cavanillesii*, Mast. = *P. cuprea*, Cav. Diss. x. t. 273. *P. Cavanillesii*, DC. Prod. iii. 323.
Hab. Ins. Antill.

Sectio 2. *Corona membranacea e tubo versus basin enata, erecta vel deflexa.* (Sp. 106-111.)

(*Tacsonia* sect. *Psilanthus*, DC. pro parte.)

* *Flores apetalæ* (§ *Pentaria*).

106. *P. LANCIFOLIA*, Desv. in Ham. Prod. Flor. Ind. Occ. ex DC. Prod. iii. 331. = *P. regalis*, Macfadyen, Flora of Jamaica, 151.

Hab. Ins. Antill.

107. *P. VIRIDIFLORA*, Cav. Ic. v. t. 424. = *Tacs. viridiflora*, Juss. Ann. Mus. vi. 389. *Pass. tubiflora*, H. B. K. Nov. Gen. et Sp. ii. 139.

Hab. Mexico (Liebmann, 32, 37, 39).

** *Flores dichlamydei* (§ *Decaria*).

108. *P. BICUSPIDATA*, Mast. = *Tacs. cuneata*, Benth. Pl. Hartweg. 183. *Tacs. bicuspidata*, Karst. Linnæa, xxx. 160.

Hab. In Nov. Granat.

109. *P. TRINERVIA*, Mast. = *Tacs. trinervia*, Juss. Ann. Mus. vi. 390, t. 58.

Hab. Venezuela, Nov. Granat. (Linden, 1127; Holton, 707; Triana, 369).

110. *P. SANGUINOLENTA*, Mast. Gard. Chron. 1868, 1162.

Hab. Peruvia (Lobb, 151).

Species haud satis nota.

111. *P. HETEROPHYLLA*, Lam. Enc. Méth. iii. 41.

Subgenus IV. *GRANADILLA*, DC.

(*Anthactinia*, Bory.)

Sectio 1. *Bractæ conjunctim enatæ.* (Sp. 112-117.)

§ 1. *Folia simplicia.*

A. *Stipulæ lineares.*

112. *P. SEEMANNI*, Griseb. in Bonplandia, 1858, p. 7.

Hab. in America Centrali (Fendler, 120).

113. *P. MALIFORMIS*, Linn. (Willd.), Sp. Pl. iii. 608. = *P. ornata*, H. B. K. Nov. Gen. et Sp. ii. 129.

Hab. Brasilia, Nov. Granata (Goudot, 1, 8; Linden, 1185; Hartweg, 1020), Venezuela, Ins. Antill., Cuba (Wright, 199).

B. *Stipulæ late ovatæ acutæ.*

114. *P. LIGULARIS*, Juss. Ann. Mus. vi. p. 113, t. 40. = *P. Loweii*, Heer in Regel. Gart. Flor. 1852, p. 69, t. 14. ? *P. serratistipula*, DC. Prod. iii. 328.

Hab. in Amer. Centr. (Goudot, 3; Mandon, 608), Mexico (Galeotti, 3668), Bolivia.

§ 2. *Folia lobata.*

115. *P. TRILOBA*, Ruiz et Pav. ex DC. Prod. iii. 330. = *Passiflora colubrina*, Pœpp. et Endl. Nov. Gen. ii. 58 (1838).

Hab. Peruvia (Spruce, 4052; Pöppig, 2171).

116. *P. VELATA*, Mast., sp. nov. loc. cit.

Hab. Venezuela (Fendler, 2329; coll. 2. 1879; Moritz, 1318).

117. *P. SERRATA*, Linn. Amœn. Acad. i. 232, t. 10. f. 21.

Var. *digitata*, DC. Prod. iii. 330.

Hab. Brasilia, Peruvia, Guiana, Ins. Antill.

Var. *digitata*, Brasilia (Burchell, 9963).

Sectio 2. *Bractæ liberæ.* (Sp. 118-180.)

§ 1. *Floris tubus limbo brevior, carnosulus.*

A. *Caules ramique valde tetragoni; folia simplicia.*

118. *P. QUADRANGULARIS*, Linn., DC. Prod. iii. 328.

Hab. In hortis tropicis ubique culta, in Brasilia, ut videtur, spontanea (Burchell, 9489, 3180).

119. *P. ALATA*, Aiton, Hort. Kew. iii. 306; Wendland, Coll. Plant. ii. t. 46 (1810). = *P. tetradena*, Vand. ex DC. Prod. iii. 331. ? *P. pyriformis* DC. Prod. iii. 331.

Var. *α. brasiliانا*. = *P. brasiliانا*, Desf. Cat. Hort. Paris. ed. 3, p. 411. *P. phænicea*, Lindl. Bot. Reg. t. 1603. *P. maliformis*, Flor. Flum. ix. t. 73. *P. oviformis*, Rœmer, Synops. Monogr. ii. 167.

Var. *β. latifolia*. = *P. latifolia*, DC. Prod. iii. 328.

Var. *γ. mauritiana*. = *P. mauritiana*, Du Petit Thouars, Ann. Mus. vi. t. 65. *P. mascarensis*, Presl, Bemerk. 72.

Hab. in Brasilia (Pohl, 920, 3108; Garduer, 4689; Warming, 1157; Gaudichaud, 1043; Lund, 1180; Sello, 2123; St.-Hilaire, 287).

- Var. α . Brasilia (Burchell, 3180).
 Var. β . Peruvia (Pavon).
 Var. γ . Ins. Sancti Mauritii, et Bourbon.
 120. *P. MACROCARPA*, Mast. Gard. Chron. 1869, 1012.
Hab.? Brasilia (Wallis), Peruvia (Spruce), Venezuela, Nov. Granat. cult.
B. Caules ramique teretes vel angulares, haud alati.
a. Folia simplicia.
 121. *P. BAHIENSIS*, Klotzsch? Linnæa, xv. 293.
Hab. Brazil.
 122. *P. RIPARIA*, Mart. MSS.
Hab. Brazil (Martius, 3228; Spruce, 2191).
 123. *P. MIERSII*, Mast., sp. n. *loc. cit.*
Hab. Brazil (Burchell, 1378, 3919, 4300; Warming, 1166; St.-Hilaire, 225; Sello, 290; Weddell, 717).
 124. *P. GLANDULOSA*, Cav. Diss. x. t. 281. = *Tacs. glandulosa*, Juss. Ann. Mus. vi. 391. *T. Stoupyana*, DC. Prod. iii. 335. *T. Rohriana*, DC. Prod. l. c. *T. Fockeana*, Miquel, Linnæa, xviii. 364. *T. subcoriacea*, Garcke, Linnæa, xxii. 62.
Hab. Brazil (Burchell, 9303), Guiana Angl. Belgic. et Gallic. ab omnib. collector. reportata.
 125. *P. VARIOLATA*, Poepp. et Endl. Nov. Gen. ii. 58, t. 179.
Hab. Brazil (Spruce, 2868, 2247).
 126. *P. LONGIPES*, Juss. Ann. Mus. vi. 111, t. 38. f. 1.
Hab. in Nov. Granat. et Guiana Britannica (Schomburgk, n. 279).
 127. *P. SUBROTUNDA*, Mast., sp. n. *loc. cit.*
Hab. Brazil (Gardner, 1632, 6030).
 128. *P. TILIÆFOLIA*, Cav. Diss. x. t. 285.
Hab. in Peruvia (Pavon).
 129. *P. COLORATA*, Mast., sp. n. *loc. cit.*
Hab. in Brazil (Sello, 5960).
 130. *P. ÆRSTEDII*, Mast., sp. n. *loc. cit.*
Hab. in Costa Rica (Ærsted).
 131. *P. JILEKI*, Wawra, Bot. Erbgeniss. der Reise d. Kais. von Mexico, &c., p. 59, tab. 8.
Hab. Brazil (St.-Hilaire, 716; Glazieu, 3020; Sello, 5960).
 132. *P. AMABILIS*, Hook. Bot. Mag. 4406.
Hab. Brazil (Sello, 599).

133. *P. MARGINATA*, Mast., sp. n. *loc. cit.*
Hab. Brasil. merid. (Sello, 2126).
 134. *P. LAURIFOLIA*, Linn. Sp. Pl. ii. 1356. = *P. acuminata*, DC. Prod. iii. 328. *P. tinifolia*, Juss. Ann. Mus. vi. 113, t. 41. f. 2.
Hab. Brasilia (Burchell, 9504, 9988; Gardner, 1663; Spruce, 1172, 1394, 3390), Guiana Belgica (Hostmann, 541, 543), Guiana Gallica (Sagot, 281, 287; Splitzgerber, 2), Guiana Anglica, ins. Antillan.
 135. *P. SERRATIFOLIA*, Linn. Amœn. Acad. i. 217, t. 10. f. 1.
Hab. Mexico (Jurgensen, 934; Liebmann, 75; 76, 77, 78, 79, 80, 81, 82; Linden, 894), in Guiana Belgica, Antill. &c.
 136. *P. NITIDA*, H. B. K. Nov. Gen. et Sp. ii. 130. = *P. nymphæoides*, Karst. Linnæa, xxx. 165.
Hab. Brazil (Poeppig, 2584, 2893, 2712; Spruce, 3472; Burchell, 9988; Pohl, 924), Guiana Belgica (Wulfschlägel, 1475), Guiana Anglica (Schomburgk 956), in Nov. Granat.
 137. *P. MALACOPHYLLA*, Mast., sp. n. *loc. cit.*
Hab. Brazil (Warming, 1178).
 138. *P. GUAZUMIFOLIA*, Juss. Ann. Mus. vi. 112, t. 39, f. 1. = *P. theobromifolia*, DC. Prod. iii. 331.
Hab. in Nov. Granat.
 139. *P. COCCINEA*, Aublet, Guiana, t. 324. = *P. velutina*, DC. Prod. iii. 327. *P. fulgens*, Morren, Belgique Horticole, 1866, vol. xiii. p. 193.
 140. *P. MUCRONATA*, Lam. Enc. Méth. iii. 33 (1789). = *P. albida*, Ker, Bot. Reg. t. 677. *P. pallida*, Vell. Flor. Flum. ix. t. 70.
Hab. Brasilia (Gaudichaud, 1039; Tweedie, 1371; Burchell, 1542, 2906; Lund, 1182, 1187; Sello, 110, 214, 2147, 2124; Peckott, 354).
b. Folia 3-5-7-lobata.
 141. *P. PEDATA*, Linn. Amœn. Acad. i. 233, t. x. f. 22.
Hab. in Guiana Angl. (Schomburgk, 633), ins. Antill. Cuba (Wright 2600).
 An huc *P. helleborifolia*, Wallis (nomen tantum)?
 142. *P. TRISECTA*, Mast., sp. nov. *loc. cit.*
Hab. in Bolivia (Pentland).
 143. *P. PALMATISECTA*, Mast., sp. nov. *loc. cit.*
Hab. Tucuman (Tweedie, 1170).

144. *P. SPECIOSA*, Gardn. in Field. Sert. Plant. t. 17.

Hab. Brazil (Gardner, 426, 4691; Glaziov, 1598; Weddell, 3395; Sello, 2132, 2150; St.-Hilaire, 590; Warming, 1171, 1185; Claussen 379, 380; Pohl, 923).

145. *P. QUADRIGLANDULOSA*, Rodschd. Obs. p. 77 (1796); Meyer, Primit. Flor. Essequib. (1818) p. 226. = *Tacsonia sanguinea*, DC. Prod. iii. 334. *Tacs. quadriglandulosa*, DC. Prod. iii. 335. *Tacs. quadridentata*, DC. l. c. *Tacs. pubescens*, DC. l. c. *Passiflora guianensis*, Miquel, Linnæa, xviii. 751.

Hab. Brazil (Spruce, 1789, 1616), Guiana, Ins. Sct. Trinitatis.

146. *P. VITIFOLIA*, H. B. K. Nov. Gen. et Sp. 180. = *P. sanguinea*, Sm. in Rees, Cycl. *P. punicea*, DC. Prod. iii. 329. *Tacs. Buchanani*, Lemaire, Ill. Hortie. t. 519. *Pass. servitensis*, Karst. Linnæa, xxx. 163. An huc *P. caracasana* (Willd.), Spreng. Syst. Pl. iii. 40? et *P. multiformis*, Jacq. Fragm. 169, t. 67. f. 1?

Var. *minor*, Mast.

Var. *involutrata*, Mast.

Hab. in Brasilia (Sello, 2150, 2132), in Nov. Granat. (Linden, 1652; Goudot, 1844; Cuming, 1222), in Amer. Centr. (Fendler, 118; Seemann, 562).

Var. *minor*.

Hab. in Brasilia.

Var. *involutrata*.

Hab. in Brasilia.

147. *P. RECURVA*, Mast., sp. n. loc. cit.

Hab. Brasilia (Gardner, 2877).

148. *P. MIDDLETONIANA*, Paxt. Mag. Bot. ix. (1842) t. 51.

Hab. —? An forma hortensis?

149. *P. CININNATA*, Mast. Gard. Chron. 1868, 966; Hook. Bot. Mag. 5737.

Hab. Brasilia (Gardner, 1025, 1315, 1630; Claussen, 382; St.-Hilaire, 753).

150. *P. INCARNATA*, Linn. Amœn. Acad. i. 230, t. 10. f. 19.

Hab. Amer. Septent.

151. *P. EDULIS*, Sims, Bot. Mag. 1989. =? *P. cu-neifolia*, Cav. Diss. x. t. 292. *P. incarnata*, var. β , Bot. Reg. t. 152?. *P. diaden*, Flor. Flum. ix.

t. 90? *P. rigidula*, Jacq. Eclog. ii. t. 124? *P. pallidiflora*, Bertoloni, Sylloge Plant. hort. Bonon. 1827, p. 6.

Var. α . *verrucifera*. = *P. verrucifera*, Lindl. Bot. Reg. xxvi. t. 52.

Var. β . *Kerrii*. = *P. Kerrii*, Spreng. Syst. Veg. iii. 39.

Var. γ . *pomifera*. = *P. edulis*, Flor. Flum. ix. t. 89, haud Sims. ? *P. serratifolia*, Jacq. Obs. Bot. part ii. p. 26, t. 46. f. 2, non Linn. *P. pomifera*, Rœmer, Synop. Monog. ii. 179.

Var. δ . *rubricaulis*. = *P. rubricaulis*, Jacq. Eclog. t. 169.

Hab. Brasil. merid.

152. *P. MEMBRANACEA*, Benth. Pl. Hartweg. 83.

Hab. Guatemala (Hartweg).

153. *P. ALBA*, Link et Otto, Ic. Pl. Rar. t. 33.

Hab. Brasilia (Gardner, 4690), Mexico (Liebmann, 33, 34), Peruvia, Venezuela (Fendler, 2327).

154. *P. MERIDENSIS*, Karsten, Linnæa, xxx. 165.

Hab. Venezuela. (Species mihi incognita.)

155. *P. GRITENSIS*, Karsten, Linnæa, xxx. 163.

Hab. Venezuela. (Species mihi incognita.)

156. *P. TETRADEN*, Vellozo, Flor. Flum. t. ix. 91. = *P. sidæfolia*, Rœmer, Synops. Monog. ii. 173.

Hab. Brasilia (Peckott, 588).

157. *P. MOOREANA*, Hook. Bot. Mag. 3773.

Hab. La Plata (Tweedie).

158. *P. CORNUTA*, Mast., sp. nov.

Hab. Brasilia (Burchell, 8537).

159. *P. VIOLACEA*, Vellozo, Flor. Flum. (1827) ix. t. 84.

Hab. Brazil (Pohl, 922, 60, 3464; Warming, 1152; Claussen, 378; St.-Hilaire, 1623, 988; Sello, 1149, 2130; Guillemín, 834).

160. *P. AMETHYSTINA*, Mikan, Delect. Flor. et Faun. Bras. fasc. iv. c. ic. color. bona. = *P. onychina*, Lindl. Bot. Reg. ser. nov. 1838, t. 21.

Hab. Brazil (Sello, 709, 2131; Claussen, 33; Guillemín, 378, 384).

161. *P. GARDNERI*, Mast., sp. n. loc. cit.

Hab. Brazil (Gardner, 3193; Pohl, 2484).

162. *P. SUBULATA*, Mast., sp. n. loc. cit.

Hab. Peruvia.

An eadem ac *P. subpeltata*, Ortega?

163. *P. PALLENS*, Poepp. = *P. stipulata*, Benth. ex Griseb. Plant. Wright. Cubens. 2599, nec Aublet.

Hab. Cuba (Wright, 2599), Venezuela (Fendler, 2327).

164. *P. FILAMENTOSA*, Willd. Sp. Pl. iii. 623. = var. β , Bot. Reg. 584. *P. palmata*, Lodd. Bot. Cab. 97.

Hab. Brasil. aust. (Gaudichaud, 1719).

165. *P. ACTINIA*, Hook. Bot. Mag. 4009.

Hab. Brasil. aust. (Burchell, 2822).

166. *P. PILOSA*, R. et P. ex DC. Prod. iii. 330. = *P. menispermifolia*, H. B. K. Nov. Gen. et Sp. ii. 137.

Hab. Peruvia.

167. *P. GLAUCA*, Aiton, Hort. Kew. (1789) iii. 308.

Hab. Venezuela, Mexico, Guiana Belgica, Nov. Granat.

168. *P. STIPULATA*, Aublet, Pl. Guian. (1775) t. 325.

Hab. Guiana.

169. *P. ADENOPHYLLA*, Mast., sp. n. loc. cit.

Hab. Mexico (Linden, 877; Galeotti, 5664; Hahr, 2437).

170. *P. SPRUCEI*, Mast., sp. n. loc. cit.

Hab. in Ecuador, prope Guayaquil (Spruce, 6459).

171. *P. CAMPANULATA*, Mast., sp. n. loc. cit.

Hab. Brasil. aust. (Weddell, 1333).

172. *P. TUCUMANENSIS*, Hook. Bot. Mag. 3636.

Hab. Brasil. merid. Tucuman (Tweedie, 181, 1173; Gibert, 43).

173. *P. EICHLERIANA*, Mast., sp. n. loc. cit.

Hab. Brasil. merid. (Sello, 358; Gaudichaud, 482).

174. *P. PICTURATA*, Ker, Bot. Reg. t. 673.

Hab. Brasil (Burchell, 9573), Guiana Belgica.

175. *P. CÆRULEA*, Linn. Amœn. Acad. i. 231, t. 10. f. 20.

Hab. Brasil. merid. (Sello, 149, 738, 2235), Uruguay (St.-Hilaire, 2291).

176. *P. CALCARATA*, Mast., sp. n. Glabra, caule

tereti; foliis subrotundis trilobis glanduloso-ser-ratis subtus glaucis, petiolo lamina æquilongio medio biglanduloso; stipulis magnis ovato-lanceo-latis; pedunculis petiolis brevioribus; bracteis stipuliformibus; floribus late campanulatis; sepalis dorso sub apice longiuscule calcaratis, coronæ fau-cialis pluriserialis filamentis distinctis patentibus petala subæquantibus; corona membranacea e fauce tubi emergente basi tubulata margine bre-viter filamentosa; ovario oblongo glabro.

Hab. Ins. Madagascar (Bojer in herb. Kew.). Species insignis.

§ 2. *Floris tubus elongatus cylindratus, basi ventricosus.*

177. *P. REFLEXIFLORA*, Cav. Ic. v. t. 425. = *Tacs. reflexiflora*, Juss. Ann. Mus. vi. 393. *Tacs. levis*, Benth. Bot. Sulph. 100. *T. hastata*, Ruiz et Pav.?

Hab. in Amer. centrali (Hartweg, 662), in Peruvia ad Tarapoto (Spruce, 3923).

178. *P. SETACEA*, DC. Prod. iii. 329. = *P. Suru-ruca*, Flor. Flum. ix. t. 88.

Hab. Brazil (Gardner, 47; Pohl, 920; Glaziou, 1538; Lund, 1183; St.-Hilaire, 403; Weddell, 583; Gaudichaud, 1034).

179. *P. RACEMOSA*, Brotero, Trans. Linn. Soc. t. xii. p. 71, tab. 6. = *P. princeps*, Hort.

Hab. Brazil (Gardner, 47; Warming, 1165; Glaziou, 3018; Weddell, 169, 191; Gaudichaud, 1032; Pohl, 921 et 291; St.-Hilaire, 181).

180. *P. RADDIANA*, DC. Prod. iii. 329. = *P. kermesina*, Hort. ? *P. dentata*, Arrab. Flor. Flum. ix. t. 94.

Hab. Brazil (Gardner, 48; Blanchet, 3303; St.-Hilaire, 197; Burchell, 9901; Glaziou, 3018).

Sectio 3. *Bracteæ liberæ, foliaceæ. Corona mem-branacea, brevis, arcte longitudinaliter plicata, margine crispato.* (Sp. 181-184.)

(Habitus sect. *Granadillæ*; corona *Plectostem-matis*.)

181. *P. HAHNII*, Fournier, Rev. Hort. 1869, p. 430, c. tab. color.

Hab. Mexico (Hahn).

182. *P. PULCHELLA*, H. B. K. Nov. Gen. et

Sp. ii. 134. = *P. rotundifolia*, Jacq. Obs. Bot. part ii. (1767), nec Linn. nec Swz. *P. divaricata*, Griseb. Bonplandia, 1858, p. 7. *P. rotundifolia*, β . *Jacquini*, DC. Prod. iii. 326.

Hab. in Amer. Central. (Fendler, 2330).

183. *P. SILVESTRIS*, Vellozo, Flor. Flum. ix. t. 74.

Hab. Brazil (St.-Hilaire, 1689!).

184. *P. MEDITERRANEA*, Vell. Flor. Flumin. ix. t. 72.

Hab. Brazil.

*Species ad Granadillam, ut videtur, pertinentes
haud satis cognite.*

P. ELEGANS, Mast., sp. n. *loc. cit.*

Hab. in Brasilia meridionali (Fox, Bonpland).

P. ATOMARIA, Planchon MSS. in herb. Kew.

Hab. in Nov. Granata (Triana).

P. ARISTULATA, Mast., sp. n. *loc. cit.*

Hab. in Peruvia ad Tarapoto (Spruce, 3988).

P. CYANEA, Mast., sp. n. *loc. cit.*

Hab. in Venezuela ad Topo, prov. Caraccas (Burchell; Fendler, coll. 2, n. 469).

P. NEILLII, Regel, Flora (B. Z.), xxxii. (1849) p. 184.

P. GARCKEI, Mast. (sp. innominat a cl. Garcke descript. in Linnæa, xxii. 60. n. 49 (1849).

P. OVALIS, Vell. Flor. Flum. ix. t. 75, icon tantum.

P. PALLIDA, Lour. Coch. Chin. 644, ex DC. Prod. iii. 331. (An forte *Malpighiacea* quædam?)

P. HERMANNI, DC. Prod. iii. 332.

P. ARVENSIS, Vell. Flor. Flum. ix. t. 71.

P. VERRUCULOSA, Weinmann, Syll. Pl. i. 228.

Hab. Nov. Holl.

P. ADENOPODA, Fl. Mex. ined. ex DC. Prod. iii. 330.

P. PATULA, Wendl.? nomen tantum.

P. HONDALA, Steudel? nomen tantum.

IV. *TRYPHOSTEMMA*, Harv. Thes. Cap. t. 51.
Benth. et Hook. Gen. Pl. i. 811.

1. *T. NATALENSE*, Harv. Thes. Capens. t. 51.

Hab. Natal.

2. *T. ZANZIBARICUM*, Mast., sp. n. in Oliv. Flor. Trop. Afr. ii. 508.

Hab. Zanguebar.

V. *BASANANTHE*, Peyr. in Wawr. et Peyr. Sert. Benguel. 29. Benth. et Hook. Gen. Pl. i. 812.

1. *B. LITTORALIS*, Peyr. Sert. Benguel. 30; Mast. in Oliv. Flor. Trop. Afr. ii. 509.

Hab. Benguella (Welwitsch).

2. *B. NUMMULARIA*, Welwitsch, Trans. Linn. Soc. xxvii. p. 28, t. ix.; Mast. in Oliv. Flor. Trop. Afr. ii. 509.

Hab. Angola (Welwitsch).

Obs. Genus, ut videtur, a *Tryphostemma* haud satis diversum.

VI. *PAROPSIA*, Noronh. ex Benth. et Hook. Gen. Pl. i. 812.

1. *P. GUINEENSIS*, Oliv. Journ. Linn. Soc. viii. 161.

Hab. Africa occid. trop., Old Calabar.

2. *P. GREWIOIDES*, Welw. in herb.: Mast. in Oliv. Fl. Trop. Afr. ii. 505.

Hab. Angola (Welwitsch).

Habitu *Smeathmannias* refert; florum conformatione autem ad *Paropsias* accedit.

3. *P. EDULIS*, Du Petit-Thouars ex DC. Prod. iii. 322.

Hab. Madagascar. (Non vidi.)

4. *P. MALAYANA*, Planch. in herb. Kew. (nomen). Foliis angustis ellipticis, longiuscule acuminatis; floris tubo campanulato; ovario globoso.

Hab. Malacca (Griffith, 2514, pro parte; Main-
gay, 662).

5. *P. VARECIFORMIS*, Mast. Foliis oblongis, acuminatis; floris tubo brevissimo; ovario pyriformi. = *Trichodia vareciformis*, Griff. Notul. iv. 571.

Hab. Malacca (Griffith, 2514, pro parte; Main-
gay, 658, 663).

VII. *SMEATHMANNIA*, Soland. ex R. Br. in Tuckey, Congo, 439. Benth. et Hook. Gen. Pl. i. 812. *Bulowia*, Schum. et Thonn. Pl. Guin. ii. 21.

1. *S. PUBESCENS*, R. Br., DC. Prod. iii. 322.

Hab. Afric. trop. occident.

2. *S. LÆVIGATA*, R. Br., DC. Prod. iii. 322.
Hab. Afric. trop. occident.

VIII. *BARTERIA*, Hook. fil. Journ. Linn. Soc.
 v. 14, t. 2. Benth. et Hook. i. 812.

1. *B. NIGRITIANA*, Hook. fil. *loc. cit.*
Hab. Afric. trop. occident.
 2. *B. FISTULOSA*, Mast. in Oliv. Flor. Trop.
 Afric. ii. 511.
Hab. Afric. trop. occident., Fernando Po.

IX. *CROSSOSTEMMA*, Planch. in Hook. Niger
 Flora, 364. Benth. et Hook. Gen. Pl. i. 813.

1. *C. LAURIFOLIUM*, Planch. *l. c.*
Hab. Afric. trop. occident.

X. *DEIDAMIA*, Thouars ex Benth. et Hook. f.
 Gen. Pl. i. 811.

Species 5, Madagascarienses, a me non visæ.

XI. *THOMPSONIA*, R. Br. ex Benth. et Hook.
 Gen. Pl. i. 811.

Genus a me non visum, a cl. Brown nomine tantum indicatum.

XII. *ATHERANTHERA*, genus novum, e tribu
Modeccearum, *Modeccæ* affine.

Flores dichlamydei, unisexuales, masculi hucusque tantum recogniti. Sepala 5, æqualia, primo inter se æqualiter distantes, postea, ob petalorum inæqualitatem, sepala duo a reliquis sunt amota. Petala 5, imbricata, concava, demum inæqualia. Corona nulla. Stamina 10, quorum 5 sterilia, basi cohærentia, petalisque adnata. Filamenta plana, liguliformia, superne demum torta. Antheræ subglobosæ, uniloculares (connectivo in mucronem curvatum exeunte), primo introrsæ, postea, tortis filamentis, extrorsæ rimaque lon-

gitudinali unica dehiscentes. Pollinis cellulae sphaericæ. Pistilli rudimentum minutum.—Herba cirrata, late scandens. Folia alterna, petiolata, cordata, late ovato-acuta, repando-dentata. Petioli eglandulosi. Stipulae nullæ. Flores paniculatim dispositi.

Genus hucusque floribus masculis recognitum sepalis, petalis, staminibusque, ab affinibus valde diversum. Quoad habitum *Modeccam* refert.

A. WELWITSCHII, Mast. in Oliv. Flor. Trop. Afric. ii. 520.

Hab. in dumetosis ad sylv. oras Mala de Pungo, Angola (Welwitsch!).

GEOGRAPHICAL DISTRIBUTION.

In the 'Flora Brasiliensis' I have given a Table showing the distribution of the species of *Passifloreæ*, so that a few general remarks are all that is necessary in this place. The species are almost wholly tropical in their distribution, which extends in America from about lat. 40° N. to lat. 40° S. The largest number of distinct genera are to be found in tropical Africa; but the species are there comparatively few. On the other hand, the

American genera are few, but they comprise by far the larger number of the species. The Asiatic and Australasian species are not numerous, and their distribution is tropical or subtropical.

The American species of *Passiflora* may roughly be distributed in the following manner, according to the regions they inhabit.

United States. Two species are found in this region. One, *P. lutea*, is found in Pennsylvania and southwards (Gray); it belongs to the *Decaloba* section. The other, *P. incarnata*, is nearly allied to the Brazilian *P. edulis*, which belongs to the subgenus *Granadilla*, and, being so far separate from the remainder of its allies of the same subgenus, may be considered an outlier.

Texas and New Mexico have a few distinct-looking species belonging to the sections *Cieca* and *Decaloba*.

Mexico has several distinct and peculiar species belonging to the subgenera *Cieca* and *Decaloba*.

Central America, from about lat. 15° N. to lat. 8°, has a few species, mostly of Mexican type, and also a few Granadillas. *P. quadrangularis*, indeed, is found wild in the woods of Nicaragua.

The *West Indies* have about thirty species, eleven of which are peculiar to the islands. The species of the section *Murucuia* are confined to this district. There are eight species belonging to the section *Decaloba*, and as many to *Granadilla*; but none of the latter are peculiar. On the whole the West-Indian region, so far as Passion-flowers are concerned, is one of the most distinctly marked.

The *Galapagos Islands* contain two or three distinct varieties, which, indeed, were considered to be species by Dr. Hooker. They pass by so many shades into continental varieties of the protean *P. suberosa*, that, although noteworthy as local or insular forms, I cannot hold them to be specifically distinct.

Venezuela and N.E. New Granada contain several species belonging to the sections *Decaloba* and *Granadilla*.

Guiana and the Amazon district. So far as plants of this order are concerned, the regions above named may be taken together. Rich in species, many of them peculiar, this district is one of the most remarkable of the whole. *Dilkea* is peculiar to it, as also are two of the species of *Passiflora* belonging to the subgenus *Astrophea*, several Granadillas, and some Decalobas. Ciecas are scarce. True Tacsonias, in my sense of the word, are absent.

Western Andes, including, in general terms, the western districts of New Granada, Ecuador, Peru, Bolivia, and Chile. This region is the home of the Tacsonias, many of which grow at great heights on the mountains. No Tacsonias proper are found beyond this district. *T. pinnatistipula* occurs furthest to the south in Chile.

In the lower equatorial regions a few species of *Granadilla* and *Decaloba* are found, and a few Ciecas.

North-east Brazil is not rich in species; the majority are species of *Granadilla*.

Central Brazil, including the east-coast regions, has a large number of species of *Granadilla*, but few peculiar species.

South Brazil, as far south as the Rio Grande, also contains a large number of Grana-dillas, but few of which are peculiar to the district.

The *Argentine Provinces* contain but few species; but a large proportion are peculiar, those from Tucuman in particular.

Asia. A few species of *Passiflora* are found in Central India, one in Nepal, a few in the Malayan peninsula, others in the Malayan islands; and one new species (see *ante*, p. 632, n. 42), very interesting from its isolation, was found by Mr. C. Wright in a small island off Hong Kong*. These Asiatic species belong almost exclusively to the sub-section *Polyanthea*; and some of them were included in the so-called genus *Distemma*, which, however, for reasons previously stated, I cannot concur in retaining. *P. Walkeria*, a so-called species from Ceylon, I believe to be a form of *P. minima*, probably introduced to Ceylon. *P. nepalensis* occurs as far north as Nepaul. I have reason to believe that there are a few undescribed species in Cochin China; I infer this from a cursory glance at some species in the Paris herbarium, but which time did not allow me to examine. In addition to *Passiflora*, the genus *Paropsia* is represented in Malacca.

Oceanic species. Under this head I include species found in the Fiji Islands, New Caledonia, and Norfolk Island. These are for the most part peculiar species of *Passiflora*, belonging to the group *Polyanthea*, and forming, as it were, a transition from the Indian species just referred to to the next or

Australian group, which comprises a small number of forms of the same general aspect as those just mentioned.

West Tropical Africa. Here we have no truly wild *Passiflora*, but a number of distinct and peculiar paucitypic genera, such as *Barteria*, *Smeathmannia*, *Crossostemma*, and *Paropsia* in the north, and *Basananthe*, *Atheranthera*, and *Machadoa* in the south. *Paropsia* is remarkable for having species in Western Africa, Madagascar, and the Malay archipelago. *Tryphostemma* is peculiar to East Africa, unless, as I believe is the case, the western genus *Basananthe* forms a part of it, in which case the genus has representatives on both sides of the continent.

South Africa has the very peculiar genera *Acharia*, *Ceratiosicyos*, and *Tryphostemma*.

Madagascar, so far as known at present, contains some peculiar genera, such as *Deidamia*, *Physena* (of which we know little), a *Paropsia*, and a new species of *Passiflora*

* Mr. Wright has favoured me with the following note referring to this species:—"Mr. Stimson (the zoologist) and myself hired a Chinaman and his boat for a short excursion of two or three days among the islets of the coast eastward of Hong Kong. On one of the smallest which we examined, overgrown with rank grass, perhaps uninhabited at some time of the year, and grazed upon by goats carried there for the sake of the grass, I found the *Passiflora*, to all appearance, indigenous. I had the impression on my mind then that *all* the *Passifloras* were American; hence the vividness of my recollections about it. The name of the islet was written in accordance with the pronunciation of the boatman. It was a very small one, and would hardly appear in any thing like a gazetteer, and only on a chart of large scale.

"CHARLES WRIGHT.

"P.S.—We know the queer mistakes made by travellers among peoples whose language they know but imperfectly or not at all, in the application of names or utterances to objects for which they were not intended. Hence some very odd trivial names have originated. Now it is quite possible that Loong Kong was *not* the name of the island, but of some very different thing, though we so understood our boatman.—C. W."

belonging to the section *Granadilla* (see *ante*, p. 638, n. 176)—a section, as we have seen, having its head quarters in Brazil.

Bourbon and *Mauritius* contain a form of *Passiflora alata*, by some considered distinct—a view I cannot assent to. I should deem it most probable that the species in question has been introduced from America at some period or another, and undergone a slight modification in course of time.

In this brief review of the principal phenomena of geographical distribution of *Passifloreæ* I have hitherto omitted to speak of other tribes than the *Passifloreæ* and also of such species as *Passiflora quadrangularis*, which is cultivated in most parts of the tropics for the sake of its fruits, but which is probably of Central-American origin. Jacquin speaks of it as in cultivation in the West Indies, but not as wild. In Nicaragua, however, it appears to be truly wild, and perhaps in Brazil also. *P. fœtida*, in one or other of its varieties, is widely distributed throughout the tropical and subtropical regions of the globe. Perhaps its large sticky involucre has had something to do with its diffusion, burr-fashion, over so wide an area. Its medicinal or esculent qualities seem hardly sufficiently important to account for its wide dispersion. *P. fœtida* and its varieties occur wild in the West Indies and Brazil. *P. suberosa* and some of its varieties (var. *minima* for example) are also widely dispersed, one can hardly guess how or why; for there seems no special facility in its organization to account for its wide diffusion, and the plant has no prominent ornamental or useful qualities. The head quarters of this species are in the West Indies; but forms of it are very abundant in Brazil. The Galapagos forms have been previously alluded to. *P. edulis*, a Brazilian species, is also cultivated in the warmer parts of the world, and is likely to establish itself as a quasi-spontaneous plant in suitable localities. It has been found in Australia, probably as an escape from gardens (?).

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* In order to avoid unnecessary repetition, only a few of the more important publications are here cited; others are referred to elsewhere, and especially in the enumeration of species.

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To these references might be added many others relating to the history and legends associated with *Passiflora edulis* (Granadilla). A list of such references is given in Linnæus's paper in the 'Amœnitates Academicæ' above cited; others are mentioned in the dissertations of Cavanilles and of C. Morren above mentioned.

EXPLANATION OF PLATES.

PLATE LXIV.

1. *Pass. quadrangularis*. To the left is the peduncular tubercle beginning to divide into flower-stalk (*b*) and tendril (*a*); to the right is the foliar tubercle; *c*, the future leaf; *d*, stipule. The small line beneath the figure denotes the actual size; the × shows the position of the axis.
2. Early stage of leaf, *a*, and tendril, *b*.
3. Upper surface of young leaf, showing the central groove.
4. Early stage of leaf, peduncle, &c.: *a*, stipule already well developed; *b*, leaf; *c*, tendril; *d*, peduncle with bracts.
5. Early stage of leaf, flower, &c.: *a*, leaf turned down, showing gland at the upper end of the incipient leaf-stalk; *b*, *b*, stipules; *c*, tendril; *d*, flower-stalk; *e*, *e*, *e*, bracts; *f*, flower-tubercle.
6. Leaf from 5, separated; seen from the side and more highly magnified; the lower pair of glands are the most advanced in development.
7. *Pass. alata*: *a*, earliest stage of the flower; *a*, *b*, *c*, bracts; *d*, tendril; *e*, floral tubercle.
8. Flower further advanced, seen from the side; only three of the sepals are yet distinguishable.
9. Flower still further developed, seen from the side; the bracts have greatly increased in size, and are now nearly equal; the calyx has five sepals.
10. Flower in a still further stage of development, seen from the top, and a little flattened artificially; 1-5 are the sepals, all now provided with their *corniculus*. Between the sepals are five petal-tubercles.

11. In addition to the parts shown in fig. 10, the 5 stamen-tubercles are here seen opposite the sepals.
- 11*a*. Young anthers from 11.
12. Longitudinal section through a portion of a flower further developed than 11, and showing the three carpellary tubercles.
13. Gynæcium from a flower more advanced than 12. The styles remain separate, but the bases of the carpels are inseparate.
14. One petal with the stamens, their filaments now obvious.
15. Portion of a flower more advanced than 14. At the base of the petal may be seen the corona just appearing, also the commencement of the receptacular tube and of the gynophore.
16. Section through the pistil of 15, enlarged, showing the origin of the ovules as little conical or sub-globular tubercles from the wall of the pistil.
17. Portion of the same flower as 15, showing the corona.
18. All the parts of the flower are apparent in this section.
19. *Pass. racemosa*. Portion of the placenta from a young bud, showing the progressive development of the ovules.
20. Separate ovules, showing nucleus, secundine and primine; curvature taking place.
21. Top view of ovule.
22. *Pass. alba*. Ovule fully formed. At the apex of the funicle is a little expansion, which is the beginning of the arillus.
- 23, 24. Further stages in the development of the arillus.
25. Arillus laid open.
26. *Pass. foetida*. Ripe seed.
27. *Pass. alba*. Primine partially cut away to show the secundine marked with pits.
28. Fragment of an ovule showing at *a* the primine turned on one side; at *b* the inner surface of the secundine next the nucleus, and marked with conical projections corresponding to the pits on the outer surface; *c*, cut edge of the secundine.

PLATE LXV.

1. Female flower of *Modecca tamnifolia*. A portion of the tube of the flower is removed to show the position of the staminodes (much enlarged).
2. Section lengthwise through the middle of the flower: *a*, gynophore; *b*, inner staminode; *c*, outer staminode; *d*, petal; *e*, sepal; *f*, corona.
3. Diagram showing the arrangement of the parts; the letters refer to the same organs as in the preceding figure.
4. *Pass. cincinnata*. Section through the flower, and intended to show the manner in which the stamens curve over and deposit the pollen among and upon the inner threads of the corona: *a*, bract; *b*, sepal; *c*, petal; *d*, outer thick threads of the corona; *e*, stamen, beneath which are the inner fine threads of the corona; *f*, the honey-secreting portion of the flower-tube.
5. Top view of a portion of the flower of *Passiflora cincinnata*, showing the stamens bent down so as to come into contact with the inner threads of the corona. (Figures 1-5 drawn by Mr. Worthington Smith, F.L.S.)
6. Portion of the stem of *Passiflora quadrangularis*, magnified 200 diam. (see text).
7. *Pass. punctata*. Epidermis and gland of leaf (*ocellum*), raphides, &c. (see text).
8. *P. quadrangularis*. Section of petiole, showing the arrangement of the vascular bundles, $\times 25$ (see text).
9. Section across midrib, $\times 25$ (see text).
10. Section through thread-like tip of the filament, $\times 250$.

W.G.S. et-
-M.T.M. del. ad nat.

G. Jarman sc.