

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

No. 15. MARCH 1849.

XVIII.—*Observations upon several genera hitherto placed in Solanaceæ, and upon others intermediate between that family and the Scrophulariaceæ.* By JOHN MIERS, Esq., F.R.S., F.L.S. &c.

MY attention during the last few years having been directed to the study of the *Solanaceæ*, I have given the results of this inquiry in a series of memoirs in the 'Lond. Journ. Bot.,' vols. iv., v. and vii., and also in the 'Illustration of South Amer. Plants,' where delineations are offered of the peculiar features of each genus. Having at length completed the analysis of the remaining genera of this order, the results will be given in succession in this Journal; but in order to explain my views in regard to that family, the following observations are necessary.

Following the track I had marked out as the basis of these investigations, which has been chiefly to satisfy myself by careful analysis of the true limits that serve to separate different genera, I have encountered a number of facts which are very difficult to reconcile with our present distribution of the *Solanaceæ*, and which have induced me to carry this inquiry much further than was at first contemplated. These results having been published at intervals, as they presented themselves, the order in which they have appeared is necessarily imperfect in a systematic point of view; but as my principal object has been to arrive at truth, I expect some degree of indulgence, for what may appear as defects of arrangement and want of plan. I have alluded to the increasing number of novel cases that have offered themselves during this inquiry, which render it difficult to decide whether certain genera should be classed in *Solanaceæ* or in *Scrophulariaceæ*, as these natural orders are at present considered; and in consequence of the accumulation of these anomalies, it appears at length necessarily expedient to draw a more certain line of distinction between these two important natural orders. This difficulty is not new in the history of the science, for nearly forty

years ago it did not escape the acute penetration of our distinguished countryman Mr. Robert Brown, who then suggested the plan of avoiding it by the establishment of an intermediate family*. Another of the great botanists of our time, Mr. Bentham, who has made the *Scrophulariaceæ* one of the chief objects of his study, and to whom we are indebted for the admirable monograph of that order in the 10th volume of the 'Prodromus' of DeCandolle, published only two years ago, although evidently aware of this necessity, has never carried it into execution: the tribe of the *Salpiglossideæ*, which he placed at the head of the *Scrophulariaceæ*, was manifestly framed under a point of view bearing toward this end; and in the addenda to the same volume of the 'Prodromus,' p. 595, he offers some remarks upon what I had previously hinted, respecting the separation of the genus *Lycium* from the *Solanaceæ* (Lond. Journ. Bot. v. 183).

The establishment of the *Salpiglossideæ* in the manner just mentioned, has however in no degree removed the objections before existing, and from the facts which I shall now have to communicate, these exceptions will be seen increased to a manifold amount, for it is now evident that a considerable number of genera, hitherto placed in *Solanaceæ*, possess a regular corolla, with a 5-lobed border, offering an imbricate æstivation, contrary to the usual structure of the order, and although possessing five stamens, one is often smaller, and sometimes sterile, showing an evident tendency towards the structure of the *Scrophulariaceæ*; and thus, besides *Lycium* and some of the genera of the *Salpiglossideæ*, we have now *Petunia*, *Nierembergia*, *Solandra*, *Juanullosa*, *Marckea*, *Hyoscyamus*, *Atropa*, *Mandragora*, *Nicandra*, *Anisodus*, &c. &c., forming too important a number of exceptional cases to be passed over in neglect. Having lately examined with much care the structure of most of these genera, I am now better prepared to carry out the views, which I hinted at three years ago, in an earlier stage of this inquiry (Lond. Journ. Bot. v. 152), where I suggested the propriety of associating these dissident genera in a distinct and intermediate tribe or family.

I therefore now propose definitely to confine the *Solanaceæ* as

* *Solanaceæ*, "a Scrophularinis distinguuntur præcipue embryo arcuato vel spirali et corollæ æstivatione plicata, floribusque sæpissime regularibus isostemonibus. Hinc genera corolla non plicata et simul embryo recto, vel excludenda, vel cum iis corolla imbricata, embryo leviter arcuato, staminibusque didynamis in propria sectione disponenda, futuri ordinis initia."—*Prodr.* p. 444.

From the state of our knowledge at that time, it is evident that these allusions were intended to apply principally to the *Verbasceæ*, which by Jussieu, Linnæus and most preceding botanists were classed among *Solaneæ*, but they certainly may be referred with additional force to the instances alluded to above.

nearly as possible within the limits prescribed by Mr. Robert Brown in his 'Prod.' (*loc. cit.*), viz. to those genera with a monopetalous corolla, with a 5-, rarely 4-partite border, even in exceptional cases nearly regular and equal, the borders of whose lobes are always valvate or induplicato-valvate in æstivation; epipetalous stamens, alternate with and equal to the number of the lobes, the fifth being seldom shorter and still more rarely sterile, anthers always bursting by longitudinal slits or pores; an ovarium most generally 2-celled, rarely 3- to 5-locular, with a simple style, a bilobed or clavate stigma often hollow; a fruit either capsular or baccate, and albuminous seeds with a terete embryo, straight, and more or less curved in a nearly annular form, or somewhat spiral, the radicle in all cases pointing to the basal angle of the seed, and turned away to some short distance from the hilum, which is generally lateral and marginal, rarely almost basal.

The *Scrophulariaceæ* I would also propose should be confined to those genera that possess a tubular corolla more or less curved and irregular, with a 4- or 5-partite border generally unequal and bilabiate, the lobes rarely equal, but in every case with a decidedly imbricate æstivation; stamens 2 or 4, didynamous, seldom with a fifth, which is very rarely fertile, often only rudimentary: an ovarium, most generally bilocular; a simple style, with a stigma more or less bilabiate or bilobed; the fruit almost always capsular (in very few instances baccate), 2-locular, rarely more-celled, bursting in various ways, with central placentæ adnate to the dissepiment, and an embryo enveloped in albumen but little curved, generally with the radicle pointing to a basal hilum*; in one solitary instance (*Campylanthus*) the embryo is however perispherically curved. In this very natural family, although the floral leaves are often alternate, the cauline leaves are most generally opposite, which occurs only accidentally in *Solanaceæ*, and the origin of the inflorescence is strictly axillary. Thus limited, they form a very distinct natural order.

The intermediate group, which I now propose as a suborder, under the name of *Atropineæ*, or as a new order, under that of *Atropaceæ*, will consist of genera having a tubular persistent calyx, more or less deeply divided, a hypogynous tubular corolla, with the tube more or less plicated in bud, and with a border generally divided into 5 lobes slightly unequal, but which are

* According to Mr. Bentham's authority, DeCand. 'Prod.' x. p. 186, and a statement positively affirmed by most botanists, but one which, it appears to me, must be received with some modification; for in the seemingly truthful analyses of the genera figured by Nees v. Esenbeck, 'Gen. Pl. Germ.', the radicle is shown as in *Solanaceæ*, not pointing directly to the hilum. See plates of *Erinus*, *Veronica*, *Wulfenia*, *Odontites*, *Euphrasia*, *Bartsia*, *Pedicularis*, and *Alectorolophus* (*Rhinanthus*).

always either imbricately disposed in æstivation or arranged under some modification between that form and the plicate, but never valvate, the margins of each lobe being constantly free from those of the adjoining ones; they have generally 5 fertile epipetalous stamens, alternate with the lobes, with one of them sometimes a little shorter, 1 or 3 being very rarely sterile; anthers bilobed, with the lobes parallel, bursting longitudinally at the margin, one of these lobes being sometimes sterile; the ovary 2-celled, rarely 5-locular, with ovules generally ascending, attached to fleshy placentæ which are adnate to the dissepiments, as in *Solanaceæ* and *Scrophulariaceæ*, a simple style, and a bilobed stigma often of a very peculiar form; the fruit is either baccate or capsular, the seeds generally reniform or compressed, with a lateral hilum; the embryo, placed in albumen, is either straight or more or less curved, sometimes perispherically or spirally. They are plants with much the habit of the *Solanaceæ*, with alternate, simple or geminate leaves, many of them possessed of powerfully medicinal properties.

They offer the peculiarity, distinct from *Scrophulariaceæ*, and similar to that of the *Solanaceæ*, in having the origin of the inflorescence always somewhat extra-axillary and lateral in regard to the insertion of the petiole. I propose to arrange them in the following manner:—

ATROPINEÆ OR ATROPACEÆ.

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|---|---|--|
| <p>Tribe 1. <i>Nicotianeæ</i>. Corolla with an elongated funnel-shaped tube, often more or less hypocrateriform, with 5 nearly equal lobes, which are conduplicate and then twisted in æstivation, as in <i>Convolvulus</i>: stamens 5, one frequently shorter; anthers 2-lobed, lobes almost free, medifixed, and without connective, bursting laterally along the outer edge: capsule 2-locular with bifid valves, the margins of which are somewhat septical, and slightly inflexed at base: seeds with a short terete embryo somewhat incurved or slightly arcuate.</p> | } | <p><i>Nicotiana</i>,
<i>Lehmannia</i>,
<i>Sairanthus</i>,
<i>Polyclidia</i>.</p> |
| <p>Tribe 2. <i>Datureæ</i>. Corolla with an elongated funnel-shaped tube, having a 5-angular expanded border with a contorted complicated æstivation, as in the <i>Nicotianeæ</i>: 5 equal stamens; anthers 2-lobed, lobes linear, laterally adnate, dorsally attached to a fleshy connective, and bursting longitudinally in front: fruit sub-baccate or capsular, 2-celled above, 4-celled below, with the fleshy placentæ adnate to the middle of the dissepiment: seeds with a nearly annular curved terete embryo.</p> | } | <p><i>Datura</i>,
<i>Ceratocaulis</i>,
<i>Brugmansia</i>.</p> |

Tribe 3. *Duboisieæ*. Corolla with a tube either elongated and ventricose above, or short and rotate, with a 5-lobed border, the lobes being diversely volutive in æstivation: 5 equal stamens or 4 didynamous with the rudiment of a fifth; anthers rounded, cordate, always extrorse, either 2-celled, with the cells confluent at the apex, or unilocular with a hippocrepiform line of dehiscence, and gaping transversely as in *Verbascum*: ovarium 2-locular, with numerous ovules affixed to thickened placentæ adnate to the dissepiment: fruit either baccate or capsular, 2-valved, with septicidal dehiscence: terete embryo in albumen, slightly curved.

Duboisia,

Anthocercis,
Anthotroche.

Tribe 4. *Schizanthææ*. Corolla deeply cleft into several irregular divisions, with a somewhat reciprocative æstivation: stamens 5, of which 3 are sterile; style erect, with a small fistulose stigma, slightly swollen below, its contracted entire margin filled with a globose viscous gland: capsule 2-celled, 4-valved, seeds with a terete hemicyclically arcuate embryo.

Schizanthus.

Tribe 5. *Salpiglossideæ*. Corolla more or less ventricose above, sometimes contracted in the mouth, the border being divided into 5 nearly equal regular segments, one of them always somewhat larger and more erect, their æstivation being reciprocative (see p. 172): stamens 4, didynamous, sometimes with the rudiment of a fifth; anthers 2-lobed, lobes divaricate at base, connected at apex by intervening filament, one of the lobes being sometimes reduced to a small lateral dehiscent gland: style winged at its apex or expanded into a remarkable tongue-shaped process, which is stigmatose at its emargination: fruit capsular, 2-locular, 2-valved: embryo slightly curved, much more so in *Salpiglossis*.

Salpiglossis,
Pteroglossis,
Leptoglossis,
Browallia.

Tribe 6. *Petunieæ*. Corolla with an elongated tube, sometimes hypocrateriform, seldom with the rudiment of a palate, the border being divided into 5 nearly equal, rounded and emarginated lobes, their æstivation in *Petunia* being replicative (see p. 173), in *Nierembergia*, replicative at the base of the lobes, with a perfectly quincuncial imbrication at their summits: stamens 5, one of which is shorter, 2 longest; anthers 2-lobed, divaricate at base, without connective: stigma expanded into a remarkably tongue-shaped form, emarginate at its apex, in *Nierembergia* embracing the anthers: capsule and seed as in *Salpiglossideæ*.

Petunia,
Nierembergia.

Tribe 7. *Hyoscyameæ*. Corolla tubular, more or less expanded in the mouth in a campanular form, with the border divided into 5 equal rounded lobes: stamens 5, equal; anthers 2-lobed, affixed to a narrow dorsal connective above, free below, and bursting longitudinally in front near the margin: ovarium 2-celled, and singularly surmounted by a fleshy epigynous gland, which is either small and stylobasic, or else enveloping the upper moiety of the ovarium: fruit an exsuccous berry, which sometimes bursts by a circumscissile line on the margin of the gland: embryo terete, annular, and somewhat spiral.

Hyoscyamus,
Scopolia,
Physoclena,
Cacabus,
Thinogeton.

Tribe 8. *Atropeæ*. Corolla tubular, more or less campanular, with a border divided into 5 equal rounded lobes, which are imbricate in æstivation: stamens 5, equal; anthers ovate, 2-lobed, lobes laterally adnate, reversed in *Atropa* by the deflexion of the filaments: fruit baccate, 2- or 5-celled, fleshy, often somewhat exsuccous: embryo terete, nearly perispherical.

Atropa,
Nicandra,
Cliocarpus,
Anisodus,
Mandragora,
Lycium.

Tribe 9. *Solandraæ*. Corolla generally with an elongated, straight, rarely a short tube, in no degree plicated in bud, border 5-cleft into more or less rounded equal lobes: 5 equal stamens, generally epipetalous, but sometimes arising from the outside of a free ring, attached to the base of the corolla; anthers oblong, 2-celled, cells parallel and adnate upon a dorsal connective, and bursting longitudinally in front: fruit a fleshy 2-locular berry, and seeds with a nearly straight terete embryo, with a lax testa, as in the *Cestrineæ*.

Solandra,
Marckea,
Juanulloa,
Sarcophysa,
Ectozoma.

Tribe 10. *Brunsfelsiæ*. Corolla with a more or less elongated tube, somewhat ventricose below the contracted mouth, border divided into 5 nearly equal segments, their æstivation being decidedly imbricative (unknown in *Heteranthia*): stamens didynamous, somewhat inflected at the apex, with one pair shorter; anthers unilocular and hippocrepiform, as in the *Verbasceæ* and the *Duboisieæ*: style slender: stigma small, bilobed, and simply clavate, or with the lobes somewhat gaping: fruit either capsular or baccate, with a nearly straight embryo.

Brunsfelsia,
Franciscea,
Heteranthia.

The *Solanaceæ*, *Atropaceæ* and *Scrophulariaceæ*, as here defined, evidently constitute an alliance, bound together by very striking and peculiar characters, distinguishable in the structure of their corolla and ovarium, but more especially in that of their

fruit, which is most generally 2-celled, with many seeds fixed to thickened placentæ adnate to the dissepiment, and having a terete embryo, more or less curved, with an inferior radicle, characters that are common to the whole of this large group. So gradual is the transition from one link to another of this chain, that it is difficult to discover any decided break in their continuity, but notwithstanding this, they form too large an assemblage to constitute one single family. The *Solanaceæ*, as distinguished from the *Scrophulariaceæ* in general, exhibit characters sufficiently marked, but the difficulty lies with the large intermediate group above indicated, that equally partake of the features of both these extremes. I am quite averse to the practice of multiplying unnecessarily the amount of natural orders beyond the smallest possible number: it is not therefore any idle notion of proposing a new family that leads now to this suggestion, which would defeat its own object unless supported by facts, and urged by the necessity of the case; but it is the desire of grappling with a formidable obstacle, that would otherwise prevent us from establishing any decided limits between these two great families. If this difficulty presented itself to me in so prominent a degree three years ago (*Lond. Journ. Bot.* v. 183, *note*), when I first noticed the anomaly in *Lycium*, and suggested its separation from *Solanaceæ* on that account, with how much more force must this discrepancy present itself, when the exceptionable cases now amount to so extensive an accumulation in point of number! The æstivation of the corolla has hitherto been considered to form an unerring line of demarcation between the *Solanaceæ* and *Scrophulariaceæ*, but if we place in the former family a large proportion of genera possessing an imbricate æstivation, and offering frequently nearly anisomerous flowers (characters peculiar to the last-mentioned order), we lose at once the only valid features that can serve to discriminate the boundaries of these great families. It is clear that the intermediate group here proposed to be collected together can only be disposed of in three modes: they must be associated either with the *Solanaceæ*, or be attached to the *Scrophulariaceæ*, or else they must remain as a distinct family. In the first case, the *Solanaceæ* would be then divided into two suborders: 1. the *Solanineæ*, having a corolla with valvate æstivation; and 2. *Atropineæ*, with imbricate æstivation. In the second case we should associate, 1. *Atropineæ*, with flowers nearly isomerous; and 2. *Scrophularineæ*, with anisomerous flowers. In either of these two cases we find that inconsistency to a great extent would be unavoidable; for in the former instance we admit a large circle of exceptions to the only leading characteristic mark of the order; and in the second case we include a considerable number of genera, nearly isomerous, in a

family whose principal feature is to possess anisomerous flowers ; but in the third case we avoid these difficulties and ensure consistency, preserving at the same time the peculiar characteristic features both of the *Solanaceæ* and *Scrophulariaceæ* : we should then have thus, 1. *Solanaceæ*, offering isomerous flowers with a valvate or induplicato-valvate æstivation ; 2. *Atropaceæ*, isomerous flowers, or nearly so, with imbricate or a peculiar æstivation ; and 3. *Scrophulariaceæ*, anisomerous flowers with imbricate æstivation. In any of the three modes of distribution above indicated, it matters little which we adopt, in regard to the absolute arrangement of the various genera, for in every case they remain alike, in exactly the same linear order of position. The value of the *Atropaceæ*, as a distinct order, must now rest entirely on its own intrinsic merits : its adoption seems the only course by which a large amount of inconsistency can be removed, and it appears to me a far less objectionable plan to call up a new family, than to destroy the great landmarks that serve to discriminate the limits of two of the most natural families in the system.

Having shown the arrangement proposed for the distribution of the *Atropaceæ*, I must offer the following explanation. The division into the suborders *Rectembryeæ* and *Curvembryeæ*, as proposed by Endlicher, and followed by me in the arrangement of the *Solanaceæ* formerly given in 'Lond. Journ. Bot.' v. 148, offers by far too inconstant and doubtful a character to be maintained there, or be adopted here ; for among the *Salpiglossideæ*, some species of *Petunia* possess an embryo nearly straight, and more curved in others, while in *Salpiglossis* it is often spirally bent into more than a complete gyration. I have preferred rather to follow the æstivation of the corolla, as it gradually verges from the plicato-valvate of the *Solanaceæ* into the imbricate mode of the *Scrophulariaceæ* : thus in the tribes *Nicotianeæ* and *Datureæ* we have the contorto-conduplicate, a form by no means valvate, but the first departure from it : in the *Duboisieæ* we have another advance, where the lobes of the border are seemingly valvate, but on examination their margins will be found convolutely inflected, a form which I have named volutive : in the *Salpiglossideæ* it assumes the next step here denominated reciprocative : in the *Petunieæ* we have again another degree, which is only a modification of the imbricative, and which I have termed replicative : and finally, in the *Hyoscyameæ*, *Atropeæ*, *Solandreæ* and *Brunsfelsieæ*, it becomes decidedly imbricative and quincuncial, as in the *Scrophulariaceæ*, with which natural order the latter tribe most closely osculates. In the *Atropeæ* the amount of imbrication is small in extent ; in the genera *Brunsfelsia* and *Solandra* it is excessive in amount, the lobes wholly enveloping one another in

succession. I proceed now to add a few remarks upon each tribe separately.

1. *Nicotianææ*.—The æstivation of the corolla in this tribe, as has been just remarked, is by no means valvate, or induplicato-valvate, as in the *Solanaceææ*, the lobes of its border being on the contrary conduplicate, that is to say, the sides are turned inwards, and each lobe is thus folded separately on its inner face, along the central nervure, the sides closely pressed together, the margins being quite free from those of the adjoining lobes, and thus plicated, they all possess a spirally twisted inclination in the bud. This approaches the æstivation of the *Salpiglossideææ*, to which tribe they offer a still nearer affinity in having the fifth stamen very often shorter, with the other four somewhat didynamous. It is for these reasons that I have removed the *Nicotianææ* from the *Solanaceææ*, where I formerly placed them.

2. *Datureææ*.—With this very natural group *Solandra* has been associated by most botanists, but it evidently possesses a very different relationship. The *Datureææ* are remarkable for their large showy flowers, and they all present an æstivation similar to that of the *Nicotianæææ*, only more decidedly contortive and quite distinct from the valvate præfloration of the *Solanaceæææ*. *Brugmansia* I consider as most decidedly distinct generically from *Datura*, with which it is associated by most botanists, differing in many points of structure, and forming arborescent shrubs, sometimes even tall trees, with long pendent trumpet-shaped flowers of an unusually large size.

3. *Duboisieææ*.—The genera composing this very distinct group were partly included by Mr. Bentham (Prodr. DeCand. x. 191) in his *Salpiglossideææ*; these are *Duboisia* and *Anthocercis*, to which Prof. Endlicher added *Anthotroche*, a genus which by the former has been referred to *Solanaceæææ*. In proposing to alter the decisions of so distinguished a botanist as Mr. Bentham, who, from the accuracy of his observations and the solidity of his conclusions, stands deservedly as one of the first botanists of our time, it becomes necessary that I should offer some extremely valid reasons for the changes now suggested, and accordingly I will offer a few remarks on each genus in succession.

a. *Duboisia* appears to me to have no relation with any genus belonging to the *Scrophulariaceæææ*. Its only species was originally described by Mr. Brown in his 'Prodr.' p. 448, who placed it, together with *Anthocercis*, in a second section of *Solanææææ*. The habit of this plant, as well as the structure of its flowers, are there stated to agree with those of *Myoporum*, whence it derived its specific name: the figure given of this plant by Endlicher in his 'Iconographia,' pl. 77, sufficiently agrees with other Myoporaceous plants there designed. On examining a specimen of

the same plant in Sir Wm. Hooker's herbarium, I noticed one very important character that has been quite overlooked by all preceding observers: the anthers are here decidedly extrorse, instead of the usual introrse direction before assigned to them. This circumstance brings *Duboisia* in close connexion with the two following genera, and at once removes them from the tribe of the *Salpiglossideæ*.

β. *Anthocercis*.—I was glad to avail myself of the opportunity of investigating the structure of the flowers in this genus from a plant in the living state of *A. viscosa*. It agrees with the figure given by Endlicher in his 'Iconographia,' tab. 68, of *A. littorea*, with the exception of the very important feature of the structure of the anthers, which, as in the preceding genus, offer the very distinct peculiarity of being affixed extrorsely just above the sinus upon the filament, so that the lines of dehiscence are towards the tube of the corolla, not introrsely towards the centre of the flower, as appears represented in the plate above referred to. The æstivation of the corolla in *Anthocercis viscosa* is also very peculiar: at first sight it would be said to be induplicato-valvate, but upon more careful examination it will be observed that each lobe of the border is distinctly supervolute, one of its edges being rolled inwards and overlapped by its opposite edge; these are not all turned in one direction, two being dextrorsely, and the other three coiled up alternately in a sinistrorse order. This mode of æstivation is certainly extremely unusual and peculiar, approaching that observed in the *Goodeniaceæ*, on which on a former occasion (Lond. Journ. Bot. vii. p. 59) I have made some observations. There exists between them this difference, that here each lobe is longitudinally and supervolately coiled round upon itself, in a somewhat spiral form, while in *Goodenia* the winged margins are respectively folded back over one another, upon the plane of the central portion of each segment. I have also examined in the dried state the flowers of *A. littorea*, *A. albicans*, *A. Tasmanica* and *A. scabrella*, and they all appear to offer the same kind of æstivation and similarly extrorse anthers, so that these appear to be constant characters. It is worthy of remark, that the peculiar smell of the leaves and flowers of *Anthocercis viscosa* resembles that of the *Myoporaceæ*, and that its pedicels are bibracteate, which is also a feature in that family; but its extra-axillary peduncles, the æstivation of its corolla, the position of its stamens, its bilocular ovary with numerous ovules attached to a thick-



ened placentiferous dissepiment, its many-seeded capsular fruit, and its slightly curved embryo with an inferior radicle, are characters quite opposed to its admission into that family. Nor can these be made to harmonize either with the *Scrophulariaceæ* or *Solanaceæ*, to the latter of which they offer a nearer affinity. These characters are sufficiently prominent and distinct, and demand a more attentive investigation.

γ. *Anthotroche*.—This genus was placed by Prof. Endlicher in *Scrophulariaceæ*, among the *Salpiglossideæ*, but it has been since excluded from the order by Mr. Bentham, and referred to *Solanaceæ* (DeCand. Prodr. x. p. 586). It appears to me however to have as little relation with the one as with the other of these families. Upon examining a specimen belonging to this genus from Swan River, I find that in the structure of its anthers it agrees entirely with that just described as existing in *Duboisia*; this consists of one reniform unilocular cell, fixed extrorsely on the filament, and dehiscing on the exterior face by one hippocrepical suture. Here the tube of the corolla is short and straight, and the border is divided into five regular lobes, which are rotately expanded; the stamens are 5 and equal. The ovarium has an epigynous prominent stylobasic gland as in *Cacabus*, analogous to that of *Hyoscyamus*.

Respecting the *Duboisieæ* it only remains to be observed, that the main points of distinction between it and the other tribes with which it is here associated, will be found to exist in the extrorse direction of the anthers and the singular æstivation of the corolla, peculiarities which, although very remarkable, are not of themselves of sufficient importance to claim for the plants that compose it the rank of a separate family, but they constitute a very distinct tribe of the *Atropaceæ*. It will consist of two sections: 1. *Euduboisieæ*, with baccate fruit, and 2. *Anthotrocheæ*, with capsular fruit, comprising *Anthocercis* and *Anthotroche*. It corresponds with the other tribes of the *Atropaceæ* in the origin of the floral peduncles being lateral with respect to the point of insertion of the petiole.

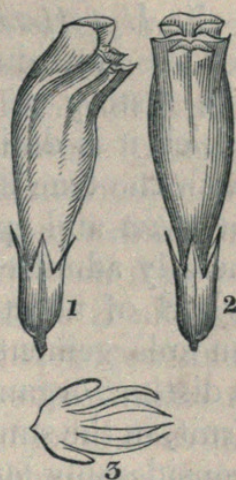
4. *Schizanthææ*.—The genus *Schizanthus*, from the lateral extra-axillary insertion of its pedicels and other characters, appears evidently to belong to the *Atropaceæ* rather than to the *Scrophulariaceæ*, but it does not accord with any of the tribes above noticed. It differs from them in the structure of its anthers, which consist of two parallel cells, quite distinct and separated from one another, but conjoined by a broad membranaceous connective, upon which they are dorsally attached: it possesses five stamens, of which three are quite anantherous and rudimental; the corolla is deeply cleft into numerous unequal segments which have an imbricate æstivation. Its stigma approaches the form

of that of *Heteranthia*: its fruit is capsular as in the *Salpiglossideæ*, and its seeds contain a terete embryo, curved in an almost spiral form. Its leaves are always alternate and deeply pinnatisected, showing an approach to *Salpiglossis* and *Pteroglossis*. The abortion of three of its stamens is an irregularity of which we find a parallel case in *Ianthe*, which only differs in that respect from *Verbascum*; and the deeply laciniated divisions of its corolla is another abnormal feature, but this may be considered only as a separation of the lobes of the corolla at each sinus, or a return to its five normal divisions, with a still farther cleavage of each lobe, by an extension in an excessive degree of the incisions commenced in the emarginatures of all the lobes of the border in *Salpiglossis*, which thus shows a tendency towards the laciniated form of the corolla of *Schizanthus*.

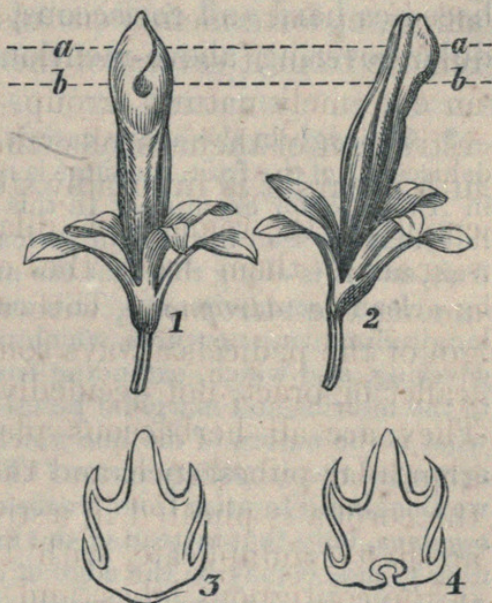
5. *Salpiglossideæ*.—I have ventured to remove this tribe wholly from the *Scrophulariaceæ* for the reasons that will be here fully explained, and as these are founded upon facts in great measure new, I may confidently expect that such an arrangement will meet with the concurrence of the author of the able monograph of this last-mentioned family, who in detailing the characters of the tribe in question, as given in the Prodr. DeCand. x. p. 190, goes the length of saying, “subordo Solanaceis capsularibus arcte affinis, et forte melius eis adsociandus.” I propose however to remove from it several of the genera there associated. They form an extremely natural group, distinguished by the very peculiar æstivation of their corolla, their didynamous stamens, or where a fifth occurs it is invariably sterile, and they are especially conspicuous for the remarkable dilatation of the stigma, which at once signalizes them from the others. Their place is manifestly among the *Atropaceæ*, with which they agree in having the origin of the pedicels always somewhat lateral in regard to the floral leaflet or bract, not decidedly axillary, as in the *Scrophulariaceæ*. They are all herbaceous plants, generally clothed with viscid glandular pubescence, and the campanular portion of the tube of the corolla is plicated in æstivation; but the lobes of its border are first conduplicate, with the margins always free from those of the contiguous lobes, and twisted inwards in a peculiar manner, for which I have proposed the term *reciprocative**, a condition intermediate between the induplicato-valvate æstivation of the *Solanaceæ* and the imbricate præfloration of the *Scrophulariaceæ*; in order to render this more evident, the accompanying

* It may be thus defined: *Æstivatio reciprocativa*, i. e. lobi superioris exterioris marginibus utrinque induplicatis, loborum alterorum simpliciter conduplicatis, 2 sinistralibus dextrorsim, 2 dextralibus sinistrorsim torsive convolutis, marginibus sese applicitis et a contiguis liberis postice spectantibus, plicaturis antice inclinantibus.

figure is given in the margin; fig. 1 being the corolla viewed sideways; fig. 2, ditto seen in front; fig. 3, ditto seen from above. I have added to this group a new genus, *Pteroglossis*, founded upon a plant collected in the north of Chile by Bridges (his No. 1389). In *Salpiglossis* the two broadly expanded lips of the stigma appear almost confluent into a tongue-shaped process, while in the other genera they are more or less distinctly separated and 2-lipped, especially in *Leptoglossis* and *Browallia*; but in *Pteroglossis* one of the lips appears altogether wanting, or reduced to a small prominent gland.



6. *Petuniæ*.—The genera which I have separated from the *Solanaceæ* to form this tribe, approach the *Salpiglossideæ* most closely in habit and in the general structure of their flowers and seeds, and moreover partake of their peculiar feature, the great dilatation of their stigma: the broadly expanded lips of this organ appear however more or less soldered into a tongue-shaped process, as in *Salpiglossis*, which singularly embraces the connate anthers in *Nierembergia**. They differ notwithstanding from the *Salpiglossideæ* in the peculiar complex æstivation of their corolla: that of *Nierembergia*, being figured in plate 18 A. fig. 2 of the 'Illustration of South Amer. Plants,' will require no further explanation: the figure of that of *Petunia* was omitted in plate 23 of that work, and its description was most obscurely given in 'Lond. Journ. Bot.' v. p. 18 (in a note), owing to several omissions and transposals of words in the hurry of the last moment of the monthly publication of that journal. In order to remedy this omission, a delineation of the æstivation † of



Petunia violacea is now given in the margin; fig. 1 being the corolla seen in front; fig. 2, the same viewed sideways; fig. 3, a transverse section made across the line *a a*; fig. 4, ditto ditto across *b b*.

* See Ill. South Amer. Plants, pl. 18. A. fig. 4, B. fig. 5, and pl. 20. fig. 3.

† It may be thus more simply defined: *Æstivatio replicativa*, i. e. lobis omnibus subconduplicatis, superioris interioris marginibus revolutis, alterorum plicaturis postice torsis, marginibus cum contiguis quincuncialiter late imbricatis, margine altero hinc revoluti.

7. *Hyoscyameæ*.—This forms a very natural tribe, remarkable for the very singular epigynous gland, hitherto I believe new in the history of vegetable physiology, the origin and nature of which it is desirable to ascertain. It cannot bear any analogy with the true disc, which is always hypogynous in the superior ovary and epigynous in the inferior germen, and which is generally admitted by botanists to be little more than a confluent whorl of abortive stamens. In *Cacabus* it assumes the form of an enlargement of the base of the style, but that it exists here as a distinct organ is proved by the swelling seen within the matured fruit, in the summit of the cavity of the cells. In *Thinogeton* it is considerably larger, where it appears as a coriaceous thickening of the chartaceous covering that forms the upper portion of its dry berry. It is however most distinctly developed in *Hyoscyamus*, even in the young ovary, in the form of a fleshy external gland, which covers more than the superior moiety of the entire germen, and on making a longitudinal section it is seen distinctly adnate upon the true endocarpium: it forms therefore a very good discriminating character of this tribe. The cause of the opercular dehiscence of the fruit in *Hyoscyamus* is thus readily accounted for, because while the lower half of the pericarpial covering remains thin and membranaceous, the opercular portion becomes hard and coriaceous, from the indurescence of the glandular covering above-mentioned*. I have placed doubtfully in

* Although in the above case it is easy to trace the cause of the opercular dehiscence of the fruit, the same is not so readily accounted for in other cases; in *Anagallis* for example. In this last-mentioned instance, a distinct zonal line may be seen in the thin pericarpial covering before the ripening of the fruit, and it is along this that the membranaceous capsule afterwards bursts, by a clean circumscissure. This zonal line however bears no relation to the longitudinal true nervures, which may be distinctly traced in the pericarpial covering, and which, extending from the style to the base, may be referred to the midribs and marginal junctions of the original carpellary leaves: but what is the nature of the line which traverses these nervures at right angles across all the carpellary leaves? This is difficult to be accounted for, unless we imagine it to arise from a cause somewhat analogous to the case of *Hyoscyamus*, only that instead of the line being the marginal limit of an epigynous gland, it may be the edge of an original elementary hypogynous disc, which by its subsequent growth and attenuation becomes hardly distinguishable from the rest of the pericarpium. On examining this pericarpial covering, about the period of the fall of the corolla, this zonal line is seen more transparent than the rest of its substance, and not opaque, as is observable in the regular longitudinal nervures which may then be readily traced; at this period however, and even in the younger state of the ovary, before this zonal line becomes distinguishable, the lower half of the pericarpial membrane is decidedly of a more greenish hue than the upper moiety. This appears to me the only theory on which we can account for the dehiscence of the capsule in *Anagallis*, but in suggesting it, I confess that I could not discern the fact of the original existence and ultimate attenuation of such a disc as I have imagined. Although, generally speaking,

this tribe, *Scopolia*, *Physoclena*, *Thinogeton* and *Cacabus*, genera which offer a striking affinity to one another in their most essential characters, and there can be little doubt that they all form a portion of one very distinct group. These characters coincide for the most part with those of *Hyoscyamus*, and the only consideration wanting to complete their affinity is the æstivation of their corolla. The funnel-shaped and almost entire border of the corolla in those genera would almost necessarily imply the regular plicature of its campanular portion, but it is probable that at the same time the lobes in æstivation may be somewhat imbricate, as is distinctly observable in *Nierembergia* and *Petunia*. It is impossible to determine this question from dried specimens, and it can only be ascertained from the examination of living plants. Should the æstivation be found, on the contrary, to be entirely induplicato-valvate, these four genera would not belong to *Atropaceæ*, but must be referred to *Solanaceæ*, where they would naturally find their place as a capsular tribe preceding the *Jaboroseæ*.

8. *Atropaceæ*.—This very distinct group is distinguishable from the other tribes by its baccate fruit, and its ovary devoid of a fleshy epigynous gland. The first four genera possess a perennial root, with numerous deciduous herbaceous stems, large showy flowers, and a somewhat shrubby habit, with dense foliage and large leaves. *Lycium*, on the contrary, is a straggling shrub with woody stems, and frequently with spinous branches: its flowers are small. These differences are only generic, and do not offer sufficient reasons for separating the latter genus as a tribe distinct from the others.

no apparent hypogynous disc is to be seen among the *Primulaceæ*, it is occasionally discernible, but I believe only in those genera where the capsule bursts into valves by the longitudinal carpellary nervures, as in *Lysimachia*, of which genus Nees v. Esenb. in his 'Gen. Pl. Fl. Germ.' says distinctly, "Germen liberum basi disco annuliformi cinctum." This view of the case, though quite hypothetical, is rendered still more probable by the facts observable in the capsule of *Plantago*, which offers a membranaceous pyxidium very similar to that of *Anagallis*. At an early period the future transverse line of dehiscence is discernible in the ovary, as in *Anagallis*, but it is then more approximate to the base, proving that the growth of its lower portion is afterwards more considerable than the upper part; as it advances towards maturity the zonal line becomes more marked, the upper portion of the pericarpial covering being of a deeper green hue and more opaque, while the lower moiety is distinctly hyaline and transparent, and of more slender texture; on becoming ripe, the greater indurescence of the upper half, by desiccation, is still more evident, facts which lead to the only reasonable conclusion, that the upper portion of the ovary is covered by a very thin epigynous glandular covering, as in *Hyoscyamus*, but too thin to be readily detected in parts of such very slender texture: that it does exist, is however proved by the circumstance of that part of the pericarpial covering being always less pervious to light, when viewed under the microscope, than the lower moiety.

9. *Solandrea*.—These form a very natural group, being all suffruticose, mostly subscandent plants, with large leaves and generally showy flowers. I have been enabled to obtain very satisfactory elements of the little-known genera *Juanulloa* and *Marckea*, besides those of two new genera. They bear a somewhat similar position among the *Atropaceæ* that the *Metternichieæ* hold among the *Solanaceæ*, and the analogy in the structure of the seeds of *Marckea* and *Metternichia* is sufficiently remarkable.

10. *Brunsfelsia*.—This group, consisting of some of the plants placed by Mr. Bentham in his *Salpiglossideæ*, is distinguishable from that tribe as above limited by the absence of the remarkable dilatation of the stigma: it will comprise the genera *Brunsfelsia*, *Franciscea* and *Heteranthia*: the latter much resembles *Browallia* in its habit, but it accords with the two former genera in the structure of its anthers, which are unilocular, and curved in the shape of a horseshoe round a fleshy globular connective, that in great part enters into and nearly fills the cavity of the cell, as in the *Verbasceæ*. I have here considered *Franciscea* as distinct from *Brunsfelsia*, which Mr. Bentham (in DeCand. Prodr. x. p. 198) combined together under one genus. In *Brunsfelsia* however the corolla is always of a yellowish colour, the tube is considerably longer and narrower in proportion, and the fruit consists of a large fleshy drupe inclosing a putamen which is quite indehiscent. In *Franciscea* the flowers are always of a purplish or violet colour, with a much shorter tube and an oblique rotate border: the fruit is generally capsular, and rarely somewhat baccate; but when this occurs, I have noticed in the dried specimens, that as the fleshy sarcocarp covering the putamen dries into the form of a coriaceous integument, both split into four divisions at the apex, in a valvular form, as in the capsular species. In *Brunsfelsia* the style is very long and slender, quite erect at the apex, and terminated by a small clavate stigma which is bilobed, its equal concave lobes being filled with a ball of grumous matter. In *Franciscea* the style is considerably enlarged and incurved at its summit, which is terminated by a much larger bilobed gaping stigma, the lower lobe being somewhat smaller, and it exhibits in its sinus a globe of viscous matter, seen only in the living state. In *Heteranthia* the style is far exserted, and is terminated at its slender and somewhat incurved apex by an almost obsolete fistulose stigma. The species of *Brunsfelsia* attain the size of large trees, 20 feet in height, while on the contrary those of *Franciscea* do not exceed the size of bushes, which are seldom more than 3 or 4 feet high. *Heteranthia*, on the other hand, is a small repent perennial plant, with short ascending branches, terminated by a racemose inflorescence.

Having now reviewed in succession the different genera composing the *Salpiglossideæ* of Bentham, with the exception of *Schwenkia*, it is necessary to offer a few words upon that genus, the true affinity of which for many years puzzled the sagacity of botanists.

Linnaeus had the penetration first to point out its affinity with the *Solaneæ*, an opinion which has been since quite disregarded. It was afterwards considered as belonging to *Primulaceæ*, on account of the insertion of its stamens opposite to the lobes of the corolla. By Nees v. Esenbeck and Martius it was subsequently referred to *Scrophulariaceæ* (Nov. Act. xi. p. 47); but a note was added by Martius pointing out the greater probability of its affinity to *Acanthaceæ*, because of the fissure of the apex of the dissepiment, a character which I have not observed in the genus. This indication has not been adopted by others, certainly not by Nees, who in his monograph on this last-mentioned family (DeCand. Prodr. vol. xi.) does not allude in any way to *Schwenkia* in relation to it. Mr. Bentham was the first to explain the apparent anomaly of the position of the stamens in regard to the lobes of the corolla, and to demonstrate that the intermediate glands seen in most of the species constituted the true normal lobes of the border, and that the stamens were consequently alternate, and not opposite to its lobes. It was therefore placed by that able botanist next *Browallia*, a position that appears to me hardly satisfactory, on account of the valvate æstivation of the lobes of its corolla, and because its anthers consist of two distinct cells fixed on the apex of a dilated membranaceous filament. For these reasons, I would suggest its nearer affinity to *Fabiana*, with which it possesses many characters in common: the cristate projection of the placentæ from the middle of the dissepiment, and the insertion of the ovules in distinct linear series as described by Martius (*loc. cit.*), quite correspond with the figure I have given of the placentation of *Fabiana* (Ill. S. Am. Pl. tab. 17). *Schwenkia* however is a genus that requires more careful examination.

Having thus indicated those genera which I propose to separate from the *Solanaceæ*, it is desirable to exhibit the arrangement of the remainder that will hence constitute that family. There is a considerable alteration in the view now offered, from that given on a former occasion, as since that time most of the genera have been more attentively examined, and their characters more accurately ascertained. I intend therefore in the sequel to present a description of the outlines, all now completed, of such of the genera as have not yet been delineated, enumerating at the same time the several species composing them (with the exception of those of *Solanum*, *Capsicum*, *Physalis* and a few others),

to which will be subjoined a review of the several new genera that have presented themselves in the course of this inquiry. To these details will be added the description of such of the genera of the *Atropaceæ* as have not yet been described by me, and the whole will offer a large accumulation of novel facts, that probably may serve to facilitate the labours of the able botanist now engaged in a monograph of this large family, which has hitherto been so little studied.

In these investigations I have been carried far beyond the line originally intended, having been tempted to proceed by the abundant materials that have presented themselves to my notice, principally derived from the rich herbarium of Sir Wm. Hooker, to whose kind liberality I am mainly indebted for the opportunity of bringing to light so large an accumulation of new facts. The following synopsis will be sufficient to exhibit the proposed arrangement without farther explanations.

SOLANACEÆ.

Tribus 1. METTERNICHIEÆ (char. Lond. Journ. Bot. v. 148). Fructus capsularis, embryo teres, rectus

1. *Metternichia*.2. *Sessea*.

Tribus 2. CESTRINEÆ (char. *loc. cit.*). *Id. id.*...

3. *Cestrum*.

Tribus 3. FABIANEÆ (char. *loc. cit.*). Fructus capsularis, embryo paullulo incurvatus, fere rectus

4. *Fabiana*.5. *Vestia*.6. *Schwenkia*?

TRIBUS 4. JABOROSEÆ. Corolla tubo elongato siccatione nigrescens: fructus baccatus 2-locularis, embryo teres, fere annularis

7. *Jaborosa*.8. *Dorystigma*.9. *Himeranthus*.10. *Trechonætes*.11. *Salpichroma*.12. *Nectouxia*.

Tribus 5. IOCHROMEÆ. Corolla tubo elongato, limbo 5-fido plus duplo longiore: antheræ longitudinaliter dehiscentes: calyx fructiferus vix auctus baccam 2-locularem suffulciens vel arcte cingens: embryo teres, fere annularis

13. *Iochroma*.14. *Cleochroma*.15. *Lycioplesium*.16. *Pæcilochroma*.17. *Hebecladus*.18. *Dunalia*.19. *Acnistus*.20. *Phrodus*.

Tribus 6. *PHYSALEÆ*. Corolla tubo brevi, limbo campanulato 5-angulato vel 5-partito : antheræ longitudinaliter dehiscentes : calyx fructiferus valde auctus et vesicarius : fructus baccatus, embryo teres, fere annularis. .

21. *Physalis*.
22. *Larnax*.
23. *Margaranthus*.
24. *Withania*.
25. *Hypnoticum*.

Tribus 7. *WITHERINGEÆ*. Corolla tubo brevi, limbo 5-fido vix excedente : antheræ longitudinaliter dehiscentes : calyx fructiferus vix auctus, baccam 2-locularem suffulciens, vel eam arcte vestiens : embryo teres, spiraliter curvatus

26. *Witheringia*.
27. *Capsicum*.
28. *Brachistus*.
29. *Saracha*.
30. *Discopodium*.
31. *Puneera*.
32. *Aureliana*.
33. *Sichlera*.

Tribus 8. *SOLANÆÆ*. Antheræ apice 2-porosæ, vel in tubum connatæ, intus dehiscentes : fructus baccatus, 2- raro pluri-locularis : embryo teres, spiraliter arcuatus

34. *Solanum*.
35. *Cyphomandra*.
36. *Triguera*.
37. *Lycopersicum*.

VERBASCEÆ.—The suggestions of our learned countryman offered in his ‘Prodr. Fl. Nov. Holl.,’ which I have cited in a former page (in a note, *ante*, p. 162), were evidently intended, in the state of our knowledge at that time, to apply principally to the *Verbasceæ*, which by Jussieu, Linnæus, and other eminent botanists had been classed among the *Solaneæ*. Bartling afterwards was the first to arrange the *Verbasceæ* as a distinct tribe among the *Scrophulariaceæ*, and Nees v. Esenbeck, acting upon the suggestion of Mr. Brown, proposed the *Verbascinæ* as a distinct family, intermediate between *Solaneæ* and *Scrophularinæ* (Trans. Linn. Soc. xvii. p. 78). The principal reasons that have induced all subsequent botanists to adopt the suggestion of Bartling, have been the imbricate æstivation of the corolla, and the frequent suppression of some of the stamens, which have been considered paramount to the many other not less important considerations that tended to show the near approximation of the *Verbasceæ* to the *Solaneæ*; but these objections, fatal as they were to the admission of this tribe into the latter family, do not apply to their connexion with the *Atropaceæ*,

with which group they exhibit beyond all doubt a very close alliance. This is manifest in their general habit, their alternate leaves with glutinous pubescence, their fetid smell, their powerfully narcotic and other medicinal qualities, which are so characteristic of the *Solanaceæ* and *Atropaceæ*: to these may be added the particular structure of their stamens, which have their anthers of a somewhat lunar form, and quite unilocular, curved round a large clavate termination of the filament, with an almost globular expansion of their connective, within the cell, that serves as the polliniferous receptacle, a character pointed out by Nees as being foreign to the *Solanææ* and rare among the *Scrophularinææ*, and as claiming for them a distinct station in the system. On the other hand it should be borne in mind, that this peculiar character exists also in the genus *Scrophularia* itself, the flowers of which exhibit often declinate anthers and barbate filaments, together with a fifth sterile stamen, a feature rare in the *Scrophulariaceæ*, and one that tends to show a very close connexion of this genus with the *Verbasceæ*, with which tribe it had been before associated by all preceding botanists, until Mr. Bentham, in his admirable monograph of the order, has placed it among the *Cheloneæ* (DeCand. Prodr. x. 299). In most of the genera of this last-mentioned tribe, the anthers are formed constantly, I believe, of two distinct and divaricate cells, affixed at their apex on the slender summit of the filament, and quite wanting of the fleshy connective so manifest in *Scrophularia* and the *Verbasceæ*. Whatever may be determined in regard to the proper place of the *Verbasceæ* in the system, it is manifest that it is not by the number of the stamens that we can fix the limit between the *Atropaceæ* and *Scrophulariaceæ*: thus it is impossible to separate *Celsia* from *Verbascum*, and it would be equally as admissible to include *Celsia* with its didynamous stamens, or *Ianthe* with its single pair, in *Atropaceæ*, as it is to place *Verbascum*, with its regular pentandrous flowers, in *Scrophulariaceæ*: such discrepancies cannot fail to occur in many solitary points of osculation between the genera of different tribes, in all our artificial modes of the classification of plants. We have also other instances not less strikingly contrary to the ordinary rule in the *Xuaresia biflora* of the 'Flora Peruviana,' which has a regular 5-partite corolla and 5 alternate equal stamens: this plant Mr. Bentham unhesitatingly considers to be a true species of *Capraria*, a genus decidedly *Scrophulariaceous*; and in like manner the *Bacopa* of Aublet with its 5 equal stamens offers another exception, but here the plant has opposite leaves, and possesses so precisely the habit and general features of *Herpestes*, that its position must without doubt be fixed contiguous to that genus. The same rule will apply to another anomalous case instanced by Mr. Bentham

in the genus *Campylanthus*, the seeds of which have a perispherically-curved embryo, a character that by itself would place it in *Atropaceæ*; but that distinguished botanist fixes its position among *Scrophulariaceæ*, on account of the form of its corolla and of its anthers, notwithstanding, as he observes, that it bears little analogy with any other genus contiguous to it. The principal reason however that appears to me to give the *Verbasceæ* the preference of a place among the *Scrophulariaceæ* is the truly axillary origin of the floral peduncles, a character that in all such doubtful cases may be employed as a decisive line of demarcation between that order and the *Atropaceæ*. The position of the *Verbasceæ* should then appear at the head of the *Scrophulariaceæ*, occupying the place of a suborder in the manner of the *Salpiglossideæ* of Bentham (DeCand. Prodr. x. p. 190), where they would serve as a connecting link of the closest affinity between these two families.

RETZIA.—This anomalous genus* has never yet found a certain or satisfactory place in the system, and its position must remain problematical until the structure of its fruit and seed be more accurately investigated. By many botanists it has been placed in *Convolvulaceæ*; others have indicated its relation to *Apocynæ*; some have again referred it to *Polemoniaceæ*, with which it certainly offers no affinity; and Bartling proposed for it a new natural order, under the name of *Retziaceæ*, but this stands upon too insufficient grounds. Endlicher places *Retziaceæ* as a doubtful order after *Solanaceæ*, and Dr. Lindley arranges the genus *Retzia* among *Solanaceæ*, after *Sessea*. In the form of its calyx and of its corolla, the number and position of its stamens, its bilocular ovary with placentæ attached to the dissepiment, the structure of its capsule and of its seeds as far as they are known, offer characters strictly conformable with those of *Solanaceæ*; but it would now rather fall among the *Atropaceæ*, on account of the æstivation of its corolla, which is said by Endlicher and Lindley to be imbricate, and not valvate: the form of its embryo, which on the authority of Brown (Prodr. 482) is terete and straight, necessarily, if it were admitted into this family, would point to its situation as a tribe near the *Solandreæ*.

Thus far every feature appears in conformity with such an ar-

* RETZIA, *Thunb.* Calyx tubular, 5-fid, lobes lanceolate, somewhat unequal. Corolla tubular, elongated, straight, tube in no degree plicated, border of 5 short equal lobes imbricated in æstivation. Stamens 5, equal, nearly sessile in mouth of tube, alternate with its lobes, filaments extremely short. Anthers oblong, cordate, 2-celled, cells parallel, bursting longitudinally in front. Ovary oblong, seated on a fleshy gland, 2-locular, ovules upon placentæ adnate to the dissepiment? Style longer than corolla, filiform. Stigma very short, bifid, with divaricate linear segments. Capsule bisulcate, bilocular, bivalved. Seeds several. Embryo straight, terete.

rangement, but one objection presents itself which renders this conclusion somewhat unsatisfactory, and that is the peculiar habit of the only well-recognized species, *Retzia spicata*, which is different from that of any *Solanaceous* or *Atropaceous* plant. Here the leaves are verticillate in fours, and the flowers are solitary and sessile in each axil, being supported by two bracts similar in size and shape to the lobes of the calyx. The genus *Solenostigma* of Klotzsch, founded upon one of Zeyher's African plants, and supposed to be identical with *Retzia*, was placed by that botanist in *Stilbaceæ*; but the name would imply that the stigma is there hollow and tubular, while in *Retzia* it consists of two small linear divaricate segments; hence it is probable that Klotzsch's plant is very different from that of Thunberg. I may here observe however, that this fact does not of itself invalidate their mutual affinity, for in the vast genus *Solanum* we meet with different species, some with a hollow tubular stigma, and others with bifid linear segments, exactly similar to the stigma of *Retzia*. The *Polemonium campanuloides* and *P. roelloides* of Thunberg have been referred to *Retzia* by Sprengel, G. Don and Dr. Walpers; these plants have both alternate leaves, and if really species of that genus, they would tend to remove the doubts above expressed in regard to the place of *Retzia* in this natural order. Willdenow states (Syst. i. 887) that the two species last alluded to, cannot belong to *Polemonium*, which has a trifid stigma; and he adds, that *P. campanuloides* has a bifid stigma as in *Retzia*. The *Convolvulus ænotheroides* (Linn. fil.) is also said to be another species of this genus. The only facts wanting to confirm its place in the system are the position of its ovules and the structure of its seeds. Dr. Lindley, who has examined its ovarium, has observed that its ovules are very few, two (or four?) in each cell, articulated with and suspended from the dissepiment by a large thickened funiculus, a character not at all conformable with the *Atropaceæ* or *Solanaceæ*, and one that would seem to remove this genus nearer to the *Bruniaceæ*, with which *Retzia* will be found to possess many similar characters. For the present therefore we must hesitate in attaching *Retzia* to the *Atropaceæ*.

The genus *Lonchostoma* of Wikström, placed by most botanists in *Retziaceæ*, offers, I find, many characters in common with *Bruniaceæ*: its sepals are united at the base by a membranaceous tube which closely invests the ovarium, if not almost adnate with it; they are surrounded by bracts of equal size: it resembles *Gravenhorstia* in having its petals combined into a funnel-shaped tube with a 5-partite border, the lobes of which are carinate and convolutely imbricate in æstivation; the anthers, cordate at base, are nearly sessile in the mouth; the style is divided halfway down and terminated by clavate stigmata; the ovarium, 2-celled, appears

under the microscope to be composed of two distinct, though connate carpels; the ovules are few, horizontally attached, or somewhat pendulous from narrow axile placentæ attached to the twofold dissepiment. These are characters that seem to correspond in great measure with the *Bruniaceæ*, with which the habit of *Lonchostoma* does not ill accord. These are merely hasty indications, as it would be foreign to the object of the present investigation to pursue such inquiries farther.

XIX.—*On the Anatomy of Eolis, a genus of Mollusks of the order Nudibranchiata.* By ALBANY HANCOCK and DENNIS EMBLETON, M.D.

[Continued from vol. i. 2nd Series, p. 105.]

[With two Plates.]

Nervous System.

THIS is made up of central masses or ganglia united by commissures, and of nerves. The ganglia are five or six pairs, four of which are symmetrically arranged with regard to the median line, and together with their commissures surround the commencement of the œsophagus lying upon the upper and posterior surface of the buccal mass, vol. xv. Pl. V. fig. 16 *b* and Pl. V. fig. 1 of present paper. Two pairs are supra-œsophageal and two infra-œsophageal. The former exceed the latter many times in size. The masses are of a pale yellowish flesh-colour, and appear to be filled with globular vesicles of various sizes.

First, of the supra-œsophageal or cerebral ganglia, the median pair, Pl. V. fig. 1 *a a*, largest of all, are irregularly ovate, flattened above and below, and somewhat constricted about the middle as if composed of two parts; their anterior ends, which are the larger and truncated, are united across the median line by a short broad commissure. The second or lateral pair, *b b*, lie rather behind the first and on the sides of the œsophagus; they are irregularly spheroidal, smaller than the first and flattened like them, and intimately connected to their external posterior margin. The two pairs of infra-œsophageal ganglia are of very unequal size: the first or buccal, or larger pair, *c c*, are elliptical, their long diameters placed transversely one on each side of the median line, across which a short thick commissure unites their contiguous ends; from the under surface of these, at their outer and anterior part, spring two short pedicles, supporting the second pair of ganglia, *d d*, the gastro-œsophageal, very small, not one-fourth the size of the last, but of the same form. In



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