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VIII.—Observations on the Solanaceæ

John Miers Esq. F.R.S. F.L.S.

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sac protruding; *b*, a thickened rib of tissue (analogous to the raphe?).

Fig. 4. *Chiococca anguifuga*,—an ovary in longitudinal section.

Fig. 5. *Bannisteria* sp.,—a transverse section of an ovary.

Fig. 6. An ovary of a *Sarcocolla* in longitudinal section, two of the ovules being removed from each cell

Fig. 7. A transverse section of half the ovary.

Fig. 8. A transverse section of the ovary of *Penca fruticulosa*.

Fig. 9. *Aster sibiricum*; a floret of the ray as seen laterally, a part of the wall of the ovary being removed.

VIII.—*Observations on the Solanaceæ.* By JOHN MIERS, Esq.,
F.R.S., F.L.S.

[Concluded from p. 14.]

HAVING animadverted upon M. Dunal's general arrangement of the *Solanaceæ*, I now proceed to offer a few comments on some of the genera. In p. 449 we find *Cacabus* included in *Physalis*: it is nearly four years since (*Luj. op.* iv. 252) I pointed out the characters by which the former differs from the latter, one of the most striking features being, that in *Cacabus* the inflorescence is fasciculated, while in *Physalis* the axillary flowers are invariably solitary. In this last-mentioned genus the calyx is at first more urceolate, 5-toothed, afterwards it becomes greatly enlarged, inflated, pentagonously globular and subreticulated: in *Cacabus* at an early stage it is tubular, inflated below by five salient saccate lobes, and narrowed towards the mouth, where it is divided into five acute segments; it is then delicately thin in texture, finely and elegantly reticulated, and afterwards increases in size, but less in proportion, when it always retains its delicate texture, form, and almost araneoid appearance. In *Physalis* the corolla is broadly and roundly campanular, generally of a yellow colour, and is either immaculate, or more usually marked with five large purple spots in its lower moiety; it is seldom more than twice the length of the calyx: in *Cacabus* the corolla is large and conspicuous, tubular, and slender at base, suddenly expanding into a funnel-shaped campanular form, with a nearly entire limb, like the flower of a *Nolana* or *Convolvulus*, being like them of a delicately pale blue, marked with five long linear rays, each ray formed of three nearly parallel nervures; it is at least three times the length of the calyx. M. Dunal states that *Cacabus* has the habit and the corolla of *Atropa*. On this point he appears to me clearly under a mistake, for its habit is certainly more that of a *Nolana*, being a prostrate herbaceous plant, with a fleshy angular stem, and its corolla, as above shown, bears no resemblance to that of *Atropa*. One of the peculiar features which I have pointed out in this genus, is the

remarkable fleshy epigynous gland, seen on the summit of the ovarium, like the same feature seen in *Thinogeton*, to which genus it closely approaches in its general habit, and in the form and colour of its flowers: there is indubitably much analogy in this peculiar feature, observable in both these genera, with the still more conspicuous fleshy enlargement of the summit of the ovarium in *Hyoscyamus*: there is nothing approaching to this structure in *Physalis*. It is for these reasons that I preferred placing *Cacabus* among the *Hyoscyameæ* next to *Thinogeton*, although I have not discovered that its fruit possesses an opercular dehiscence, nor been able to ascertain the æstivation of its corolla. M. Dunal does not appear to have been aware of these facts, but Prof. A. DeCandolle in a note of the Appendix to the 'Prodromus' (p. 690) adheres to the views of that botanist on this subject, and reverses the conclusions to which I arrived, without attempting to subvert the facts above-mentioned, or annul the reasonings founded on them: he quotes the character I published of *Cacabus nolanoides* under the name of *Physalis nolanoides*. These facts remain submitted to the judgement of botanists, and it appears to me that any one who will carefully compare the analysis given of that plant in plate 49 of my 'Illustrations' with any species of *Physalis*, will admit that it cannot possibly belong to the latter genus, and that *Cacabus* is justly entitled to claim a generic distinction. *Physalis*, indeed, possesses such well-marked features, that it seems a pity to mar its simple and prominent characteristics by combining it with a group so essentially distinct as *Cacabus*.

The ample generic character of *Witheringia*, as defined by M. Dunal (p. 402), and the details he has given from an examination of good specimens of L'Héritier's typical species, *W. solanacea*, confirm the opinion I long ago expressed in regard to this genus: these details, if carefully compared, will be seen to differ in no respect from the characters presented by most species of *Saracha* of the 'Flora Peruviana.' The reasons for this conviction were given nearly four years since (*huj. op.* iii. p. 142 et 451), when I considered the typical plant above-mentioned as a species of *Saracha*: to this inference I was led by its striking resemblance to another species closely allied to it, which I figured in my 'Illustr. South Am. Plants' in plate 39 A, under the name of *Saracha glandulosa*, the only structural difference between these species being that L'Héritier's plant is tetramerous, while all other species of *Saracha* are pentamerous. As M. Dunal considers this difference to be of no generic value, it is clear that under such circumstances the *Witheringia*, L'Hérit. (non aliorum), and *Saracha*, R. and P. (with a single species excepted), must merge into one genus, and according to the rule of priority

the former will claim the precedence: in such case the species of this genus will be as follows:—

1. <i>Witheringia solanacea</i> , L'Hérit.		DC. Prodr. xiii.	402
2. ——— <i>villosa</i> , nob.	= <i>Saracha villosa</i> , Don	„ „	430
3. ——— <i>contorta</i> , nob.	= ——— <i>contorta</i> , R. & P.	„ „	„
4. ——— <i>Zuccagniana</i> , nob.	= ——— <i>Zuccagniana</i> , Don	„ „	„
5. ——— <i>biflora</i> , nob.	= ——— <i>biflora</i> , R. & P.	„ „	431
6. ——— <i>procumbens</i> , nob.	= ——— <i>procumbens</i> , R. & P.	„ „	„
7. ——— <i>umbellata</i> , nob.	= ——— <i>umbellata</i> , G. Don	„ „	„
8. ——— <i>alata</i> , nob.	= ——— <i>alata</i> , Dun.	„ „	„
9. ——— <i>jaltomata</i> , nob.	= ——— <i>jaltomata</i> , Schl.	„ „	432
10. ——— <i>allogona</i> , nob.	= ——— <i>allogona</i> , Schl.	„ „	„
11. ——— <i>dentata</i> , nob.	= ——— <i>dentata</i> , R. & P.	„ „	„
12. ——— <i>viscosa</i> , nob.	= ——— <i>viscosa</i> , Schr.	„ „	433
13. ——— <i>ciliata</i> , nob.	= ——— <i>ciliata</i> , nob.	„ „	683
14. ——— <i>propinqua</i> , nob.	= ——— <i>propinqua</i> , nob.	„ „	„
15. ——— <i>diffusa</i> , nob.	= ——— <i>diffusa</i> , nob.	„ „	„
16. ——— <i>laxa</i> , nob.	= ——— <i>laxa</i> , nob.	„ „	„
17. ——— <i>auriculata</i> , nob.	= ——— <i>auriculata</i> , nob.	„ „	„
18. ——— <i>conspersa</i> , nob.	= ——— <i>conspersa</i> , nob.	„ „	684
19. ——— <i>glabrata</i> , nob.	= ——— <i>glabrata</i> , nob.	„ „	„
20. ——— <i>acutifolia</i> , nob.	= ——— <i>acutifolia</i> , nob.	„ „	„
21. ——— <i>vestita</i> , nob.	= ——— <i>vestita</i> , nob.	„ „	„
22. ——— <i>glandulosa</i> , nob.	= ——— <i>glandulosa</i> , nob.	„ „	„
23. ——— <i>Candollei</i> , nob.	= ——— <i>Miersii</i> , A. DC.	„ „	„

The *Saracha geniculata*, Mart. Gall. (Prodr. xiii. 430), should be removed from this genus and placed in *Physalis* (*P. geniculata*): this is evident from the description of its inflorescence and other characters, among which is that the berry is edible as in *P. Peruviana*.

In order to explain the ground on which my conviction of the identity of *Witheringia* and *Saracha* is founded, looking at this latter genus in the sense in which it has been hitherto understood, it may be well to observe, that a difference in the description of generic characters often results from an investigation of the flowers in a living or a dried state: thus in *Saracha* (as hitherto limited), the corolla when dried scarcely shows the fornicated origin of the filaments, the dilated bases of which in that state appear flattened, as if simply adnate to the bottom of the tube; but when these are seen in a living state, the filaments will be found to spring out of as many dilated salient glands, the margins of which often extend upward for some short distance along the tube and form conspicuous hollow cups that secrete a nectariferous juice, a corresponding furrow being often seen externally at the bottom of the tube opposite these glands; the hairy filaments spring at an angle from and are in fact an extension of the front margin of these cups, which, with the dense clothing of long cottony hairs generally seen about the base of the tube, form altogether a kind of fornix or annulus around the ovarium: the anthers are seen in a somewhat connivent group surrounding

the stigma. These are precisely the distinguishing features that characterize *Witheringia*, but described in other words by M. Dunal in p. 402: this structure is indistinctly shown in L'Héritier's figure, though better explained in his description. The other features of M. Dunal's diagnosis, as respects the form of the calyx, corolla, pistillum and fruit, will be found to agree completely with those of *Saracha*, the species of which correspond in habit with L'Héritier's typical plant. It would have been better for the sake of convenience to have retained the genus *Saracha*, now so long established, for the group of plants just enumerated: this was maintained as long as a doubt hung over the real nature of L'Héritier's plant; but now that this doubt is removed, we have no alternative but to follow the course demanded by the rules of science.

Having thus removed from *Saracha* all its species, except *S. punctata*, R. & P., which in reality is the original type of this genus as instituted and figured in the Prodrômus of the genera of the 'Flora Peruviana' (p. 31. tab. 34), and which I formerly separated from it in order to form the basis of a new genus (*Pæcilochroma*) (Lond. Journ. Bot. vii. 353), we are now compelled to retrace our steps, and re-establish *Saracha* for that group of plants, so that the name of *Pæcilochroma* must consequently be suppressed: the several species enumerated will now stand as follows:—

1. <i>Saracha punctata</i> , <i>R. & P.</i> , instead of <i>Pœcilochroma punctatum</i> , <i>nob.</i> (<i>I. c.</i>)		
2. ——— <i>frondosa</i> , <i>nob.</i>	=	——— <i>frondosum</i> , <i>nob.</i> „
3. ——— <i>guttata</i> , <i>nob.</i>	=	——— <i>guttatum</i> , <i>nob.</i> „
4. ——— <i>maculata</i> , <i>nob.</i>	=	——— <i>maculatum</i> , <i>nob.</i> „
5. ——— <i>Lobbiana</i> , <i>nob.</i>	=	——— <i>Lobbianum</i> , <i>nob.</i> „
6. ——— <i>Lindeniana</i> , <i>nob.</i>	=	——— <i>Lindenianum</i> , <i>nob.</i> „
7. ——— <i>Quitoensis</i> , <i>nob.</i>	=	——— <i>Quitoense</i> , <i>nob.</i> „
8. ——— <i>Boissieri</i> , <i>nob.</i>	=	——— <i>Boissieri</i> , <i>Dun.</i> = <i>Lyciople-</i>
<i>sium Boissieri</i> , <i>Dun.</i>
9. ——— <i>Funkiana</i> , <i>nob.</i>	=	——— <i>Funkianum</i> , <i>Dun.</i>
10. ——— <i>Sellowiana</i> , <i>nob.</i>	=	<i>Witheringia Sellowiana</i> , <i>Sendtn.</i>

Considering for the reasons before stated, that among the several individuals included by M. Dunal in *Witheringia*, the typical species only belongs really to that genus, it becomes necessary to indicate the proper position of the remaining species in the manner following :—

2. <i>Witheringia macrophylla</i> , <i>H. B. K.</i> est	<i>Brachistus macrophyllus</i> , <i>nob.</i>
(<i>huj. op.</i> iii. 263).
3. — <i>Sellowiana</i> , <i>Sendt.</i>	= <i>Saracha Sellowiana</i> , <i>nob.</i>
4. — <i>acuminata</i> , <i>Dun.</i>	= <i>Brachistus acuminatus</i> , <i>nob.</i>
5. — <i>stramonifolia</i> , <i>H. B. K.</i>	= — <i>stramonifolius</i> , <i>nob.</i> (<i>huj.</i>
<i>op.</i> iii. 263).
6. — <i>lanceolata</i> , <i>Dun.</i>	= <i>verisimiliter Solani species.</i>
7. — <i>aspera</i> , <i>Spr.</i>	= <i>potius Borraginea</i> ut suspicatur
cl. Dunal.

Witheringia ciliata, H. B. K. ; *W. dumetorum*, H. B. K. ; *W. mollis*, H. B. K. ; *W. rhomboidea*, H. B. K. ; *W. riparia*, H. B. K., and *W. diversifolia*, Klotsch, referred by M. Dunal to his genus *Fregirardia*, had been long before placed by me in *Brachistus* (*huj. op.* iii. 263–268).

The *Witheringia* of Von Martius, which I had proposed to restore for a group of plants of which the type is *W. picta*, Mart., must consequently be suppressed, and we shall presently see to what genus these must now be referred. This last-mentioned plant has been oddly arranged by M. Dunal in *Withania*, for what reason it is difficult to conjecture, as it offers no analogy whatever with that genus : it is associated with other kindred species, placed by Dr. Sendtner in his genus *Athenæa*, which is made to form a distinct section of *Withania* under that name (*Prodr.* p. 458–459). The *Witheringia hirsuta*, Gardn. (No. 239), from Tejuca, a plant that I collected in company with that active botanist, was long ago shown by me (*huj. op.* iii. 145) to be identical with the *Witheringia picta*, Mart. (*Withania picta*, Dun. *Prodr.* p. 458). This same plant however is again referred by M. Dunal to *Bassovia* under the name of *B. Gardneri* (*Prodr.* p. 409). I was always struck by the strong analogy between the *Witheringia picta*, Mart., and the drawing of *Bassovia sylvestris* (Aubl. tab. 85), but in the absence of more precise evidence in regard to the latter plant the reflection was passed over, as I found this species had been referred by M. Dunal to the genus *Solanum* (Dun. Syn. 22). Now, however, that *Bassovia* has been restored by this distinguished botanist, and its characters displayed at some length, this reflection returns with additional force, especially as the genus *Aureliana* of Dr. Sendtner is at the same time made to be identical with it. If we compare the *Aureliana velutina*, Sendtn. (*Flor. Bras.* tab. 19) with the figure of *Athenæa anonacea*, Sendtn. (tab. 18 of the same work), and these again with the *Witheringia picta*, Mart. (*Nov. Gen. et Sp.* tab. 227), and my details of Gardner's plant (in *Illust. S. Am. Plants*, ii. pl. 35), and keep in recollection that the same species has been referred by M. Dunal, at the same time, both to his section *Athenæa* of *Withania* and to the genus *Bassovia* of Aublet, we must come to the conclusion that the genera *Witheringia*, Mart., *Athenæa*, Sendtn., *Aureliana*, Sendtn., and *Bassovia*, Anbl., are identically one genus, and of these the latter must claim the priority, on account of its long previous existence. To the species of *Bassovia* enumerated by M. Dunal (*Prodr.* 405–411) we must therefore add *B. picta* (of which *B. Gardneri*, Dun., must be regarded as a synonym), *B. pogogena*, *B. mollis*, *B. micrantha*, *B. pyriformis*, *B. Pohlana*, *B. Schottiana*, *B. ? Novo-Friburgensis*, *B. Martiana*, *B. oocarpa*, *B. hirsuta*, and *B. anonacea*, nob.

I have hitherto only spoken of the section *Athenæa*, and it now remains to consider the other species included in the same genus by M. Dunal: of these it is evident that only two really belong to *Withania*—the original *W. aristata*, Pauq., and *W. frutescens*, Pauq., which form a genus marked by distinct characters, the limits and differential features of which have been defined in 'Hook. Journ.' i. 225 (Illustr. S. Am. Plants, ii. App. p. 7); the remaining nine species are referable to *Hypnoticum*, *Larnax* and *Puneera*, genera confounded by M. Dunal in the genus *Withania*. This last-mentioned genus differs from *Hypnoticum* in its urceolate calyx with five long setiform teeth, the tube expanding with the growth of the fruit into a large bell-shaped cup, with a still broader open mouth, in the bottom of which the berry is seated; this cup is of somewhat thickened texture, glabrous, and very reticulated by numerous strong transverse veins between its ten longitudinal nervures; the margin is almost entire, with five long setiform processes, which are extensions of the principal nerves: in *Hypnoticum* the calyx is tubular, very tomentose, with five broad short teeth; this increases in size, becomes inflated in the middle, contracted in the mouth, with five erect short teeth, finely reticulated in texture, and enclosing the berry as in *Phy-salis*. In *Withania* the corolla has the form of a very short tube below, with a limb of equal length, divided into five elongated narrow lobes obtuse at the apex; the stamens are shorter than the tubular portion; the filaments, much dilated at base, form a disjointed annular ring adnate to the base of the corolla; they are compressed, gradually narrowing toward their summit; the anthers, equal to them in length, are erect, pointed at the apex, and cordate at base, by the divarication of the two parallel cells: in *Hypnoticum* the corolla is smaller than in *Withania*, and more tubular; the tubular part, not exceeding the length of the calyx, is marked below the mouth with five coloured spots; it has a small border of five short angular reflexed teeth; the filaments are filiform, arising out of as many expanded processes adnate to the base of the corolla, and the anthers are formed of two parallel cells, without intervening connective. In *Withania* the stigma is formed of two lips with a large intermediate globular stigmatic gland: in *Hypnoticum* the stigma is clavate, obsoletely 2-lobed. In *Withania* the berry is small, seated in the broadly campanular expanded calyx, containing few seeds, which are proportionally large, somewhat conchoid, the embryo of more than a circle, being spirally helical: in *Hypnoticum* the berry is larger, generally of a bright scarlet colour, 2-celled, filled with very numerous small seeds, which are reniform and compressed, with a spiral and nearly annular embryo; the cotyledons, equal in length to the terete radicle, are subdilated and accumbent. These differences

are sufficiently evident and numerous enough to constitute a wide generic distinction—the affinity of *Hypnoticum* being much closer to *Physalis*, from which it differs in its much smaller corolla and the adnate placentation of its seeds.

M. Dunal has formed another section of *Withania* out of the *Puneeria coagulans* (Stocks), a plant extremely different from the former genus; in habit and structure it more nearly approaches *Hypnoticum*, resembling it greatly in the form of its flowers: the calyx, however, instead of becoming inflated to a larger diameter than the berry, and reticulated and vesicular, in *Puneeria* invests it closely, remaining opaque and tomentous, destitute of visible nervures, brittle, and of the texture of tender paper. Its flowers are diœcious, a rare occurrence among the *Solanaceæ*; the corolla is tubular, scarcely funnel-shaped, with a narrow border of five short reflexed teeth: the whole plant is covered with dense tomentum consisting of stellated brachiate hairs, as in *Physalis* and *Hypnoticum*: in these features there is little in common with *Withania*.

Larnax differs from *Withania* in its herbaceous stems and fasciculated axillary flowers, in its minute urceolate calyx with five short blunt teeth, which increases in size with the growth of the fruit; it is of thin texture, becomes inflated and globular, closely investing and concealing the berry, its mouth being much contracted and tubular, as in *Margaranthus*. The corolla is somewhat bell-shaped, with a border equal in length to the tubular portion, divided into five expanded oblong segments: its stamens have capillary filaments. One species is made to form a section of *Withania* by M. Dunal (*Pseudowithania*), but it will be seen to hold little resemblance to that genus.

The remaining species before alluded to, included by M. Dunal in *Withania*, may therefore be thus disposed of; viz.—

1. *Withania somnifera*, Dun. is *Hypnoticum somniferum*, Rodr.
2. ——— *Morrisoni*, Dun. = *Larnax Morrisoni*, nob. Agreeing with this genus in its numerous fasciculated flowers, its small urceolate calyx and red berries enclosed in an inflated calyx, and in the country of its origin: its characters are quite at variance with *Withania*.
3. ——— *Orinocensis*, Dun. = *Larnax Orinocensis*, nob. (*huj. op. iv. p. 38*).
4. ——— *Xalapensis*, Dun. = *Larnax Xalapensis*, nob. (*ibid.*).
5. ——— *subtriflora*, Dun. = *Larnax subtriflora*, nob. (*ibid.*).
6. ——— *arborescens*, Dun. = of doubtful affinity, not only in regard to the genus, but to the family to which it belongs: its berry is said to be 10-celled, each cell being 1-seeded: it cannot therefore belong to *Solanaceæ*.

7. *Withania ramosa*, Dun. is *Larnax ramosa*, nob. Agreeing with this genus in the similarity of its inflorescence and structure of its flowers and its red berries enclosed in an inflated calyx, and the country of its origin.
8. ——— *sordida*, Dun. = *Larnax sordida*, nob. Referrable to this genus for the same reasons.
11. ——— *pulvinata*, Dun. = *Salpichroma pulvinatum*, nob. From the details given of it evidently belonging to this genus.
12. ——— *coagulans*, Dun. = *Puneeria coagulans*, Stokes.

The genus *Lycium* differs from all true *Solanaceæ* in the very imbricated æstivation of its corolla, as frequently pointed out, but this character has not been considered by M. Dunal as of any value, for he constitutes a section of this genus (*Schistocalyx*) out of two species where the corolla has apparently a valvate æstivation. The first species is the *Lycium ciliatum*, Schl., a plant referred by me on this very account to *Salpichroma* (Lond. Journ. Bot. iv. 329). As this reference has not been confirmed either by Dr. Sendtner or M. Dunal, it is necessary that I should repeat my reasons for the above conclusion. The habit of the plant, as described by Prof. Schlechtendal, is quite as much that of *Salpichroma* as that of *Lycium*; in both cases the axils of its branches, after the fall of its leaves, become nodose; the stems are angular, from the salient lines decurrent from the points of insertion of the petioles; the exserted stamens are in like manner often densely villous at the points of their origin. It differs however from *Lycium* in its calyx being divided nearly to the base into five very long linear segments, densely ciliated with glandular hairs, and which increases in size with the fruit; the corolla, nearly twice the length of the calyx, is funnel-shaped, with five reflexed subtriangular segments, which are glandularly ciliated on their margins, indicating a valvate or a plicato-valvate æstivation as in *Cestrum*: these segments in *Lycium* are invariably broad and rounded in their form, overlapping one another by their margins, of thin texture, which are almost always glabrous, except in a few cases where they are fringed with simple ciliate hairs: the berry is red, supported by its erect persistent calyx, the lobes of which exceed it in length, while in *Lycium* the berry is supported on its small unchanged cupshaped 5-toothed calyx, not one-fourth or one-sixth the length of the fruit. These are all characters of *Salpichroma* and not of *Lycium*, and although certainly we have not positive evidence, we have every fair indication that the plant in question belongs to the former rather than to the latter genus. This subject will be again considered in a review I have prepared of the genus *Lycium*.

Another singular medley of incompatible genera, resulting
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from the rejection of the character of æstivation, occurs in the genus *Juanulloa*, which M. Dunal divides into three sections: 1. *Eujuanolloa*; 2. *Physalina*; 3. *Sarcophysa*. In *Juanulloa* proper we see a small group of plants, distinguished by their scandent habit, large thick coriaceous leaves and conspicuous pendent flowers; the calyx, covered with dense yellow stellate tomentum, is formed of five distinct sepals, which are connivent by their tomentous margins into a pentagonous tube, with undulating prominent angles; this is persistent, increasing but little with the growth of the berry, which it partially encloses, being generally slit into its original segments by the separation of the adherent edges of the sepals; the corolla, covered also with orange-coloured tomentum, is twice or three times the length of the calyx, and in the form of an elongated narrow tube, somewhat ventricose in the middle, and contracted in the mouth, with a small border of five almost orbicular lobes, quincuncially imbricated in æstivation, being, as well as the tube, of a thick fleshy consistence; the berry is filled with seeds, having a nearly straight terete embryo: these characters are fully delineated in plate 46 of my 'Illustrations.' In *Sarcophysa* we find a corolla very similar in texture and structure, but larger and more ventricose; the calyx, of half its length, is fleshy in substance, roundly tubular, ventricose, decreasing in diameter towards the mouth, where it is terminated by five short erect teeth; this scarcely increases in size, but becomes still thicker, more coriaceous in texture, and is at length irregularly ruptured on one side, nearly to the base, by the growth of its enclosed large berry. This genus has been shown to be generically distinct from *Juanulloa* (*huj. op. vii. 349*), both being closely allied to *Solandra*; its characters are delineated in plate 47 of the same work. The place in the system of *Juanulloa* and *Sarcophysa*, as I have shown, is not among the true *Solanaceæ*, but in the tribe *Solandrae* of the *Atropaceæ*.

The section *Physalina* of M. Dunal belongs to a very different group, which I have described under the name of *Cleochroma*, a genus closely allied to *Iochroma*, and therefore belonging to the family of the true *Solanaceæ*. The *Juanulloa* (*Physalina*) *umbellata*, Dun. (*Prodr. 530*) is again recorded (*Prodr. 491*) as the *Iochroma calycina*, Benth., figured in 'Bot. Reg.' (1831) tab. 20, both being an identical plant of Hartweg's collection (No. 1312), and described by me as *Cleochroma calycina* (*huj. op. vii. 350*). This and two other species of his section *Physalina* are frutescent shrubs, with leaves of more membranaceous texture, with conspicuous purple fasciculated flowers; the calyx is much larger than in *Iochroma*, tubular, thin in texture, 5-toothed, increasing considerably in size during the development of the flower, becoming ventricose in the middle, and finally enclosing the fruit;

the corolla, of more membranaceous texture, is tubular, and of small diameter at its base, soon expanding above into a broad funnel-shape, with a wide conspicuous border of five large acute lobes, which are plicately valvate in æstivation; the fruit is a berry, concealed by the membranaceous calyx, which is sometimes, but not always, split on one side; the seeds contain a slender, filiform, almost annular embryo; the yellowish down that invests the flowers of this species consists of simply articulated hairs: in *Juanulloa* the hairs of its dense tomentum are stellately brachiate. The second species of *Physalina*, the *Juanulloa grandiflora*, Dun., appears to me to agree well, in all essential respects, with my *Cleochroma grandiflora*, figured in plate 32 of my 'Illustrations'; it is the *Iochroma grandiflora*, Benth., and again described by M. Dunal (Prodr. 491) under that name; it seems to differ only in the blade of the leaves being somewhat shorter; and if the dimensions of the calyx, which always increases rapidly with the age of the flower, be taken as that of its ultimate growth (as shown in fig. 4 of the plate referred to), all the proportions and floral details will be found to accord completely with those of M. Dunal's description: should it be found, however, to be a distinct species, it may be called *Cleochroma Dunalii*. Upon the same evidence, *Juanulloa microphylla*, Dun., will become *Cleochroma microphylla*, nob. M. Dunal includes *Cleochroma* as a section of *Iochroma*: it is undoubtedly much allied to that genus, but I have offered strong reasons (Illust. South Am. Plants, i. p. 147) to prove why it should be considered generically distinct. We have only to compare the details given in plates 46, 47, 32, 31 and 30 of the work last quoted, to be convinced of the great generic differences between *Juanulloa*, *Sarcophysa*, and *Cleochroma*, and of this last from *Iochroma*.

Codoconia of M. Dunal (Prodr. p. 482), if it be not identical with, is evidently allied most closely to *Hebecladus*, and not to *Atropa*, agreeing with the former in habit, and the æstivation and general structure of its floral parts, differing only in being 6-merous, and in having shorter stamens and style, which in other genera (as in *Solanum*, *Capsicum*, and his *Witheringia* for instance) are not allowed to constitute generic distinctions.

With the *Sicklera* of Dr. Sendtner (Prodr. p. 501) I am not in the least degree acquainted, but from the description there given, it cannot be, as M. Dunal states, allied to *Lycium*, on account of its herbaceous habit and the valvate æstivation of its flowers: judging from the characters there described it appears to be very near *Capsicum*, and indeed to differ little from that genus: it accords in the form of its unchanged persistent calyx, in the shape and size of its corolla, the insertion of its short stamens, and its apiculated cordate subexserted anthers: there does

not appear anything in the description of its other characters at variance with that genus.

Upon a few other genera described in the 'Prodromus' I shall at another time treat at more length, and in now closing these strictures upon the last volume of the 'Prodromus,' I beg to disclaim the slightest intention of reflecting either on M. Dunal or M. DeCandolle, who must ever demand our homage and highest esteem. I will here only allude slightly to the circumstance, that although M. Dunal in his important monograph has naturally availed himself to a large extent of the materials I have contributed towards a history of this family, he has, without the slightest reference to them, passed over altogether the several reasonings, and the numerous essential and differential characters I had given, with the view of distinguishing the several genera, and upon which I proposed to group the different tribes and sections of the order. In offering these remarks I am bound to say, that my principal motive has been to establish and ascertain the relative value of the facts so applied, and also to show that the illustrious author of that monograph in his arrangement of the *Solanaceæ* has not selected and employed those characters best suited to establish the affinities of the several natural divisions, that he has been incautiously drawn into many errors by neglecting to attend to certain fixed rules and valid characters already suggested by others, and that consequently his whole arrangement of the order is incomplete and unsatisfactory: it almost bears the semblance of having been compiled nearly twenty years ago under the imperfect state of our knowledge of the family at that time, and upon the defective system of arrangement then employed, the genera since established appearing as if now interpolated at random, without regard to their affinities, or placed as sections of old genera to which they bear no relation, and to which the characters there given are ill adapted: similar defects are apparent in the distribution of species in several genera, as I shall shortly have occasion to show in regard to the genus *Lycium*: at the same time all must agree that the whole forms a collection of materials of much value and importance. I do not presume to say that the distribution and characters I have proposed are the best that can be offered, but as they seem to bring together the several well-marked groups, and with all their defects to offer to a great extent a consistency of arrangement, they are at least entitled to the indulgent consideration of botanists.

I cannot dismiss this review without adverting to the admirable work of Dr. Sendtner on the *Solanaceæ* of Brazil (Vienna, 1846), which is more especially deserving of attention because the classification there employed in the distribution of the very

extensive and difficult genus *Solanum* has been fully adopted by M. Dunal in the 'Prodromus,' in preference to the unscientific arrangement in Don's 'Dictionary,' previously in use among botanists. The system of Dr. Sendtner is founded in great measure on the structure of the stamens, which afford valid characters, as I had long before observed and adopted for my own purposes. Dr. Sendtner has therefore rendered much service to science by this work, which everywhere displays originality of observation, his materials being classically and ably elaborated. His ordinal diagnosis of the *Solanaceæ* is infinitely preferable to that of M. Dunal, but notwithstanding this admission it is not free from some defects, among which may be mentioned the assertion that in the position of the embryo the extremity of the radicle points to the hilum. His synopsis of the distribution of the few genera indigenous in Brazil answers the purpose there intended, but is one quite unfitted for a classification of the whole family. The *Nolanaceæ* are here very properly excluded, although *Grabowskya* is placed in the *Solanaceæ* upon an erroneous principle, as explained in a former page (*ante*, p. 3). The *Cestrineæ* are likewise excluded from the *Solanaceæ* on account of their straight embryo, and, as suggested by Schlechtendal, placed in a separate family, while *Nicotiana*, *Petunia* and *Nierembergia*, also with a nearly straight embryo, are retained in the latter order; this is inconsistent, at the same time that the peculiar mode of æstivation in these genera, so different from *Solanaceæ*, is unnoticed. The Brazilian *Cestrineæ*, according to these views, are confined to *Cestrum* and *Metternichia*; the embryo in the former is said to be hemianatropous, in the latter anatropous, but I can perceive little difference in this respect, as in both cases the hilum is somewhat ventral and removed from the radicle, which points to the base of the seed as in *Nicotiana*: the only real distinction that I can perceive in the ordinal characters of Dr. Sendtner is that in *Solanaceæ* the calyx is "opisthodromicus ($\begin{smallmatrix} \cdot & \circ & \cdot \\ \cdot & \circ & \cdot \end{smallmatrix}$), *i. e.* sepalò secundo postice verso, atque locum in mediana inter axin secundarium et primarium obtinente," and in the *Cestrineæ* the calyx is "emprosthodromicus ($\begin{smallmatrix} \cdot & \circ & \cdot \\ \cdot & \circ & \cdot \end{smallmatrix}$), *i. e.* laciniis 3 anticis et 2 posticis." These are hard words that might be better expressed by the more simple terms of 'posticeps' and 'anticeps': this character, if it be general, has certainly escaped my observation, and we might almost infer that it is not constant, since M. Dunal, who has evidently studied Dr. Sendtner's work, nowhere alludes to this feature. I have searched in vain for its constancy in dried specimens, and it must be confessed that

it does not appear to be likely, from its very nature, to prove a character available for practical purposes, because by the mere torsion of the pedicel, in so small a quantity as one-tenth part of a revolution, an opisthodromical calyx becomes at once emprostodromical. Besides, at all times it must be a doubtful test among the *Solanaceæ* and *Atropaceæ*, where the insertion of the peduncle is always more or less extra-axillary and lateral, forming a kind of inflorescence termed centrifugal; for here the point of the calyx, that under ordinary development would be directed towards the axis of its parent branchlet, is actually twisted away from it, so that in the more bilabiate genera of the *Atropaceæ* the two lips cease to be superior and inferior as in the true *Scrophulariaceæ*: this is very clearly manifest in *Nierembergia* and several other genera when examined in a living state. We should be guided by facts rather than by hypothesis in these cases.

Dr. Sendtner in his work (p. 225) has made some rather ill-natured remarks for my want of attention to what he conceived to be essential characters, quoting in addition that I had not observed the structure of the stamens in *Cyphomandra*, and had not noticed the articulation of the pedicel in *Cestrum*. My details of *Pionandra*, as illustrated in plate 8, were made, and the drawings taken from the living plants, ten years previously, though only published about the same time as *Cyphomandra*; these naturally differ in some respects from the dissections of Dr. Sendtner, made from dried specimens, and it is from this cause that this excellent botanist failed to observe the fleshy annular ring that I have depicted. It is true that I omitted to mention the articulation of the pedicels in *Cestrum*, as well as many other ordinary characters which it was not thought necessary to notice, but it is evident that this feature, which is common to other species, did not escape my observation, for in plate 16 of the same work, every flower of *Cestrum organense* there delineated will be seen to be distinctly articulated on its pedicel. If an omission of this kind has crept into the descriptions of the desultory nature I had adopted, it is evident that the more learned and systematic work of Dr. Sendtner is not less free from error; for instance, among many others, we may quote his generic character of *Hyoscyamus*, where the lobes of the corolla are said to be plicated in æstivation when they are really imbricated—the placentation is stated to be free, whereas it was certainly adnate in the species I examined in a living state: he makes no mention whatever of the conspicuous epigynous gland that crowns the summit of the ovary, which tends subsequently to the singular mode of dehiscence of its capsular fruit. In like manner this learned botanist failed to observe the gynobasic origin of the style in *Grabowskya*, which

led to his error in placing that genus among the *Solanaceæ*, and he does not notice the erect position and basal insertion of its ovules, so contrary to all that is met with in that family. I merely quote these instances, out of a number of others, to show that the most accurate observers and the most learned men are as liable to errors and omissions as those of less pretensions, and they ought consequently to look charitably on the faults of others. The necessity of groping, as it were, in the dark in search of tangible facts, and treading the path firmly at every step, giving thus a desultory character to these communications, added to the rigour of detail, originating in my professional habit of proving everything by rule and by positive demonstration, may justify the charge made by Dr. Sendtner, who says of me, regarding these contributions, "*rei botanicæ parum proffit: veras disciplinæ botanicæ notiones vilipendens*," &c. (*loc. cit.* p. 225); and this dullness may account for my utter inability to comprehend the more refined and transcendental definitions of the German school. This accomplished botanist, describing in his elaborate work the nature of the inflorescence of the *Solanaceæ* (p. 181), has employed an extent of definition that would occupy ten close octavo pages, in order to describe that which appears to me might be made far more intelligible in almost as many lines. After giving my best attention to this elaborate diagnosis, I am yet unable to comprehend the finer distinctions of "recaulescent, concaulescent, estalechic, antidromical or homodromical" developments and their various combinations; nor can I perceive the utility of employing other new terms, such as "*dichasia, concinna, cormanthæ, metapodia, hypopodia*," and a number of others, in order to explain what we commonly understand by a simple or compound cyme or corymb, expressions long in use and comprehensible to everybody, without the necessity of employing words, involving ideas of development founded wholly on hypothesis. Besides, after all, the fact is known to all horticulturists that in the same species its habit and the development of its inflorescence are subject to much variation if grown in different soils, in a hot or cold temperature, in a moist or dry atmosphere, in exposed or open situations; hence the characters derivable from such sources are always variable, while those features observed in the development of the flowers and fruit are far more constant and always to be relied upon for scientific purposes. This consideration leads us naturally to inquire how many out of the 900 kinds of *Solanum* enumerated by M. Dunal ought not to be considered as genuine species? There are many individuals of this genus that are perfect weeds and have become quite cosmopolitan, such for instance as *Solanum nigrum*, *S. dulcamara*, *S. pseudocapsicum*, *S. torvum*, &c.; these under different circumstances assume many

varieties of development, and consequently figure in herbaria as numerous and distinct species.

In concluding these observations tending to justify the conclusions I have formed after a long and careful examination of the whole family of the *Solanaceæ*, it is necessary to offer a few words of apology, especially after the reproachful remarks of Dr. Sendtner before quoted. It will be seen that the different subjects there treated upon were published at frequent intervals during a space of seven years, in detached portions, without regard to any system of arrangement. At the commencement I had not the most distant thought of extending these investigations to the length they have been carried, step by step: sufficient proof of this is seen in the preface to the first memoir in 1845 (Lond. Journ. Bot.) and in the first number of my 'Illustrations' in 1846, my object, as there shown, being merely to publish the drawings and details of the plants I had collected abroad; but in attempting to define in succession the particular genus to which these plants belonged, I found myself continually at fault: hence arose the necessity of comparing them with those of other collections, among which may be mentioned the rich herbarium of Sir W. Hooker, who most liberally opened everything to my inspection, and those of the British Museum and Linnæan Society: these distant journeys, necessarily frequent, much increased the difficulties of my progress, for my only plan of procedure was to make sketches of each plant for comparison with others at a distance and with my own notes at home. The results were published in desultory succession as the subjects presented themselves to my notice: had the whole of these inquiries been completed before the publication of any portion, and each analysis compared carefully with others, aided by a knowledge of the real structure of the rest, there would have been more consecutiveness and uniformity in the general definitions. Some indulgence may therefore be claimed and allowance made for the many faults that have necessarily resulted from this mode of procedure, the only one at my command. Notwithstanding the manner in which the materials are thus scattered throughout those pages, much that is useful may indubitably be gleaned, both from the text and the drawings, towards our knowledge of the members of this family and their respective affinities: a great many new facts have been added, and others previously known have been corrected; some progress has also been made towards a record of the essential as well as differential characters, and towards defining the more exact limits of each genus, and this has been throughout the full extent of my aim.

From what has been shown in the preceding remarks, it will be seen that much yet remains to be done before we obtain a

proper arrangement of the *Solanaceæ* and the genera more immediately allied to them, and it certainly affords cause for regret that at a period of excellent opportunity, with such abundant materials, with every facility at command, and with a considerable amount of assistance from others, so imperfect a digest of the family should have appeared in the highest standard work of our time, the 'Prodromus' of M. DeCandolle.

IX.—*Descriptions of species belonging to the genera Pterocyclos and Cyclostoma, from Ceylon and West Australia.* By W. H. BENSON, Esq.

1. *Pterocyclos Cingalensis*, nobis, n. s.

Testa late umbilicata, orbiculato-depressa, solidula, radiato-striata, albida, superne strigis subundatis, medio fasciâ castanea picta; spira planiuscula, apice vix prominulo, sutura profunde impressa; anfractibus 5, convexis, ultimo lente descendente, superne alato, breviter soluto; ala prominentiam elongatam angustam ascendentem formante, postice carina obtusa desinente; apertura obliqua, subcirculari; peristomate duplici, interno porrecto, superne profunde inciso, externo incrassato, superne dilatato, leviter deflexo; umbilico profundiusculo. Operculo (teste E. L. Layard) pyramidal.

Diam. major $19\frac{1}{2}$, minor 16, alt. 6 mill.

Hab. ad vicum montanum Monahagalla, Insulæ Ceylon. Teste Dom. Edgar Leopold Layard.

Distinguished from *Pt. rupestris* by the length and narrowness of the alar prominence, which ascends slightly on the penultimate whorl, and runs parallel with it, instead of spreading semi-circularly as in that shell. From *Pt. Albersi* it differs not only in size, but in the absence of the incurvated beak which is such a prominent feature in that species. The umbilicus, equally broad with that of *Pt. rupestris*, is somewhat deeper in proportion.

This very interesting addition to a genus, which, though still limited in number, receives yearly additions from our Eastern possessions, was found by Mr. Layard in the central mountain region of the island, the fauna of which he is so successfully investigating. A monograph of the genus *Pterocyclos*, including all the species hitherto published, will be found in Dr. Pfeiffer's 'Monographia Pneumonopomorum' recently issued, including, in a compact volume, excellent descriptions of all the known Cyclostomacea and Helicinacea, with references to the figures given in the 'Conchylien Cabinet,' Sowerby's 'Thesaurus,' &c.