THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

PRIDEAUX JOHN SELBY, Esq., F.L.S.,
CHARLES C. BABINGTON, Esq., M.A., F.R.S., F.L.S., F.G.S.,
JOHN EDWARD GRAY, Ph.D., F.R.S., F.L.S., V.P.Z.S. &c.,
AND
WILLIAM FRANCIS, Ph.D., F.L.S.

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818

ALERE FLAMMAM.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

" .... per litora spargite muscum,
Naiades, et circùm vitreos considite fontes :
Pollice virgineo teneros hìc carpite flores :
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas ;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasii Ecl. 1.

No. 91. JULY 1865.

I.—*Descriptions of new Genera and Species of Diatoms from Hongkong.* By R. K. Greville, LL.D., F.R.S.E. &c.

[Plate V.]

Palmeria, nov. gen., Grev.

Frustules free, hemispherical, having an axis on the plane, and longitudinal lines, indicative of fissiparous division, on the convex surface; structure an exceedingly minute hexagonal cellulation, appearing (except under a high magnifying power) like a fine close moniliform striation, radiating from a subcentral nucleus to the margin of the valve, along with a more distant series of fine costæ terminating in intramarginal punctiform nodules.

This very singular Diatom cannot be satisfactorily referred to any of the families defined in the most recent general arrangement—that of Mr. Ralfs in the last edition (1861) of Pritchard's 'History of Infusoria.' With two of them, however (the *Cymbelleæ* and the *Coscinodisceæ*), there appear to be some points in common. The form of the valve agrees with the first of these families, and the frustule, as in *Amphora*, presents a ventral and a dorsal aspect; but there are no transverse striæ, no longitudinal line, no nodules. With regard to the second family named, it is excluded at once by the absence of the requisite disciform structure and intermediate ring-like zone. Nevertheless the minute organization is very similar; for we have an hexagonal cellulation radiating from a centre, along with a series of other sharply defined lines, which may be called radiating costæ, and which terminate in submarginal nodules—the analogues of the lines and minute spines in *Coscinodiscus concinnus* of Smith. But our new Diatom seems, at first sight, to have a closer affinity with Dr. Wallich's curious genus *Hemidiscus*, which at present is placed (I fear erroneously) among the *Anguliferæ*. The arcuate form, radiating cellulation, and submarginal puncta certainly show an approximation between the two. Whatever view, however, may be taken of their family relations, there are differences which must keep them apart as genera—the chief of which is the nodule on the ventral margin of *Hemidiscus*. The submarginal puncta in that genus are also very different from the minute nodules which terminate the radiating costæ in *Palmeria*; and it is not unworthy of notice that the point of radiation in the latter genus is never *exactly* centrical, being invariably somewhat to the ventral side of the centre; whereas in *Hemidiscus* it is truly centrical.

In a popular view, the frustule of *Palmeria* is graphically compared by its discoverer to the half of a peeled orange, the lines on the convex surface representing the segments of that fruit.

In the living state, the endochrome is collected into minute roundish masses, which dot the whole of the interior of the siliceous covering. The nucleus in the valve is then very conspicuous; and I have a sketch, from Mr. Palmer, showing radiating "reticulated cords," similar to those described and figured by Professor Max Schultze in *Coscinodiscus centralis* and his *Denticella regia* (Mic. Journ. vol. vii. p. 13, pl. 2. figs. 11–13). This appearance has also been observed, even in this country, in specimens received from China, both of *Palmeria* and of a species of *Coscinodiscus*, by my friend Mr. Laurence Hardman. The peculiar current-like motions described by Prof. Max Schultze have been witnessed likewise to some extent by Mr. Palmer, especially the formation of a more compact mass of active particles, changing both its shape and position within the cell from time to time. (Letter, June 1864.)

Palmeria Hardmaniana, n. sp., Grev. Pl. V. figs. 1–4.

Hab. Hongkong Harbour; John Linton Palmer, Esq., Surgeon R.N., 1863.

A very large Diatom (varying, however, greatly in size), some examples being as much as ·0160″ and upwards in diameter.

Frustules nearly, but not fully, hemispherical previous to self-division; on one side plane, with an axis through the middle and a valve on each side; on the convex surface marked with a middle longitudinal line and two fainter ones, indicating the direction of future fissiparous division. The valves lunate, with a straight ventral margin and obtuse ends; the surface covered with very fine lines of hexagonal cellulation, radiating from a blank nucleus or roundish vacant space, not situated exactly in the centre, but a little towards the ventral side. Radiating from the same point, and at more remote intervals, are also exceedingly fine, but stronger, lines or delicate costæ, which terminate in a continuous row of punctiform nodules a little within the margin of the whole circumference.

The first gatherings of Diatoms in Hongkong Harbour, sent me by Mr. Palmer, contained some imperfect frustules of this Diatom, which, along with his notes and sketches, greatly stimulated my desire for more perfect materials. Fortunately my friend Mr. L. Hardman had also received some collections from the same locality; and, as they were rich in this production, he, at my request, most kindly instituted a careful and minute examination into its structure; and it is only due to his friendly aid and unrivalled manipulation to state that it is mainly from his notes, sketches, and specimens that my drawings and descriptions were prepared. My valued correspondent Mr. Palmer subsequently forwarded a cell filled with frustules, preserved in fluid, along with additional interesting information confirming the results at which both Mr. Hardman and myself had arrived. It is with sincere pleasure that I unite with the name of the discoverer, now so worthily bestowed on the genus, that of the gentleman who so materially aided me in the investigation of its structure.

Palmeria Hardmaniana is a very delicate and fragile Diatom, readily dividing (if arrived at the proper stage) at the slightest touch—falling asunder as the segments of an orange are separated, to use a simile already referred to. In size the frustules appear to have a great range. Mr. Hardman has observed some, however, which seem to belong to a second species, only half the average size of the one now described, and much stronger and thicker. As far as I can judge from a specimen he has kindly given me, I am disposed to agree with him; but it will be well to examine a larger series of examples before coming to a positive conclusion. Mr. Palmer informs me that he also has observed frustules of a much smaller size; but, in the absence of details, it is impossible to say whether they belong to the supposed new species or not.

Genus Asterionella.

Asterionella Synedræformis, n. sp., Grev. Pl. V. figs. 5, 6.

Frustules exactly linear throughout, truncate, with two minute apiculi at the apex; valve slightly dilated and rounded at the base.

Hab. Hongkong Harbour; J. L. Palmer, Esq.

A very fine and distinct species, agreeing only with *A. Ralfsii* in the frustules being exactly linear; but the latter is a fresh-water species, having, besides, the valve of a different shape. The present species is a large one, the frustules being sometimes ·0080″ and upwards in length. Towards the apex the margins appear to be thickened, and terminate in two minute apiculi. The valve is transversely striated, shortly acuminated at the apex, becoming more slender below (as in other species), and then slightly dilated at the base. The late Prof. Smith committed an oversight in resting the character of the genus partly upon the frustules being "inflated towards one or both extremities;" for he defines one of his own three species (*A. Ralfsii*) as "on F. V. exactly linear," which they are. This is of little consequence, as the main character depends upon the stellate arrangement of the frustules, combined with the form of the valve, which is different at the two extremities. Our new species appears to be abundant at Hongkong. I have one specimen in my cabinet in which only two frustules are absent from a circle of fourteen.

Genus Surirella.

Surirella Palmeriana, n. sp., Grev. Pl. V. fig. 7.

Valve ovate-oblong, with obtuse ends; alæ inconspicuous; costæ very slender, numerous, regular, terminating in a narrow median line, and having very delicate intermediate striæ.

Hab. Hongkong Harbour; in material communicated by J. L. Palmer, Esq.

A very fine species, allied to *S. gemma*, but differing in important particulars, especially in the total absence of alæ, and in the canaliculi being equally distant. It is, besides, a much larger species. Prof. Smith gives the length of *S. gemma* at from ·0025″ to ·0058″; that of *S. Palmeriana* is ·0080″. The canaliculi are 4 in ·001″, and the intervening spaces are beautifully arched or crenate at the margin. It appears to be exceedingly rare, as Mr. Palmer has not referred to it in his letters.

Genus Creswellia.

Creswellia annulata, n. sp., Grev. Pl. V. fig. 8.

Minute; frustules short, cylindrical, truncate, transversely striated so as to appear annulate; connecting processes very numerous, very short, linear, obtuse.

Hab. Hongkong Harbour; in material communicated by J. L. Palmer, Esq.

A fragile little species, seldom found quite entire, and generally in solitary frustules; but I have repeatedly seen two in connexion, and have at the present moment a chain of three under my eye. I have not been able to perceive any cellulation; but the annulate character is very obvious. The length of the frustule is about ·0010″; the breadth a little less.

I take the present opportunity of mentioning that in specimens burnt on the cover, and mounted dry, I have observed indications of an annulate structure in *C. cylindracea,* to which our new species appears to be allied.

Genus Hemiaulus.

Hemiaulus chinensis, n. sp., Grev. Pl. V. fig. 9.

Frustules rectangular, very minutely punctate; the angles produced into linear-attenuated horns, tipped with a spine; space between the horns nearly straight.

Hab. Hongkong Harbour; J. L. Palmer, Esq.

Like *Hemiaulus Polycystinorum* and others of the genus, the present Diatom is most inconstant in point of size, not so much in the length as in the breadth of the frustules. I have them from ·0007″ to ·0030″. It is a delicate and transparent species, and liable to be overlooked, unless burnt on the cover previous to mounting. At the sutural line the puncta are exceedingly minute, and gradually increase in size to the surface of the valve included between the horns. I am not acquainted with any true species of *Hemiaulus* in which the punctation is so minute. The horns are somewhat truncate, and furnished with a terminal, slender, short spine.

In his memorandum sketch, Mr. Palmer has represented the valve, a view of which I have not been so fortunate as to obtain.

Genus Amphiprora.

Amphiprora lepida, n. sp., Grev. Pl. V. fig. 10.

Front view broadly linear, elongated, rounded at the ends, very slightly constricted in the middle, and with a marginal row of very minute puncta; middle portion grooved with straight longitudinal lines.

Hab. Hongkong Harbour; in material transmitted by Mr. J. L. Palmer.

Well characterized by its narrow form, almost straight margins, and ribbed appearance of the connecting zone. I cannot perceive any trace of striæ or of supplementary wings. The length of the frustule is ·0065″; breadth in the middle ·0010″.

Amphiprora hyalina, n. sp., Grev. Pl. V. fig. 11.

Hyaline; front view divided, by a deep and sharp constriction, into two roundish lobes, with a row of extremely minute marginal puncta, and a second inner row of irregular ones; supplementary wings forming a single curve; connecting zone with longitudinal lines.

Hab. Hongkong Harbour; in material communicated by J. L. Palmer, Esq.

I offer this species with some little apprehension that it may turn out to be an extraordinary variety or condition of *A. alata*. Assuredly it appears to have absolutely nothing in common with the figures given by Prof. Smith in his 'Synopsis of the British Diatomaceæ;' but it more nearly resembles Kützing's figures in his 'Bacillarien,' which, although not quoted in Pritchard's 'Infusoria,' are copied in the plates. These figures, however, are somewhat confused, and, being deficient in details, cannot be regarded as definitive. There is, if I may be allowed the expression, a great difference in the physiognomy of the Chinese Diatom. The supplementary wings also, which sweep down and intersect the lines of constriction, constitute an important character. I have been unable to observe whether the wing be continued round the ends, as is said to be the case in *A. alata*. The marginal puncta are much more minute than in that species; and I cannot make out any striæ. Length ·0028″, breadth ·0018″.

Amphiprora venusta, n. sp., Grev. Pl. V. fig. 12.

Front view broadly panduriform, truncate at the ends; wings widely rounded at the corners, and then rapidly constricted; supplementary wings narrow, passing in a single curve within the nodule, striated; margin strong, with a row of minute puncta.

Hab. Hongkong Harbour; in material communicated by J. L. Palmer, Esq.

This species possesses a considerable likeness to *A. alata* (Edin. New. Phil. Journ. vol. xviii. pl. 1. fig. 13), but differs in its strong margin, in the row of marginal puncta, and in the apparent absence of striæ in the wings. In general outline it is also very similar to *A. Meneghiniana* and *A. Brébissoniana* (*loc. cit.* pl. 4. figs. 7, 8); but here the single curve of the supplementary wings, besides other characters, removes it at once. In the dry mounted slide the margin appears of a fine blue colour. Length of frustule ·0040″.

Amphiprora chinensis, n. sp., Grev. Pl. V. fig. 13.

Front view transversely striated, oblong, rounded at the ends, moderately constricted at the middle; wings flatly convex; supplementary wings narrow, with a marginal row of dark points; connecting zone with a few narrow, ridge-like lines; striæ minutely moniliform.

Hab. Hongkong Harbour; in material communicated by J. L. Palmer, Esq.

The frustules are sometimes twisted so as to throw a portion of the wings out of focus; and the disposition to twist seems almost always to cause more or less undulation in the rib-like lines of the middle portion. The whole surface is transversely striated, and the striæ of the wings are clearly, although extremely minutely, moniliform. The flatness of the wing-curves gives a degree of parallelism to the general outline, which is very characteristic. The supplementary wings follow the curve of the primary ones in a somewhat less degree, and pass down within the nodules, having the appearance of an elevated ridge, the ridge-line marked with a row of minute dark spots (scarcely puncta), caused possibly by the intersection of the striæ. Length of frustule ·0040″ and upwards.

EXPLANATION OF PLATE V.

Fig. 1. Frustule of *Palmeria Hardmaniana*: front view, magnified 100 diams., showing the lines of future fissiparous division.
Fig. 2. The same, showing the valves.
Fig. 3. The same, showing the valves and frustule in the process of division.
Fig. 4. Valve of the same, showing the radiating structure, magnified 150 diams.
Fig. 5. *Asterionella Synedræformis*, exhibiting two of the frustules and the bases of others *in situ*.
Fig. 6. Valve of the same.
Fig. 7. *Surirella Palmeriana*.
Fig. 8. *Cresswellia annulata*: two frustules *in situ*, the valves of one of them separating.
Fig. 9. *Hemiaulus chinensis*: two frustules *in situ*.
Fig. 10. *Amphiprora lepida*.
Fig. 11. „ *hyalina*.
Fig. 12. „ *venusta*.
Fig. 13. „ *chinensis*.

[All the figures are magnified 400 diameters, except figs. 1 to 3, which are magnified 100, and fig. 4, which is magnified 150 diameters.]

II.—*Notes on British Lichens.*
By the Rev. W. A. Leighton, B.A., F.B.S.E.

[Plate IV.]

I purpose, in this and subsequent papers, from time to time to present notes and illustrations of new or recently discovered British Lichens, or such as have not been figured and described in Sowerby's 'English Botany' and Supplement.

Gonionema, Nyl.

Thallus filiform; gonidial cells large, filled with granules, concatenated into a central axis. Apothecia biatorine or gyalectoid.

Gonionema velutinum, Nyl. Thallus dark brown, slender, entangled; apothecia dark brown, terminal, centre depressed, margin swollen, pale within; sporidia in asci 8, ellipsoid, simple, colourless; paraphyses slender.

Gonionema velutinum, Nyl. Prodr. 16 (1857), Syn. 88, t. 1. fig. 11 (1858), Scand. 23 (1861).
Collema velutinum, Ach. Syn. 329 (1814).

On the northern precipices of Craig Breidden, Montgomeryshire, June 1864.

This minute lichen grows in scattered or continuous patches on the face of the rock, and resembles in general appearance a coarse dense velvety pile, of a blackish-brown colour. It consists of minute, slender, cylindrical filaments, simple or branched, erect, uniform in height, crowded and entangled into a cæspitose mass. When moistened and viewed under the microscope, these filaments are found to consist of an outer fleshy or cartilaginous continuous membrane, of a darkish-brown or olive-tawny colour, within which is seen a central axis filling the entire external cylindrical membrane, formed of large globular or spherical cells concatenated in a moniliform manner, compressed longitudinally by juxtaposition, and thus giving the cells a transverse dilatation. On the external membrane being ruptured, the central axis in longer or shorter lengths extrudes itself, and is then seen to be of a pale dirty glaucous-green colour, and the cells to be filled with very minute spherical granules, which, on the application of diluted sulphuric acid, become of a reddish tinge. I did not observe any apothecia on the Breidden specimens; but the structure of the thallus in these so corresponds with an authentic specimen in fructification, received from Dr. Nylander himself, as to leave little or no doubt of their identity, notwithstanding a slight difference in the width of the filaments, most probably resulting from age and situation. The apothecia on

Dr. Nylander's specimen are very minute, appressed, and sessile on the upper extremities of the thalline filaments, and of a similar colour, depressed or gyalectoid in the centre, and surrounded with a thickish tumid margin, internally pale, and consisting of narrow linear-oblong asci interspersed among very slender paraphyses slightly swollen at the apices. Sporidia 8 in each ascus, ellipsoid, hyaline.

Dr. Nylander (*l. c.*) describes the spermogonia (which I have not seen) as pale, globular or turbinate, and terminal; spermatia oblong, short; sterigmata slender. He also says, the hymeneal gelatine becomes blue by the action of iodine, and finally of a vinous red.

PLATE IV. fig. 1. Portion of filament of thallus, magn. 330 times linear.
fig. 2. Central axis, magn. 330 times linear.
fig. 3. Cells of central axis, magn. 1200 times linear.
fig. 4. Asci and paraphyses, magnified 330 times linear.
fig. 5. Sporidia, magn. 1200 times linear.
fig. 6. Sterigmata and spermatia, after Nylander.

SPILONEMA, Born.

Thallus filiform, branched, fruticulose; granula gonima large, in transverse strata; apothecia lecideine, lenticular.

Spilonema paradoxum, Born. Thallus blackish brown, slender, cæspitose, entangled, branched; apothecia black, terminal, hemispherical, immarginate; hypothecium nigrescent; sporidia in asci 8, oblong, simple, colourless; paraphyses thick, articulate.

Spilonema paradoxum, Bornet! Trois Lich. Nouv. p. 4, in Mém. Cherb. Dec. 1856, tab. 1 & 2; Nyl.! Prodr. 17 (1857), Syn. 89, t. 2. f. 3 (1858), Scand. 23 (1861); Leight.! Lich. Brit. Exs. 347 (1858); Mudd, Man. 35 (1861).

On rocks near the Harlech turnpike, at Barmouth, North Wales, June 1856, in fructification.

Thallus forming larger or smaller, dense or scattered patches of a black olive-brown colour, on the bare surface of granitic rocks, presenting a dense cæspitose velvety aspect. Filaments of thallus erect, flexuose, and curved, entangled, irregularly and somewhat secundly branched, about $\frac{1}{8}$th of an inch in height. The extremities of the branches, when moistened and viewed under the microscope, are found to consist of a continuous outer membrane, of an olive-tawny colour, within which the large rounded or oblong gonidial cells are seen arranged in tolerably regular transverse strata. The older stems exhibit the gonidia more scattered and irregular, but still disposed in a distinctly transverse direction, and immersed in a dense cellular tissue. *Apothecia* terminal, minute, hemispherical, without any margin, black; hypothecium nigrescent. *Paraphyses* short, thick, articulate, the apical cell slightly enlarged and dark coloured. *Sporidia* 8, in narrow asci, linear-oblong, simple, hyaline. *Spermogonia* (which I have not seen), according to Bornet and Nylander, lateral, tubercular, black; arthrosterigmata articulate; spermatia "ovoïdes, fort petites" (Bornet), "breviter cylindrica" (Nylander).

Even in a sterile state, this plant, which has a general resemblance to *Ephebe pubescens,* may be distinguished by attention to the regular transverse arrangement of the gonidia, which are also of much larger size than those of that plant, and altogether differently grouped together. The outline of the filaments in *Spilonema* is uniform, whilst in *Ephebe* it is crenate or wavy, arising from the minute rugosities or tuberculations of the surface corresponding with the internal strata of gonidia. I thought at one time that there was also a chemical distinction,—dilute sulphuric acid turning the old and young filaments of *Spilonema* to a dark-green colour, whilst in *Ephebe* the younger branches were coloured green, and the older stems reddish; but this character did not seem, after experiments on different specimens, to be satisfactorily constant.

It is to be feared that, at least in some copies of my 'Lich. Brit. Exsic.,' specimens of *Ephebe pubescens,* which grew in the same locality at Barmouth with *Spilonema paradoxum,* have been inadvertently inserted.

Plate IV. fig. 7. Extremity of younger branch, magn. 330 times linear.
fig. 8. Portion of older stem, magn. 330 times linear.
fig. 9. Sporidia, magn. 1200 times linear.
fig. 10. Paraphyses.
fig. 11. Sterigmata and spermatia, after Bornet and Nylander.

Ephebe, Fr., Born.

Thallus filiform, branched, fruticulose; granula gonima smaller, subtransversely arranged, in little heaps, two, four, or more together. Apothecia endocarpoid, in thickened portions of the thallus.

Ephebe pubescens, Fr. Thallus blackish brown, slender, cæspitose, entangled, branched, slightly rugulose. Sporidia 8 in asci, lineari-oblong or subfusiform, 1-septate, hyaline; paraphyses none.

Ephebe pubescens, Fr. S. O. V. 256 (1825); Bornet, in Ann. Sc. Nat. sér. 3. xviii. 170, t. 7; Nyl. Prod. 17, Syn. 90, t. 2. f. 1. & 17–20; Scand. 24; L. P. 1!; Moug. & Nestl. 358!; Heppe, 712!; Fellm. Lich. Lapp. Or. 2!

Summit of Pen-Maen-Mawr, June 1851. Harlech turnpike, at Barmouth, Caernarvonshire, June 1856. Rocks at Dartmoor, *J. Ralfs, Esq.*! Rocks at Coachford, west of Cork, *J. Carroll, Esq.*!

This plant occurs in dense, entangled, decumbent masses, loosely attached to the rocks. Filaments rather coarse, and of a minute, tubercular, or scabrous appearance, dark brown, variously and irregularly branched. When seen moistened under the microscope, they are of an olive-brown colour; the granula gonima in the young branches and extremities of the branches appear transversely arranged, very similarly to those of *Spilonema paradoxum*; but in the larger and older stems they are more scattered and distant, and smaller in size, and are arranged somewhat irregularly transversely, in heaps of several together. The apotheeia are immersed in subfusiform swollen portions of the thallus, at a little distance from the extremities of the branches, and are similar to those of *Endocarpon*, spherical, with brownish perithecia. *Paraphyses* indistinct, mucilaginous. *Sporidia* 8 in each ascus, oblong, elongated, shortly fusiform, 1-septate, hyaline. *Spermogonia* in lateral prominences; sterigmata simple; spermatia straight, cylindrical.

For the unravelling of the synonymy, see Bornet, *l. c.*

PLATE IV. fig. 12. Portion of older stem, magn. 330 times linear.
fig. 13. Sporidia, magn. 1200 times linear.
fig. 14. Spermatia and sterigmata, after Nylander.

I possess a plant from Dr. Nylander, without any locality, named *Pilonema contextum*, Nyl., which, from the general appearance and structure of the thallus, seems allied to the foregoing. It grows in dense entangled cæspitose masses, of a blackish-brown colour. The filaments are very much branched, and seem, when moistened under the microscope, to consist of longitudinal series of small moniliform granula gonima immersed in cellular tissue. There is no fructification on the specimen.

PLATE IV. fig. 14. Portion of thallus, magn. 330 times linear.
fig. 15. Granula gonima, magn. 1200 times linear.

Racodium rupestre, Pers., of which I have a specimen from Dr. Th. M. Fries, gathered at "Smolandia, Femsjo, 1851," and which I have gathered on rocks at Sychnant, near Conway, and on the High Rock, Bridgenorth, Shropshire, and have also specimens from Llandrindod (*Rev. T. Salwey*), Leicestershire (*Rev. A. Bloxam*), and Cleveland (*Mr. W. Mudd*), and which, according to a specimen received from Dr. Guthnich, from the collections of Schærer, gathered at "Tête Noire," and labelled "Collema pannosum, Schær. Enum. p. 248," would seem to be included in that species by that author. Of this plant a fair representation is given in Dillwyn's 'Confervæ,' tab. 101, as *C. ebenea*. Viewed under the microscope, it is found to consist of minute filaments indistinctly septate, over which is spread a network of longitudinal fibres. No fructification has hitherto been detected. There can be little doubt of the lichenoid nature of this plant, the structure being similar to that of *Cœnogonium*. (See Karsten's Paper in Ann. Nat. Hist. ser. 3. vol. viii. p. 203, pl. 11.)

Plate IV. fig. 16. Filament, magn. 330 times linear.
fig. 17. Filament, magn. 1200 times linear.

Chroolepus Arnottii, Hook., of which I have an authentic specimen gathered "Kinross-shire, July 7, 1837," approaches these plants in external aspect; but the microscope shows it to consist of branched filaments of spherical cells, of a rich chocolate-brown, tapering towards the extremities, where a distinct conjugation may be seen.

Plate IV. fig. 18. Filament, magn. 330 times linear.
fig. 19. Conjugation at extremity of filament, magn. 330 times linear.
fig. 20. Conjugation, magnified 660 times linear.

Lichina pygmæa, Ag. (Leight. Lich. Brit. Exs. 260) is beautifully represented in Grev. Scott. Crypt. t. 219, and its microscopic details in Tulasne's Mém. Lich. tab. 9. figs. 1–6.

Mount's Bay, Cornwall (*J. Ralfs, Esq.*!) may be recorded as an additional habitat.

Plate IV. fig. 21. Sporidium, magn. 1200 times linear.

Lichina confinis, Ag. This Lichen is also beautifully given in Grev. Scott. Crypt. t. 221, and in Tulasne, *l. c.* tab. 10. figs. 12–18.

Mount's Bay, Cornwall (*J. Ralfs, Esq.*!), and Black Stones, Conway Bay, Caernarvonshire! June 1856, are additional habitats.

Plate IV. fig. 22. Sporidium, magn. 1200 times linear.

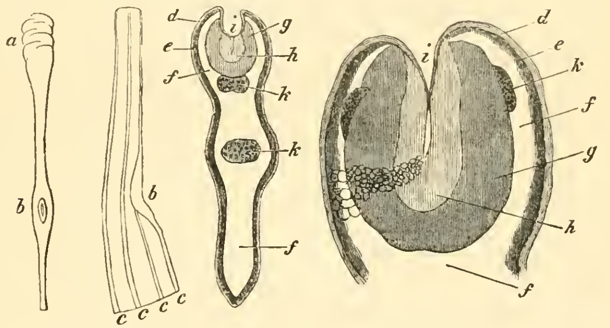
Pterygium centrifugum, Nyl. Syn. 92; Arnold, Lich. Juras. Exs. 159, may probably be found on our limestone-rocks.

The scales on the Plate are the $\frac{1}{1000}$th of an inch, magn. 330, 660, and 1200 times linear.

III.—*On the Gland of the Phyllodium of* Acacia magnifica. By the Rev. W. A. Leighton, B.A., F.B.S.E.

My attention has been attracted to a plant of *Acacia magnifica* when in blossom. On the upper edge of the vertical phyllodia (for the plant has no true leaves) subtending the showy spikes of yellow flowers, which proceed from their axils, appeared a pellucid drop of liquid, varying in size from that of a large pin's head to that of a grain of mustard-seed. This to the taste was sweet and sugary. The flowers themselves had no odour, except towards nightfall, when they gave out a weak disagreeable smell, only perceptible on close contact. On wiping off the sugary secretion, it was observed that it proceeded from a small sunken linear-oblong orifice or slit, surrounded by a swollen margin. The phyllodium itself is attached to the branch by a swollen base, the surface of which is curiously marked by shallow rimæ, alternately arranged, halfway round the base. From this swollen portion the base tapers gradually, and becomes much narrower, until, about a quarter or half an inch from the branch, the phyllodium expands into a fusiform swelling, on the centre of which the above linear-oblong orifice is situated. From this fusiform swelling the phyllodium tapers to its uniform thickness. These appearances are seen on looking down on the upper edge of the phyllodium from above, and are represented in fig. 1,

Fig. 1. Fig. 2. Fig. 3. Fig. 4.



where *a* is the swollen rimose base, *b* the fusiform expansion bearing the orifice. Fig. 2 represents a lateral view of the same, where *b* is the situation of the glandular orifice, and *c* the large bundles of vascular and spiral tissue, which proceed in a parallel direction to the apex of the phyllodium. On making a vertical section of this basal part of the phyllodium transversely through the glandular orifice, the section, in a dry state, shows the appearances represented in fig. 3. Externally there is the bright-yellow epidermis, with a layer of large cells immediately underneath, containing chlorophyll; then similar large cellular tissue, of a white colour and loose in texture; then a denser cellular tissue of much smaller cells of a white colour, which is continued towards the central slit of the gland, but becomes of a pale yellow or slightly tawny colour, probably from the very minute granular contents. Dilute sulphuric acid and weak solution of iodine produced no change of colour in any of these parts. On moistening the section with water, the external lips of the orifice become swollen and partially closed, the slit alone being visible, as seen, more highly magnified, in fig. 4 (where the same letters indicate the same parts as in fig. 3, viz. *d*, epidermis; *e*, chlorophyll-cells; *f*, loose white cellular tissue; *g*, dense white cellular tissue; *h*, dense yellow cellular tissue; *i*, glandular slit; *k*, bundles of vascular and spiral vessels). Here it is seen that the epidermis ceases somewhat above the base of the slit, where apparently the cellular tissue is exposed, and from which surface the pellucid liquid is excreted.

The plant began to blossom on the 27th of March, and was then removed from the green-house into the drawing-room, where the secretion immediately attracted my attention. I myself watered the plant every morning; and thus it was daily, and, indeed, many times every day, under my constant observation; and the secretion was pointed out to members of my family and to many friends almost daily. As I proposed to investigate the source and cause of the secretion with the microscope, I carefully watched it day by day, and am thus able to state definitely that the liquid drop was visible on the upper edge of every phyllodium subtending a spike of flowers during the whole time the plant continued in flower, viz. from March 27 to April 22. For a few days previous to April 22, the secretion appeared to decrease and partially to cease on some of the phyllodia. On April 23 the blossoms began to wither and fall. On the 24th the blossoms fell more rapidly and abundantly; and, to my surprise, there was an almost total cessation of the secretion, which now appeared on a very few only of the phyllodia. On the 24th the plant was returned to the greenhouse, and since that day to the present time (May 30), although the plant has been watched carefully for this express purpose, not the least secretion has taken place, and the orifice of the gland appears to have become partially filled up or obliterated.

Here observation ends; but, on beholding such a curious structure, the mind naturally speculates—but in vain—How is this secretion effected? Nature does not disclose her vital forces. We then turn to the probable end to be effected by such a provision; and here conjecture may be possibly more successful. The secretion takes place only during the period that the plant is in blossom. So soon as the flowers fade and begin to fall, the secretion ceases and disappears. It would seem then to be in some way or other connected with the fertilization of the flower; and as, when the secretion becomes excessive, it falls and blotches the lateral expansion of the phyllodium, it is probably to attract insects to effect this. It is right, however, to confess that no insects were observed to alight on the plant; but this may be owing in some measure to the early season of the year at which the plant blooms in this country, or to its having been taken from the green-house into a drawing-room, where the windows were generally closed; or, what is still more probable, that British insects are not the same as Australian, and have not the same habits; for it seems almost evident that it would require an insect of some considerable size and of some peculiar structure and habits to remove and apply the pollen, the secretion not being in the blossom itself, but at a short distance from it, on the phyllodium.

However, none of the flowers were fertilized; but it was remarked that the styles became elongated to nearly double the length of the stamens, particularly towards the time of the fading and falling of the blossoms. The thought readily arises, Is this another instance of dimorphism? and is there another plant, with short-styled stigmas, or with some other peculiar structure, adapted and necessary for the perfect fertilization? This, future and further observation may verify; but it appears highly suggestive of a fine field of research to those who possess or have access to large collections of *Acaciæ*. The fact of some *Acaciæ* fruiting abundantly in greenhouses, and others rarely or never, has often attracted attention; and artificial fertilization would do much towards ascertaining whether it is to the absence of insect agency that the sterility of the plants is due.

An intelligent nurseryman here informs me that he has never observed the plant to form legumes, or, at all events, other than abortive ones. He says the plant was originally raised at Ghent, from seed from Australia, and that that place is the great mart where it is propagated by cuttings, and imported into this country.

The microscopist will find the stamens, and indeed every portion of the floral whorls, beautiful and interesting objects, as, from their extreme transparency, the cellular tissue and the spiral vessels are distinctly displayed, without any dissection or other preparation than being placed in a drop of water.

IV.—*On the Nomenclature of the* Foraminifera.

By W. K. Parker, F.R.S., T. Rupert Jones, F.G.S., and H. B. Brady, F.L.S., F.G.S.

[Plates I., II., III.]

Part X. (continued).—*The Species enumerated by D'Orbigny in the 'Annales des Sciences Naturelles,'* vol. vii. 1826.

III. *The Species illustrated by Models.*

Previously to the publication of his "Tableau Méthodique des

Céphalopodes" in the 'Annales des Sciences Naturelles,' vol. vii. 1826, D'Orbigny had prepared and published, in part at least, a hundred models of *Foraminifera* (at that time regarded as microscopic Cephalopods), illustrating many of the species for the first time. These models were made in plaster of Paris, were about an inch or more in length, and were issued in sets of twenty-five, arranged in suitable boxes, each box bearing a label as follows*:—"Models of microscopic Cephalopods, recent and fossil, representing one individual of each of the principal divisions of a new method based on the mode of growth of the shells. The Models are from forty to two hundred times the size of the originals, so as to show their characters distinctly. By M. Alcide Dessalines D'Orbigny, junior. There are Four Fasciculi, each comprising twenty-five Models; besides, for the first sixty subscribers, three or four shells. The great rarity of the originals does not allow any more to be promised. (The specimens are in glass boxes, which must be opened with great care.) The four Fasciculi will be issued in the course of the first six months of 1823: the price of each is twenty francs, payable either at Rochelle to the author (Jardin des Capucins), or at Paris to M. ———. Letters and money to be post-free. The First Fasciculus of the Models may be seen at Paris, at the Museum of Natural History of the Jardin du Roi, and at M. ———'s. The subscribers will receive with

* "Modèles de céphalopodes microscopiques, vivans et fossiles, représentant un individu seulement de chacune des principales divisions d'une nouvelle méthode, basée sur le mode d'accroissement des coquilles. Le diamètre de ces modèles a été porté de 40 jusqu'à 200 fois celui des coquilles originales, afin de rendre plus sensibles tous leurs caractères.

"Par M. Alcide Dessalines D'Orbigny, fils.

"La Souscription se composera de 4 Livraisons, qui comprendront chacune 25 Modèles, et en outre 3 à 4 coquilles pour les 60 premiers souscripteurs: l'extrême rareté des originaux ne permet pas maintenant d'en promettre davantage. (Ils sont ici renfermés dans les boîtes de verre, qu'on ne doit ouvrir qu'avec la plus grande précaution.)

"Les quatre Livraisons seront expédiées dans le cours des 6 premiers mois de l'année 1823; le prix de chacune d'elles est 20 francs, et sera payé, soit à la Rochelle, chez l'auteur (Jardin des Capucins), soit à Paris, chez M. ——, en affranchissant les lettres et l'argent.

"On peut voir la première Livraison de ces Modèles, à Paris, au Muséum d'Histoire Naturelle du Jardin du Roi, et chez M. ——. Les souscripteurs recevront, avec la quatrième Livraison, le tableau méthodique de la distribution de ces Céphalopodes, qui indiquera, par numéros correspondant à ceux des Modèles, le nom des individus envoyés et l'ordre de leur classification."

"4^me^ Livraison.

"*Nota.*—Les Modèles coloriés représentent les coquilles fossiles; et les blancs, les vivans. Le lieu et la forme des syphons y sont indiqués par des traces ou par des points noirs."

the Fourth Fasciculus the Systematic Table of the Distribution of these Cephalopods, indicating, by numbers corresponding to those of the Models, the names of the specimens sent, and the order of their classification."

With the Fourth Fasciculus the following note was issued:—

"The coloured Models represent the fossil shells; the white Models, the recent shells. The place and shape of the siphuncles are indicated by the marks or black spots."

In his Introduction to M. D'Orbigny's memoir in the same volume of the 'Annales des Sciences Naturelles,' p. 99, M. Férussac says that two of the Fasciculi of Models had been published, and that the other two would soon follow. The Models therefore were issued, partly, before November 7th, 1825, when the Memoir was presented to the Academy of Sciences; and though we do not know the exact date of the publication of the third and fourth sets, we shall here regard them as belonging to about the same period (1825–26).

M. D'Orbigny's researches on *Foraminifera* appear to have arisen from his father's attention having been directed to these Microzoa; for the elder D'Orbigny, who was a physician at Esnaudes, near Rochelle, wrote to M. Fleurian de Bellevue, in 1819, on his discovering, on the shores of the Atlantic, microscopic Cephalopods, among which he had seen "living Lenticulines, Rotalies, Discorbes, Spirolines, &c." (See Annales de Physique, vol. xxxviii. p. 187.) The younger D'Orbigny enlarged his knowledge of these little shells by the collection of numerous samples of sea-sand and of fossiliferous deposits from various parts of the world, working perseveringly and methodically for several years, reducing already published notices and his own observations to a system, which, though artificial throughout and otherwise defective, was very useful; he described the general characters and external features with care, illustrating his descriptions by the Models now under consideration and the elaborate plates of his noble quarto and folio volumes on the *Foraminifera*, and leaving in the end an extensive collection of material. His several works and their numerous illustrations, chiefly relating to the larger specimens which had come under his notice, are necessarily the groundwork for writers on *Foraminifera* up to the present time.

We will now proceed to the examination of the Models *seriatim*, in the order in which they were originally numbered by D'Orbigny. A series of carefully prepared outlines appended to this paper (Plates I., II., & III.) will assist in forming a correct appreciation of our remarks. In these plates the forms represented by the Models are grouped, as far as may be, according to their respective families:—the Miliolida (*Vertebra-*

lina, Pl. I. figs. 1, 2; *Miliola,* figs. 3–15; *Fabularia,* fig. 16; *Peneroplis,* figs. 17–20; *Orbiculina,* figs. 21, 22; *Alveolina,* fig. 23); Lituolida (*Valvulina,* figs. 24–26); Lagenida (*Nodosarina,* figs. 27–46; *Polymorphina,* Pl. II. figs. 47–53; *Uvigerina,* fig. 54); Globigerinida (*Globigerina,* figs. 55, 56; *Pullenia,* fig. 57; *Sphæroidina,* fig. 58; *Textularia,* figs. 59–63; *Bulimina,* figs. 64–66; *Cassidulina,* fig. 67; *Discorbina,* figs. 68–71; *Planorbulina,* figs. 73–77, and Pl. III. figs. 78, 79; *Pulvinulina,* Pl. III. figs. 80–82; *Rotalia,* figs. 83–86; *Calcarina,* figs. 87–90); Nummulinida (*Amphistegina,* figs. 91, 92; *Operculina,* figs. 93, 94; *Nummulina,* fig. 95; *Polystomella,* fig. 96; *Nonionina,* figs. 97–99; *Heterostegina,* fig. 100).

Livraison 1re.

Model no. 1. *Nodosaria Radicula*,* Linn. sp. Annales des Sciences†, vol. vii. 1826, p. 252, no. 3.

Hab. Adriatic. Pl. I. fig. 27.

The common straight Nodosarian form, with few globose chambers, smooth and free from any surface-markings.

Model no. 2. *Nodosaria* (*Orthocerina*) *Clavulus*,* Lamk. sp. Page 255. no. 48.

Hab. Fossil near Paris. Pl. I. fig. 25.

A Clavuline variety of *Valvulina triangularis.* The term *Orthocerina* was applied by D'Orbigny in 1839 (Foram. Cuba, p. 18 of 8vo edition, p. 47 of 4to ed.) to a Foraminifer really related to *Nodosaria,* namely, *O. quadrilatera* (For. Cuba, pl. 1. figs. 11, 12). An *Orthocerina* which was described and figured by Reuss as *Triplasia* (and afterwards *Rhabdogonium*) *Murchisoni* is perhaps the best type of this somewhat peculiar genus. Although *Orthocerina* is evidently one of the *Lagenidæ,* allied to both *Nodosaria* and *Uvigerina,* it must be allowed to stand apart. (See Carpenter's Introd. Foram. p. 166.)

Prof. Reuss, in describing the three-sided *Orthocerina* above alluded to, from fossil specimens found in the Cretaceous rocks of the Eastern Alps, made use of the generic term *Triplasia* for it (Sitzungsber. Akad. Wiss. Wien, vii. 1854), and subsequently substituted *Rhabdogonium* as a denomination for these three- or four-sided *Orthocerinæ* (*ibid.* 1860). D'Orbigny's subgeneric term is misapplied to the Model under consideration, yet it was evidently used in 1839 on the plan that he originally intended;

* The species and varieties marked by an asterisk have been already noticed by us in former papers.

† The references throughout are to D'Orbigny's paper in the 'Annales des Sciences Naturelles,' ser. 1. vol. vii. 1826.

and in the Cuban figures we have examples of the type of the genus, though in a somewhat exceptional condition.

Model no. 3. *Frondicularia rhomboidalis,* D'Orb. Page 256, no. 1.

Hab. Adriatic. Pl. I. fig. 31.

A variety of *Frondicularia complanata,* Defr. The lozenge-shaped form of *Frondicularia* in which the lateral wings of the later chambers reach back only about half the length of the shell.

Model no. 4. *Vaginulina tricarinata,* D'Orb. Page 258, no. 4.

Hab. Adriatic. Pl. I. fig. 34.

A three-sided *Nodosaria,* with somewhat oblique chambers, and having a keel along each of the three edges. A similarly modified form is found fossil at Baden, near Vienna, and is described and figured by Dr. Karrer as *Rhabdogonium pyramidale,* Kar., in his valuable paper on the distribution of the fossil Foraminifera of the Vienna Basin (Sitzungsber. Math.-nat. Class. K. Akad. Wiss. vol. xliv. 1861, p. 20, pl. 1. fig. 5.

We have met with *V. tricarinata* recent in Mediterranean sands, in which, however, it is very rare. It also occurs in a fossil condition, sparingly, in Tertiary clay from near Malaga, and in the Subapennine Tertiary shell-sands.

Model no. 5. *Nodosaria (Dentalina) obliqua,* D'Orb.
Page 254, no. 36.

Hab. Adriatic. Pl. I. fig. 32.

A Dentaline *Nodosaria,* with broad and oblique chambers, the aperture being terminal, somewhat towards the convex side of the slightly curved shell.

This is a common form, both recent and fossil, and is scarcely separable from *D. communis,* D'Orb.

Model no. 6. *Marginulina Raphanus**, Linn. sp. Page 258, no. 1,
pl. 10. figs. 7, 8.

Hab. Adriatic; fossil at Castel-Arquato, Italy. Pl. I. fig. 35.

The Marginuline condition of *Nodosarina Raphanus,* and the best type of the group. The straight *N. Raphanus* is the *N. Rapa* of D'Orbigny.

Model no. 7. *Textularia pygmæa**, D'Orb. Page 263, no. 13.

Hab. Adriatic. Pl. II. fig. 59.

Another small variety of *Textularia agglutinans,* subsequently described, no. 15 (p. 263), and named *T. aciculata,* is identical with this, and must be included under the same name.

Model no. 8. *Quinqueloculina Lyra,* D'Orb. Page 303, no. 45.

Hab. Adriatic and Mediterranean. Pl. I. fig. 11.

A thin, narrowish *Miliola,* with subsigmoid, somewhat carinate chambers.

Model no. 9. *Bulimina elegans,* D'Orb. Page 270, no. 10.

Hab. Adriatic, near Rimini. Pl. II. fig. 64.

Bulimina Preslii, Reuss, figured in the 'Verst. Kreid. Böhm.' (1846), pl. 13. fig. 72, and in Haidinger's 'Naturwiss. Abhand.' vol. iv. (1850), Kreidemergels von Lemberg, pl. 3. fig. 10, is the best type of the genus *Bulimina. B. elegans* is a delicate variety, narrower and less robust in growth, as well as more imbricated in the disposition of the chambers.

Model no. 10. *Rotalia Menardii,* D'Orb. Page 273, no. 26.

Hab. Adriatic, near Rimini. Pl. III. fig. 81.

This must be placed in the genus *Pulvinulina,* being a good subspecies of *P. repanda.* It is found in deep water, and is seldom abundant, except in Tropical seas. One or two beautiful specimens have occurred to us on our own coast, in sand dredged from deep water off the Isle of Man.

Model no. 11. *Nonionina Limba,* D'Orb. Page 594, no. 14.

Hab. Adriatic, near Rimini. Pl. III. fig. 99.

A variety of the subtype *N. asterizans,* F. & M., from which it differs in the greater development of the stellate sutural limbation, and in possessing a narrow thick keel, instead of the rounded edge of the subtype. The same variety, but with stouter and somewhat encrusted shell, occurs fossil in the neighbourhood of Bordeaux.

Model no. 12. *Rotalia punctulata**, D'Orb. Page 273, no. 25.

Hab. Adriatic, near Rimini. Pl. III. fig. 82.

This is a *Pulvinulina,* and not a *Rotalia*; it is perhaps even a more fully developed form than the type, *P. repanda,* F. & M. We have found fine handsome specimens in dredgings from the coast of Norway.

Model no. 13. *Gyroidina orbicularis,* D'Orb. Page 278, no. 1.

Hab. Adriatic, near Rimini. Pl. III. fig. 85.

The thin-shelled, somewhat globular variety of *Rotalia Beccarii,* inhabiting deepish water, usually much smaller than the common shallow-water form. It is a widely distributed variety, and has been found on our own coast, in the Irish Sea and off the Shetland Islands.

Model no. 14. *Robulina virgata*, D'Orb. Page 290, no. 17.

Hab. Adriatic, near Rimini. Pl. I. fig. 40.

An umbonate *Cristellaria*, with few chambers, and destitute of any keel. Thick square bands of shell-substance, covering the partition-walls of the chamber, radiate in straight lines from the central umbo to the margin.

Model no. 15. *Rotalia bisaculeata*, D'Orb. Page 273, no. 20.

Hab. From ballast-sand. Pl. III. fig. 89.

This is rather a subvariety of the Rotaline genus *Calcarina*, of which Model no. 34 may be taken as the type. It does not differ very greatly from Deshayes's *Calcarina rarispina* (Lyell's Manual, 5th edit. p. 228, fig. 236), but sufficiently, however, to render a separate trivial name convenient. Its peculiarity consists in possessing a keel, extended into double points at intervals round the margin.

Model no. 16. *Peneroplis planatus**, F. & M., sp. Page 285, no. 1.

Hab. Mediterranean, New Holland (Rawack). Pl. I. fig. 17.

This is the well-known widely distributed type, for which, as we have before stated, Forskål's specific name *Peneroplis pertusus* takes precedence (Ann. Nat. Hist. March 1865).

Model no. 17. *Globigerina bulloides*, D'Orb. (young). Page 277, no. 1.

Hab. Adriatic, near Rimini. Pl. II. fig. 56.

This is the young shell. See note on the adult, Model 76.

Model no. 18. *Adelosina striata*, D'Orb. (young). Page 304, no. 2.

Hab. Fossil at Castel-Arquato, Italy. Pl. I. fig. 14.

It has been satisfactorily demonstrated that the delicate *Miliolæ*, with retort-shaped chambers, grouped by D'Orbigny under the generic name *Adelosina*, are only young specimens of other well-known species. The Model now under consideration represents the very young condition of *Quinqueloculina Brongniartii*; and the Model 97, which is given as the adult of the same species, is only *Q. Brongniartii* somewhat further developed.

Model no. 19. *Cristellaria* (*Saracenaria*) *Italica**, Defr. (young). Page 293, no. 26.

Hab. Adriatic, near Rimini; and fossil near Sienna. Pl. I. fig. 42.

The young condition of the shell. See note on the adult, Model no. 85.

Model no. 20. *Orbiculina numismalis**, Lamk. Page 305, no. 1.

Hab. The Antilles and the Marianne Isles. Pl. I. fig. 21.

Though he adopts this form as the type of the genus *Orbiculina,* D'Orbigny rightly associates the three forms catalogued by Lamarck as *O. uncinata* (adult), *O. numismalis* (middle-aged), and *O. angulata* (young) as the same species in different stages of growth. *O. orbiculus,* F. & M., termed *O. nummata* by Lamarck, should also be included amongst the middle-aged forms. Subsequently D'Orbigny took the adult form, with the well-known name "*adunca,*" originally conferred on it by Fichtel and Moll, as the central type; and we find this figured in the "Cuba" Monograph, pl. 8. figs. 8–16. On the same plate (figs. 4–7) we find another adult form of *Orbiculina,* thin, flat, and orbicular, with the name of *O. compressa.*

Model no. 21. *Dendritina Arbuscula**, D'Orb. Page 285, no. 1, pl. 15. figs. 6, 7.

Hab. Fossil near Bordeaux. Pl. I. fig. 20.

The thick robust variety of *Peneroplis pertusus,* with a single large aperture running into irregular dendritic ramifications. Found recent in tropical seas.

Model no. 22. *Articulina nitida**, D'Orb. Page 300, no. 1.

Hab. Fossil near Paris. Pl. I. fig. 2.

An elongated subcylindrical variety of *Vertebralina striata,* previously figured and described by Batsch as *Nautilus conico-articulatus.* It is an exceedingly variable form, and may be found in every gradation, from the narrow subcylindrical condition represented in the Model to the broad *Renulites opercularia* of Lamarck. The specimens taken from the abyssal depths of the Mediterranean and the deeper portions of the Red Sea are characteristically small. In the Eocene marl of Baljik, in Bulgaria, small and still more elongated specimens occur.

Model no. 23. *Polymorphina Thouini,* D'Orb. Page 265, no. 8.

Hab. Fossil near Paris. Pl. II. fig. 49.

A long narrow variety of *P. lactea,* W. & J.

Model no. 24. *Spirolina cylindracea**, Lamk. Page 286, no. 1.

Hab. Fossil near Paris. Pl. I. fig. 19.

The crozier-like, deep-water form of *Peneroplis pertusus,* common in the Grignon Tertiaries, and found recent in the deeper seas of tropical climates. Notwithstanding the identity with *Peneroplis,* the distinctive name *Spirolina* is convenient, if not necessary, in separating the long subcylindrical varieties from the outspread forms found in shallow water.

Model no. 25. *Valvulina triangularis**, D'Orb.
Page 270, no. 1.

Hab. Fossil near Paris Pl. I. fig. 24.

This is the arenaceous triserial, three-sided shell which may be looked upon as the type of a very variable group. The two Clavuline varieties which are represented by Models nos. 2 and 66 show the wide range on one side; and Prof. Williamson's *Rotalina fusca* (*Valvulina Austriaca*), Monograph, pl. 5. figs. 114, 115, exhibits the opposite extreme in contour.

Livraison 2^me^.

Model no. 26. *Lingulina carinata,* D'Orb. Page 257, no. 1.

Hab. Antilles; and fossil near Sienna. Pl. I. fig. 28.

The compressed, sharp-edged, straight subtype of *Nodosarina,* common as a fossil in the Lias and in many Tertiary clays, but rare in a recent condition. In D'Orbigny's "Cuba" it is mentioned as occurring in the West-Indian seas and in the neighbourhood of the Canaries. It is figured in Williamson's Monograph (pl. 2. figs. 33, 34), and noted as having been found recent in three British localities. Dr. Carpenter has it very large from Japan.

Model no. 27. *Planularia Cymba**, D'Orb. Page 260, no. 4, pl. 10. fig. 9.

Hab. Adriatic. Pl. I. fig. 38.

This has been already noticed by us amongst the forms illustrated by figures in D'Orbigny's Memoir.

Model no. 28. *Textularia gibbosa**, D'Orb. Page 262, no. 6.

Hab. Mediterranean; and fossil at Castel-Arquato, Italy. Pl. II. fig. 60.

This is one of the largest forms of *Textularia,* with ventricose segments, and is found widely distributed. In common with the other bold varieties, it is at home and most luxuriant in water from 50 to 100 fathoms.

Model no. 29. *Polymorphina Burdigalensis,* D'Orb.
Page 265, no. 2.

Hab. Fossil near Bordeaux. Pl. II. fig. 48.

A somewhat unsymmetrical *Polymorphina,* having one side flattened, and consequently an excentric aperture. The chambers are numerous, and are compactly put together, the edges overlapping and giving a general even outline to the shell.

Model no. 30. *Polymorphina (Pyrulina) Gutta**, D'Orb. Page 267, no. 28, pl. 12. figs. 5, 6.

Hab. Fossil, Castel-Arquato. Pl. II. fig. 51.

Noticed in our previous paper on the species figured by D'Orbigny.

Model no. 31. *Biloculina aculeata*, D'Orb. Page 298, no. 3.

Hab. Fossil in the rocks of Pauliac (Gironde). Pl. I. fig. 5.

This seems to be an unusual and somewhat monstrous *Biloculina*, with a number of somewhat pointed prominences, arranged in two rows on opposite sides of the outer chamber. It may be regarded as a subvariety of *B. ringens*, which it closely resembles in general contour.

Model no. 32. *Quinqueloculina Ferussacii*, D'Orb. Page 301, no. 18.

Hab. Fossil near Paris. Pl. I. fig. 12.

A narrow, elongated, somewhat angular *Quinqueloculina*, having a few stout costæ traversing the chambers from end to end. Williamson's *Miliolina bicornis* var. *angulata* (Monogr. pl. 7. fig. 196) may be assigned to this species.

Model no. 33. *Quinqueloculina Saxorum**, Lamk. Page 301, no. 1.

Hab. Fossil near Paris. Pl. I. fig. 13.

This is a well-known form, not uncommon in a recent condition on the coral-reefs of tropical seas, and very abundant in the Calcaire grossier near Paris.

Model no. 34. *Calcarina Calcar**, D'Orb. Page 276, no. 1.

Hab. Martinique, Isle of France, Madagascar. Pl. III. fig. 87.

This cannot be separated from *Calcarina Spengleri*, Linn. The list of localities might be much extended, as there are few tropical seas in which specimens do not abound.

Model no. 35. *Rotalia rosea*, D'Orb. Page 272, no. 7.

Hab. The Antilles, the Isle of Martinique, Point Carbet. Pl. III. fig. 79.

This belongs to *Planorbulina*, not to *Rotalia* (restricted), and is nearly allied to *Planorbulina Haidingerii*. Its pink colour is very characteristic; and its tolerably limited distribution gives it additional claims for distinctive appellation. Coloured figures are given in the "Cuba" Monograph, pl. 3. figs. 9, 11. Small specimens are not uncommon in West-Indian sponge-sand.

Model no. 36. *Gyroidina Soldani,* D'Orb. Page 278, no. 5.

Hab. Adriatic, near Rimini. Pl. III. fig. 86.

As we have before stated, there is no sufficient reason for the separation of either this or *G. orbicularis* from the genus *Rotalia.* It is a small deep-sea variety, somewhat bolder, and having a thicker shell than *G. orbicularis.*

Model no. 37. *Truncatulina tuberculata*,* D'Orb. Page 279, no. 1.

Hab. All the shores of European seas. Fossil near Bordeaux, Paris, and Castel-Arquato. Pl. II. fig. 77.

This is *Truncatulina lobatula,* W. & J., sp., which is the commonest variety of *Planorbulina farcta,* F. & M., sp.

Model no. 38. *Rosalina Parisiensis,* D'Orb. Page 271, no. 1.

Hab. Fossil near Paris. Pl. II. fig. 70.

This is a flat, outspread, thin-edged variety of *Discorbina trochidiformis,* Lamk., sp.; a good subspecies—the type being *D. Turbo,* D'Orb., sp. It is commonly somewhat concave on its under surface. *Discorbina ochracea* (*Rotalina ochracea,* Will. Rec. For. Gt. Brit. pl. 4. fig. 112, and pl. 5. fig. 113) is a feebler form, closely allied to the one under consideration.

Model no. 39. *Rotalia rosacea,* D'Orb. Page 273, no. 15.

Hab. Fossil, Bordeaux. Pl. II. fig. 71.

This is another useful subspecies of *Discorbina Turbo,* D'Orb., sp. It is identical with D'Orbigny's *Asterigerina Planorbis* and Williamson's *Rotalina Mamilla.*

Model no. 40. *Amphistegina vulgaris,* D'Orb. Page 305, no. 8.

Hab. Fossil on the borders of the Lagoon of Tau, and near Bordeaux. Pl. III. fig. 91.

The type of the genus.

Model no. 41. *Cassidulina lævigata,* D'Orb. Page 281, no. 1, pl. 15. figs. 4, 5.

Hab. From ballast-sand. Pl. II. fig. 67.

One of the species figured by D'Orbigny in the plates illustrating his memoir, and, as such, noticed in our previous paper.

Model no. 42. *Anomalina elegans,* D'Orb. Page 282, no. 4.

Hab. Fossil near Bordeaux. Pl. II. fig. 73.

The generic term *Anomalina* should properly be confined to the bold and more or less biconcave forms of the Planorbuline type. This Model illustrates *Discorbina,*—a good intermediate subspecies, passing insensibly into *D. vesicularis.* The same form is figured by D'Orbigny, in the 'For. Foss. Vien.' pl. 10. figs. 13–15, under the name of *Rotalia complanata*.

Model no. 43. *Nonionina sphæroides*, D'Orb. Page 293, no. 1.

Hab. From ballast-sand. Pl. II. fig. 57.

This is *Pullenia sphæroides*, and bears no relation to the Nonionine subtype. See Carpenter's 'Introduction,' p. 184. It is figured in D'Orbigny's 'For. Foss. Vien.' pl. 5. figs. 8–10 as *Nonionina bulloides*. It is a small deep-water form, found both recent and fossil.

Model no. 44. *Cristellaria Cassis**, F. & M. Page 290, no. 3.

Hab. Adriatic, near Rimini; and fossil at Sienna. Pl. I. fig. 45.

The young shell. The adult is represented in Model no. 83.

Model no. 45. *Polystomella crispa**, Linn. Page 283, no. 1.

Hab. The Atlantic, the Mediterranean, and the Adriatic. Pl. III. fig. 96.

Model no. 46. *Nonionina lævis*, D'Orb. Page 294, no. 11.

Hab. Fossil near Paris. Pl. III. fig. 97.

This is *Nautilus incrassatus*, F. & M. (*Nonionina incrassata*: see Ann. Nat. Hist. ser. 3. vol. v. p. 101).

Model no. 47. *Cristellaria lævigata*, D'Orb. Page 292, no. 19.

Hab. Fossil near Caen (Jurassic). Plate I. fig. 43.

A not uncommon form of *Cristellaria*, in which the early chambers are rotulate, and the later chambers strive to take a rectilinear arrangement. D'Orbigny refers, on the same page, to other *Cristellariæ* from the Limestone of Caen, namely *C. lamellosa*, *C. Cadonensis*, *C. Lituus*; and at p. 259 he refers to *Planularia elongata*, *P. depressa*, and *P. striata* from the same limestone.

Model no. 48. *Peneroplis planatus*, F. & M. Page 285, no. 1.

Hab. Mediterranean, New Holland. Pl. I. fig. 18.

This is the narrow variety, *P. arietinus*, Batsch.

Model no. 49. *Planulina Ariminensis**, D'Orb.
Page 280, no. 1, pl. 5. figs. 1–3 bis.

Hab. Adriatic, near Rimini. Plate III. fig. 78.

A flat, thin *Planorbulina*, with raised chamber-walls.

Model no. 50. *Alveolina Boscii**, Defrance. Page 306, no. 5.

Hab. Fossil near Paris. Pl. I. fig. 23.

The subtypical fusiform *Alveolina*, for which Montfort's trivial name, *A. sabulosa*, takes precedence.

LIVRAISON 3^{me}.

Model no. 51. *Nodosaria* (*Glandulina*) *Glans**, D'Orb.
Page 252, no. 2.

Hab. Adriatic; rare. Pl. I. fig. 30.

The finely striated variety of *G. lævigata*, D'Orb. Batsch figures this, together with the primary elongated Nodosarian form, as *Nautilus comatus*. (Sechs Küpfertaf. pl. 1. figs. 2 *a–d*.)

Model no. 52. *Nodosaria* (*Mucronina*) *Hasta*, D'Orb.
Page 256, no. 49.

Hab. Adriatic. Pl. I. fig. 29.

A carinate, finely striated Nodosarian, of the straight type. Reuss refers to this Model as a *Frondicularia*—a judgment in which we cannot agree. Its straight septa and lateral keels indicate rather its Linguline affinity; besides which, it is more elongated in contour than is usual in *Frondicularia*. It is quite out of the question to draw a distinct line between these two subgenera; but in this case there is no room for doubt as to the nearest relationship.

Model no. 53. *Rimulina glabra*, D'Orb. Page 257, no. 1.

Hab. Adriatic. Pl. I. fig. 37.

An oblique, robust, somewhat compressed, few-chambered shell, with the aperture taking the form of a long slit down the edge of the large terminal chamber. Type, *Nodosarina Raphanus*.

Model no. 54. *Vaginulina elegans*, D'Orb. Page 257, no. 1.

Hab. Adriatic. Pl. I. fig. 33.

A beautiful limbate *Vaginulina*, with the septal lines thickened by exogenous deposit of clear shell-substance.

Model no. 55. *Marginulina glabra*, D'Orb. Page 259, no. 6.

Hab. Fossil near Sienna. Pl. I. fig. 36.

A common form, not coiled enough to be a *Cristellaria*, and not well enough nourished, one may say, to be enriched with thickened shell-matter and ribs such as we see in *Marginulina Raphanus*, the well-grown type.

Model no. 56. *Pavonia flabelliformis**, D'Orb. Page 260, no. 1, pl. 10. figs. 10, 11.

Hab. Madagascar. Pl. I. fig. 22.

This is possibly a misprint for *Pavonina*. We have already noticed it in speaking of the species illustrated by figures in D'Orbigny's Memoir. It may be an *Orbiculina*.

Model no. 57. *Bigenerina Nodosaria**, D'Orb. Page 261, no. 1, pl. 11. figs. 9–12.

Hab. Adriatic. Pl. II. fig. 62.

A subtypical form of *Textularia*, with a flat wide commencement, but taking on a cylindrical uniserial mode of growth in its later chambers. It is a common form in the Mediterranean and many other seas, and has been found as far north as Shetland.

Model no. 58. *Bigenerina* (*Gemmulina*) *digitata**, D'Orb. Page 262, no. 4.

Hab. The Mediterranean. Pl. II. fig. 61.

Narrower in the growth of the early chambers than *B. Nodosaria*, having frequently a curved and compressed contour. This form and the preceding have usually the subarenaceous shell-structure of the larger *Textulariæ*.

Model no. 59. *Vulvulina Capreolus**, Defr. Page 264, no. 1, pl. 11. figs. 5–8.

Hab. Adriatic. Pl. II. fig. 63.

D'Orbigny refers this species to Defrance; but we are unable to find any notice of it in Defrance's works.

As we have before stated, this is *Grammostomum Pennatula*, Batsch, sp.

Model no. 60. *Dimorphina tuberosa*, D'Orb. Page 264, no. 1.

Hab. Mediterranean. Pl. II. fig. 53.

Some very dissimilar forms have been grouped under the name of *Dimorphina*. As this is the first mention of the generic term, we propose to confine its application to the Dimorphine varieties of *Polymorphina*, of one of which Model no. 60 is a correct delineation. It is rare. We have specimens of it from the Crag of Suffolk. A somewhat similar, but really Nodosarine, form occurs not unfrequently in the Mediterranean area, both fossil and recent; off Syra (90 fathoms); and fossil, from Tertiary clays near Malaga.

Model no. 61. *Polymorphina* (*Guttulina*) *Problema*, D'Orb. Page 266, no. 14.

Hab. Fossil, Castel-Arquato, Italy. Pl. II. fig. 50.

A many-chambered *Polymorphina*, somewhat irregular in the disposition of the segments, which are long and distinct, and do not overlap each other to the extent that is seen in most members of the genus.

Model no. 62. *Polymorphina* (*Guttulina*) *communis**, D'Orb. Page 266, no. 15, pl. 12. figs. 1–4.

Hab. Adriatic; fossil near Bordeaux, Paris, Dax, and Castel-Arquato. Pl. II. fig. 47.

One of the forms alluded to in a previous paper as figured by D'Orbigny. It is the typical *Polymorphina lactea*, W. & J., sp.

Model no. 63. *Polymorphina* (*Globulina*) *gibba*, D'Orb. Page 26, no. 20.

Hab. Atlantic (on the coast near Rochelle), Adriatic (near Rimini); fossil, near Paris, at Grignon, near Dax, near Bordeaux, at Chavagnes (Maine-et-Loire), and at Castel-Arquato. Pl. II. fig. 52.

The simplest and Globuline condition of *Polymorphina*; the chambers are few in number and embrace each other so as to leave no inequalities in the surface-contour.

Model no. 64. *Virgulina squamosa*, D'Orb. Page 267, no. 1.

Hab. Fossil near Sienna. Plate II. fig. 66.

One of the biserial forms of *Bulimina*, simulating *Textularia* in its mode of growth; much elongated, like the more delicate *Textulariæ*, but having the lengthened and twisted Bulimine aperture. *V. squamosa* is subordinate to *V. Schreibersii*.

Model no. 65. *Sphæroidina bulloides*, D'Orb. Page 267, no. 1.

Hab. Adriatic, near Rimini, Isle of France; fossil near Sienna. Pl. II. fig. 58.

A good subtype, nearly related to *Globigerina*, but, in its clear and white shell, indistinct perforations, and general arrangement of chambers, bearing great similarity (or *isomorphism*) to the *Miliolæ*. Its home is in very deep water, and it occurs most plentifully in the seas of warm regions.

Model no. 66. *Clavulina Parisiensis**, D'Orb. Page 268, no. 3.

Hab. Fossil near Paris. Pl. I. fig. 26.

Type, *Valvulina triangularis*. This form is directly intermediate between the type (Model no. 25) and the narrow, pointed condition shown in Model no. 2 (*V. Clavulus*). See Carpenter's 'Introd.' pl. 11. figs. 17, 18, and D'Orbigny's "Cuba" (*Valvulina tricarinata*), pl. 2. figs. 16–18. The Model appears to have been taken from a specimen which has accidentally lost its valve.

Model no. 67. *Uvigerina pygmæa**, D'Orb. Page 269, no. 2, pl. 12. figs. 8, 9.

Hab. Fossil near Sienna. Pl. II. fig. 54.

A typical form.

Model no. 68. *Bulimina caudigera*, D'Orb. Page 270, no. 16.

Hab. Adriatic, near Rimini. Pl. II. fig. 65.

An acute-ovate *Bulimina*, with closely investing elongate segments, the later ones reaching back to the apex formed by the first.

Model no. 69. *Rosalina globularis**, D'Orb. Page 271, no. 1, pl. 13. figs. 1–4.

Hab. Shores of the Atlantic, growing attached to sea-weeds and corals. Pl. II. fig. 69.

This is *Discorbina globularis*, a good subspecies. Egger (For. Miocän-Sch. pl. 4. figs. 1–3) describes and figures it under the name of *Rotalina semiporata*. A somewhat similar variety is given by D'Orbigny (Fos. For. Vien. pl. 11. figs. 4–6) as *Rosalina obtusa*, fine specimens of which, with lineato-granulated surface, are common off Greenland. *D. globularis* is common everywhere, from the shore down to 50 fathoms.

Model no. 70. *Rotalia armata*, D'Orb. Page 273, no. 22.

Hab. Cayenne, Martinique; fossil at Chavagnes (Maine-et-Loire), near Nantes, and near Bordeaux. Pl. III. fig. 88.

The short-spined variety of *Calcarina Spengleri*.

Model no. 71. *Rotalia pulchella*, D'Orb. Page 274, no. 32.

(No locality given.) Pl. III. fig. 80.

This belongs to the genus *Pulvinulina*, of which it is a somewhat flat-faced variety. It is the *Cidarollus plicatus* of Montfort. The same variety is given in D'Orbigny's "Cuba" (pl. 5. figs. 1, 2, 3) as *Rotalina Caribæa*.

Model no. 72. *Rotalia* (*Discorbis*) *Gervillii**, D'Orb. Page 274, no. 36.

Hab. Fossil at Valognes. Pl. II. fig. 72.

This is the *Discorbites* (*Discorbis*) *vesicularis* of Lamarck—a good varietal form of *Discorbina Turbo*, D'Orb., sp.

Model no. 73. *Rotalia* (*Trochulina*) *Turbo**, D'Orb. Page 274, no. 39.

Hab. Fossil near Paris. Pl. II. fig. 68.

This is *Discorbina Turbo*; a type-form, having its fullest development in *D. trochidiformis*, Lamarck, sp.

Model no. 74. *Rotalia* (*Turbinulina*) *Beccarii**, Linn. Page 275, no. 42.

Hab. The European shores of the Atlantic; Island of Martinique. Pl. III. fig. 83.

Specimens of this somewhat variable species have received several different names in the course of the 'Tableau des Céphalopodes.' Thus the Model now under consideration (74) is the ordinary European form; *Rotalina Corallinarum* (Model no. 75) is the more fully developed West-Indian variety, which is a still better type; and *R. tortuosa*† (page 275, no. 40) is the form common in the Adriatic. *Rosalina Parkinsoniana* (For. Cuba, p. 99, pl. 4. figs. 25–27) is another name given to an Atlantic variety.

Model no. 75. *Rotalia* (*Turbinulina*) *Corallinarum*, D'Orb. Page 275, no. 48.

Hab. The Atlantic, at Noirmoutier. Pl. III. fig. 84.
Rotalia Beccarii, best type.

Livraison 4^{me}.

Model no. 76. *Globigerina bulloides*, D'Orb. (adult). Page 277, no. 1.

Hab. Adriatic, near Rimini. Pl. II. fig. 55.
The common, wide-spread, and essentially deep-sea *Globigerina*.

Model no. 77. *Truncatulina refulgens**, Montfort, sp. Page 279, no. 5, pl. 13. figs. 8–11.

Hab. Adriatic, near Rimini; Mediterranean, off Corsica; South Sea at Rawack, Isle of Madagascar, Cape of Good Hope. Pl. II. fig. 76.
This belongs to the type, *Planorbulina farcta*, F. & M., sp.

Model no. 78. *Planorbulina nitida**, D'Orb. Page 280, no. 1.

Hab. Atlantic, coast of Bellisle. Pl. II. fig. 75.
A convenient subspecies, intermediate between *P. Mediterranensis*, D'Orb., and *P.* (*Truncatulina*) *lobatula*, W. & J., sp. Type, *Planorbulina farcta*, F. & M., sp.

Model no. 79. *Planorbulina Mediterranensis**, D'Orb. Page 280, no. 2, pl. 14. figs. 4–6 bis.

Hab. Mediterranean, attached to various bodies. Pl. II. fig. 74.
D'Orbigny subsequently altered the name of this form (For. Cuba, p. 85, pl. 6. f. 11–13) to *Planorbulina vulgaris*, because he found that the species was not peculiar to the Mediterranean. Such a change seems contrary to rule; so we adhere to the original trivial name.

† Termed *Rosalina Beccarii* by D'Orbigny in his 'For. Cuba,' p. 100.

Model no. 80. *Operculina complanata**, Defrance.
Page 281, no. 1, pl. 14. figs. 7–10.

Hab. Fossil, Bordeaux. Pl. III. fig. 93.
Subtype of *Nummulina.*

Model no. 81. *Vertebralina striata**, D'Orb. Page 283, no. 1.

Hab. Mediterranean; Red Sea; South Sea, near Rawack. Pl. I. fig. 1.

The robust, compressed, typical form. See also note on Model no. 22.

Model no. 82. *Robulina cultrata**, Montfort. Page 287, no. 1.

Hab. Adriatic; and fossil near Vienna. Pl. I. fig. 39.

There seems no necessity for *Robulina* as a generic term; and it would be impossible to carry out even the conventional distinction, depending upon the degree of curvature and minute differences in the position of the terminal orifice, laid down by D'Orbigny in separating it from *Cristellaria*. *Cristellaria cultrata* is a good subspecific name for those carinate varieties of the subtype, *Cristellaria Calcar*, Linn., which are without spinous processes.

Model no. 83. *Cristellaria Cassis**, F. & M. Page 290, no. 3.

Hab. Adriatic, near Rimini; fossil near Sienna. Pl. I. fig. 44.
The adult shell. The young form is given in Model no. 44.

Model no. 84. *Cristellaria costata*, D'Orb. Page 292, no. 10.

Hab. Adriatic, near Rimini. Pl. I. fig. 46.
A thin, elongated, carinate *Cristellaria*, with parallel costæ over the body of the shell.

Model no. 85. *Cristellaria* (*Saracenaria*) *Italica**, Defr.
Page 293, no. 26.

Hab. Adriatic, near Rimini; and fossil near Sienna. Pl. I. fig. 41.

A trihedral keelless variety of *Cristellaria Calcar*. Model no. 19 shows the young condition of the same variety.

Model no. 86. *Nonionina umbilicata**, D'Orb. Page 293, no. 5,
pl. 15. figs. 10–12.

Hab. Adriatic, near Rimini; Mediterranean; and fossil near Bordeaux and Sienna. Pl. III. fig. 98.

A variety of *Nonionina asterizans*, F. & M., sp., scarcely distinguishable from *N. pompilioides* of the same authors.

Model no. 87. *Nummulina planulata,* Lamk.* (young).
Page 296, no. 4.

(No locality). Pl. III. fig. 95.

The Model has been constructed from a somewhat convex individual, and the aperture is wrongly placed.

Model no. 88. *Nummulina* (*Assilina*) *discoïdalis,* D'Orb.
Page 296, no. 1.

Hab. South Sea, at Rawack. Pl. III. fig. 94.

This is an *Operculina,* one of the thick subvarieties of *O. complanata,* Def. The term *Assilina* has been applied to those flat *Nummulinæ* which, having no alar flaps to their segments, do not cover up their umbones, but leave the whorls apparent, with or without an increased growth of the edges of the septa.

Model no. 89. *Siderolina lævigata,* D'Orb. Page 297, no. 2.

Hab. Fossil, St. Pierre at Maestricht. Pl. III. fig. 90.

A variety of *Calcarina Spengleri,* Gmel., sp.; a smooth, quadrangular (or rather bluntly 4-spined), biconvex form, having all traces of the chambers concealed by the excessive deposit of shell-substance.

Model no. 90. *Biloculina bulloides**, D'Orb. Page 297, no. 1, pl. 16. figs. 1–4.

Hab. Adriatic, near Rimini; fossil near Paris and near Bordeaux. Pl. I. fig. 3.

This varies but little in its outline from *Biloculina ringens,* Lamk., sp., and *B. lævis,* Defr., sp.

Model no. 91. *Biloculina depressa,* D'Orb. Page 298, no. 7.

Hab. Adriatic, near Rimini; fossil at Castel-Arquato. Pl. I. fig. 4.

The flattened carinate subvariety of *B. ringens.*

Model no. 92. *Spiroloculina depressa**, D'Orb. Page 298, no. 1.

Hab. Mediterranean; and fossil at Castel-Arquato. Pl. I. fig. 6.

In the 'Annales des Sciences Naturelles' this Model is referred to as *Spiroloculina perforata*—evidently one of the very numerous misprints which occur in D'Orbigny's Memoir. We take the name given with the Model as the one probably intended. The form represented is *Spiroloculina planulata,* Lamk., sp.

Model no. 93. *Triloculina trigonula**, Lamk. Page 293, no. 1.

Hab. Fossil near Paris, Soissons, and Valognes. Pl. I. fig. 7.

A good subtype.

Model no. 94. *Triloculina tricarinata,* D'Orb. Page 299, no. 7.

Hab. Red Sea. Pl. I. fig. 8.

This form is closely allied to *T. trigonula,* of which it may be considered a variety. The outer margins of the chambers, instead of being rounded, as in *T. trigonula,* are produced, and form a sharp keel-like armature to the three angles of the shell.

Model no. 95. *Triloculina oblonga**, Montagu. Page 300, no. 16.

Hab. Adriatic; Mediterranean; Atlantic, on the French and English coasts; the Antilles; fossil near Bordeaux, Soissons, Dax, and Castel-Arquato. Pl. I. fig. 9.

The elongated, compressed form of the same subtype, passing in many instances into weak forms of *Quinqueloculina Seminulum,* Linn., sp.

Model no. 96. *Quinqueloculina secans,* D'Orb. Page 303, no. 43.

Hab. Adriatic and Mediterranean. Pl. I. fig. 10.

This is the large outspread form of *Quinqueloculina Seminulum,* Linn., sp., common in all our littoral sands, and having sharp edges and obscure irregular transverse markings, never amounting to costæ.

Model no. 97. *Adelosina striata,* D'Orb. Page 304, no. 2.

Hab. Fossil at Castel-Arquato. Pl. I. fig. 15.

The immature form of *Quinqueloculina Brongniartii,* D'Orb. See note to Model no. 18, which represents the still younger condition of the shell.

Model no. 98. *Amphistegina Lessoni**, D'Orb. Page 304, no. 3, pl. 17. figs. 1–4.

Hab. Isle of France. Pl. III. fig. 92.

A thick variety of *Amphistegina vulgaris,* D'Orb. See Model no. 40.

Model no. 99. *Heterostegina depressa,* D'Orb.† Page 305, no. 2, pl. 17. figs. 5–7.

Hab. Island of St. Helena. Pl. III. fig. 100.

A high-class Foraminifer of the Nummuline group, but having its proper chambers subdivided by secondary septula into numerous chamberlets. See Carpenter's 'Introd. Foram.' p. 288, pl. 19. fig. 1. *Heterostegina* is plentiful in some parts of the tropical and subtropical seas, and occurs fossil in the Middle Tertiary Limestones of Malta, Vienna, and the West Indies, and in Arabia.

† Inadvertently omitted to be noticed in our former paper on D'Orbigny's species, Ann. Nat. Hist. ser. 3. vol. xii. p. 439.

Model no. 100. *Fabularia Discolithes**, Defr. Page 307, no. 1, pl. 17. figs. 14–17.

Hab. Fossil near Paris; a much depressed variety at Valognes. Pl. I. fig. 16.

Probably, as we have before stated, this specific name is a misprint for *Discolithus*. The name applied by Roissy, however, (*F. ovata*) takes precedence.

Catalogue of D'Orbigny's Models. 1826.

Type.	Corrected name.	Pl.	Fig.	D'Orbigny's name.	Models.	
					Livr.	No.
Vertebralina striata, *D' O.*	Vertebralina striata, *D' O.*	I.	1.	Vertebralina striata ...	4.	81.
	—— conico-articulata, *Batsch.*	,,	2.	Articulina nitida	1.	22.
	Biloculina ringens, *Lam.*	,,	3.	Biloculina bulloides ...	4.	90.
	—— depressa, *D' O.*	,,	4.	—— depressa......... .	4.	91.
	—— aculeata, *D' O.*	,,	5.	—— aculeata	2.	31.
	Spiroloculina planulata, *Lam.*.	,,	6.	Spiroloculina depressa .	4.	92.
	Triloculina trigonula, *Lam.* ...	,,	7.	Triloculina trigonula...	4.	93.
	—— tricarinata, *D' O.*	,,	8.	—— tricarinata	4.	94.
Miliola Seminulum, *Linn.*	—— oblonga, *Montagu*.........	,,	9.	—— oblonga	4.	95.
	Quinqueloculina secans, *D' O.* .	,,	10.	Quinqueloculina secans	4.	96.
	—— Lyra, *D' O.*.................	,,	11.	—— Lyra	1.	8.
	—— Ferussacii, *D' O.*	,,	12.	—— Ferussacii	2.	32.
	—— Saxorum, *Lam.*	,,	13.	—— Saxorum............	2.	33.
	—— Brongniartii, *D' O.* (very [young).	,,	14.	Adelosina striata (young)	1.	18.
	——Brongniartii, *D' O.* (young)	,,	15.	—— striata (adult) ...	4.	97.
(Type)...........	Fabularia ovata, *Roissy.*	,,	16.	Fabularia Discolithes...	4.	100.
	Peneroplis pertusus, *Forsk.* ...	,,	17.	Peneroplis planatus ...	1.	16.
Peneroplis pertusus, *Fors.*	—— arietinus, *Batsch.*	,,	18.	—— ——, var.	2.	48.
	Spirolina Lituus, *Gmelin*.......	,,	19.	Spirolina cylindracea...	1.	24.
	Dendritina Arbuscula, *D' O.*...	,,	20.	Dendritina Arbuscula ..	1.	21.
(Type)...........	Orbiculina adunca, *F. & M.* ...	,,	21.	Orbiculina numismalis.	1.	20.
Orbiculina?......	Pavonia flabelliformis, *D' O.* ...	,,	22.	Pavonia flabelliformis...	3.	56.
(Type)...........	Alveolina sabulosa, *Montf.* ...	,,	23.	Alveolina Boscii.........	2.	50.
Valvulina triangularis, *D' O.*	Valvulina triangularis, *D' O.*...	,,	24.	Valvulina triangularis .	1.	25.
	—— Clavulus, *Lam.*	,,	25.	Nodosaria Clavulus ...	1.	2.
	—— Parisiensis, *D' O.*..........	,,	26.	Clavulina Parisiensis...	3.	66.
	Nodosaria Radicula, *Linn.* ...	,,	27.	Nodosaria Radicula ...	1.	1.
	Lingulina carinata, *D' O.*	,,	28.	Lingulina carinata......	2.	26.
	—— Hasta, *D' O.*	,,	29.	Nodosaria Hasta.........	3.	52.
	Glandulina Glans, *D' O.*	,,	30.	—— Glans	3.	51.
	Frondicularia rhomboidalis, [*D' O.*	,,	31.	Frondicularia rhomboidalis..............	1.	3.
	Dentalina obliqua, *D' O.*	,,	32.	Nodosaria obliqua	1.	5.
	Vaginulina elegans, *D' O.*	,,	33.	Vaginulina elegans......	3.	54.
	—— tricarinata, *D' O.*	,,	34.	—— tricarinata	1.	4.
Nodosarina Raphanus, *Linn.*	Marginulina Raphanus, *Linn.*.	,,	35.	Marginulina Raphanus	1.	6.
	—— glabra, *D' O.*	,,	36.	—— glabra..............	3.	55.
	Rimulina glabra, *D' O.*	,,	37.	Rimulina glabra.........	3.	53.
	Planularia Cymba, *D' O.*	,,	38.	Planularia Cymba	2.	27.
	Cristellaria cultrata, *Montf.* ...	,,	39.	Robulina cultrata	4.	82.
	—— virgata, *D' O.*...............	,,	40.	—— virgata	1.	14.
	—— Italica, *Defr.*...............	,,	41.	Cristellaria Italica	4.	85.
	—— —— (young)...............	,,	42.	—— —— (young) ...	1.	19.
	—— lævigata, *D' O.*	,,	43.	—— lævigata	2.	47.
	—— Cassis, *F. & M.*	,,	44.	—— Cassis (adult) ...	4.	83.
	—— —— (young)...............	,,	45.	—— —— (young)......	2.	44.
	—— costata, *D' O.*	,,	46.	—— costata	4.	84.

Type.	Corrected name.	Pl.	Fig.	D'Orbigny's name.	Models.	
					Livr.	No.
Polymorphina lactea, *W. & J.*	Polymorphina lactea, *W. & J.*	II.	47.	Polymorphina communis	3.	62.
	—— Burdigalensis, *D'O.*	,,	48.	—— Burdigalensis	3.	29.
	—— Thouini, *D'O.*	,,	49.	—— Thouini	2.	23.
	—— Problema, *D'O.*	,,	50.	—— Problema	3.	61.
	—— Gutta, *D'O.*	,,	51.	—— Gutta	2.	30.
	—— gibba, *D'O.*	,,	52.	—— gibba	3.	63.
	Dimorphina tuberosa, *D'O.*	,,	53.	Dimorphina tuberosa	3.	60.
(Type)	Uvigerina pygmæa, *D'O.*	,,	54.	Uvigerina pygmæa	3.	67.
(Type)	Globigerina bulloïdes, *D'O.*	,,	55.	Globigerina bulloïdes	4.	76.
	—— —— (young)	,,	56.	—— —— (young)	1.	17.
(Type)	Pullenia sphæroïdes, *D'O.*	,,	57.	Nonionina sphæroïdes	2.	43.
(Type)	Sphæroïdina bulloïdes, *D'O.*	,,	58.	Sphæroidina bulloïdes	3.	65.
Textularia agglutinans, *D'O.*	Textularia pygmæa, *D'O.*	,,	59.	Textularia pygmæa	1.	7.
	—— gibbosa, *D'O.*	,,	60.	—— gibbosa	2.	28.
	Bigenerina digitata, *D'O.*	,,	61.	Bigenerina digitata	3.	58.
	—— Nodosaria, *D'O.*	,,	62.	—— Nodosaria	3.	57.
	Grammostomum Pennatula,	,,	63.	Vulvulina Capreolus	3.	59.
Bulimina Preslii, *Rss.*	Bulimina elegans, *D'O.* [*Bat.*	,,	64.	Bulimina elegans	1.	9.
	—— caudigera, *D'O.*	,,	65.	—— caudigera	3.	68.
	Virgulina squamosa, *D'O.*	,,	66.	Virgulina squamosa	3.	64.
(Type)	Cassidulina lævigata, *D'O.*	,,	67.	Cassidulina lævigata	2.	41.
Discorbina trochidiformis, *Lamk.*	Discorbina Turbo, *D'O.*	,,	68.	Rotalia Turbo	3.	73.
	—— globularis, *D'O.*	,,	69.	—— globularis	3.	69.
	—— Parisiensis, *D'O.*	,,	70.	Rosalina Parisiensis	2.	38.
	—— rosacea, *D'O.*	,,	71.	—— rosacea	2.	39.
	—— vesicularis, *Lam.*	,,	72.	Rotalia Gervillii	3.	72.
	—— elegans, *D'O.*	,,	73.	Anomalina elegans	2.	42.
Planorbulina farcta, *F. & M.*	Planorbulina Mediterranensis, [*D'O.*	,,	74.	Planorbulina Mediterranensis	4.	79.
	—— nitida, *D'O.*	,,	75.	—— nitida	4.	78.
	Truncatulina refulgens, *Montf.*	,,	76.	Truncatulina refulgens	4.	77.
	—— lobatula, *W. & J.*	,,	77.	—— tuberculata	2.	37.
	Planorbulina Ariminensis, *D'O.*	III.	78.	Planulina Ariminensis	2.	49.
	—— rosea, *D'O.*	,,	79.	Rotalia rosea	2.	35.
Pulvinulina repanda, *F. & M.*	Pulvinulina pulchella, *D'O.*	,,	80.	—— pulchella	3.	71.
	—— Menardii, *D'O.*	,,	81.	—— Menardii	1.	10.
	—— punctulata, *D'O.*	,,	82.	—— punctulata	1.	12.
Rotalia Beccarii, *Linn.*	Rotalia Beccarii, *Linn.* (European form).	,,	83.	—— Beccarii	3.	74.
	—— Beccarii, *Linn.* (West-Indian form).	,,	84.	—— Corallinarum	3.	75.
	—— orbicularis, *D'O.*	,,	85.	Gyroidina orbicularis	1.	13.
	—— Soldanii, *D'O.*	,,	86.	—— Soldanii	2.	36.
Calcarina Spengleri, *Linn.*	Calcarina Spengleri, *Linn.*	,,	87.	Calcarina Calcar	2.	34.
	—— armata, *D'O.*	,,	88.	Rotalia armata	3.	70.
	—— bisaculeata, *D'O.*	,,	89.	—— bisaculeata	1.	15.
	—— lævigata, *D'O.*	,,	90.	Siderolina lævigata	4.	89.
Amphistegina vulgaris, *D'O.*	Amphistegina vulgaris, *D'O.*	,,	91.	Amphistegina vulgaris	2.	40.
	—— Lessoni, *D'O.*	,,	92.	—— Lessonii	4.	98.
Nummulina perforata, *Montfort.*	Operculina complanata, *Def.*	,,	93.	Operculina complanata.	4.	80.
	—— discoidalis, *D'O.*	,,	94.	—— discoidalis	4.	88.
	Nummulina planulata, *Lam.*	,,	95.	Nummulina planulata	4.	87.
Polystomella crispa, *Linn.*	Polystomella crispa, *Linn.*	,,	96.	Polystomella crispa	2.	45.
	Nonionina incrassata, *F. & M.*	,,	97.	Nonionina lævis	2.	46.
	—— pompilioides, *F. & M.*	,,	98.	—— umbilicata	4.	86.
	—— Limba, *D'O.*	,,	99.	—— Limba	1.	11.
(Type)	Heterostegina depressa, *D'O.*	,,	100.	Heterostegina depressa.	4.	99.

Appendix.

Reuss and Fritsch's Models of Foraminifera. 1861.

Whilst speaking of Models of Foraminifera, it may not be amiss to notice a more recent series than that of D'Orbigny—namely, a set of one hundred plaster Models prepared at Prague, under the direction of Professor Reuss and Dr. Anton Fritsch*. These Models are 5 centim. in length, and are furnished with printed labels. The species have been selected with a view of supplying a perfect series, and at the same time completing D'Orbigny's suite of Models. Although the aim of the authors of this set of Models is to give delineations of a more extended series of types than were known to D'Orbigny, and though the workmanship expended upon them has the advantage in point of skill, it may be doubted whether the species chosen for illustration are altogether so apt, or the general result so instructive, as in the earlier series. Of the forms thus illustrated, some have been selected from species already known, and many have been described and figured in one or other of Professor Reuss's numerous papers on Fossil Foraminifera. The needless multiplication of genera appears in a striking light in reviewing the nomenclature of this catalogue. We propose, however, merely to give the list of these Models as arranged in the "Catalogue," with the *Number* and *Locality* appended to each; also a few remarks, when specially called for, and the *type* to which the form belongs. We leave the order and the classification as we find them, thinking that it may be of interest to some to compare the results with the somewhat similar, but less artificial, system which we are in the habit of using, based upon the principles laid down in Dr. Carpenter's "Introduction."

We have to thank Mr. S. V. Wood, F.G.S., for lending us his set of D'Orbigny's Models during several years, whilst we have been engaged on this Memoir.

* "Verzeichniss von 100 Gypsmodellen von Foraminiferen, welche unter der Leitung des Prof. A. Reuss und Dr. Anton Fritsch gearbeitet wurden. Ausgegeben von W. Frič, Naturalienhändler in Prag, Wassergasse Nro. 736–II.

"Die Auswahl der Species ist so getroffen, dass die gegenwärtige Sammlung ein vollständiges Ganze bildet, und dabei die D'Orbigni'sche Suite kompletirt. Die Exemplare sind 5 Centimètre gross und mit gedruckten Etiquetten versehen.

"Der Preis (sammt Emballage) 36 fl. ö. W. oder 24 Th. P. C."

MM. Reuss and Fritsch have liberally given us a set of these useful Models.

Catalogue of the Models of Foraminifera prepared by Professor Dr. A. E. Reuss and Dr. Anton Fritsch. 1861.

[Prof. Reuss's Classification is here followed.]

I. FORAMINIFERA WITH NON-POROUS SHELLS.

A. With Sandy Siliceous Shells.

I. *Lituolidea* (Reuss).

No.	Name.	Type.	Locality.
1.	Placopsilina irregularis, *D'O.* ... (*Lituola Cenomana*, D'O.)		Upper Chalk.
2.	Haplostiche fœdissima, *Rss.* ...... (*L. Scorpiurus*, Montf.)	Lituola nautiloidea, *Lam.* ...	Upper Greensand.
3.	Haplophragmium inflatum ...... (*L. nautiloidea*, Lam.)		Upper Greensand.
4.	—— irregulare, *Roem.*, sp. ...... (*L. irregularis*, Roem.)		Chalk.

II. *Uvellidea* (Reuss).

No.	Name.	Type.	Locality.
5.	Valvulina triangularis, *D'O.*	Valvulina triangularis, *D'O.*...	Eocene.
6.	Verneuilina spinulosa, *Rss.*		Miocene.
7.	Tritaxia tricarinata, *D'O.*, sp. ... (*Verneuilina tricarinata*; old)	Textularia agglutinans, *D'O.*	Cretaceous.
8, 9.	Ataxophragmium variabile, *D'O.*, sp. (*a.* & *β.*)	Bulimina Preslii. *Rss.*	Chalk.
10.	Clavulina communis, *D'O.*		Tertiary.
11.	Gaudryina pupoides, *D'O.*	Textularia agglutinans, *D'O.*	Upper and Middle [Chalk.
12.	Bigenerina Nodosaria, *D'O.*		Recent.
13.	Conulina conica, *D'O.*	? Lituola nautiloidea, *Lam.* ...	Recent.
14.	Chrysalidina gradata, *D'O.*	? Chrysalidina gradata, *D'O.*...	Cretaceous.

B. With Compact, Porcellanous, Calcareous Shells.

I. *Squamulinidea* (Reuss).

II. *Miliolidea* (Reuss).

No.	Name.	Type.	Locality.
15.	Cornuspira involvens, *Rss.*	Cornuspira foliacea, *Phil.*	Miocene.
16.	Uniloculina Indica, *D'O.* .... (? Young of a striped *Quinqueloculina.*)		Recent.
17.	Biloculina Lunula, *D'O.* .... (*B. depressa*, D'O.)		Tertiary.
18.	Spiroloculina dilatata, *D'O.* ...... (*Sp. planulata*, Lam.)	Miliola Seminulum, *Linn.*...	Miocene.
19.	Triloculina gibba, *D'O.* .... (*T. trigonula*, Lam.)		Tertiary.
20.	Quinqueloculina, sp., *D'O.*		Tertiary.
21.	Fabularia discolithes, *Dcfr.*	Fabularia ovata, *Roissy*	Eocene.

No.	Name.	Type.	Locality.

III. *Peneroplidea* (Reuss).

No.	Name.	Type.	Locality.
22.	Peneroplis pulchellus, *D'O.*		Recent.
23.	—— planatus, *Montf.*	Peneroplis pertusus, *Forsk.*	Recent.
24.	Dendritina arbuscula, *D'O.*		Recent.
25.	Spirolina Austriaca, *D'O.*		Middle Tertiary.
26.	Vertebralina mucronata, *D'O.*	Vertebralina striata, *D'O.*	Recent.
27.	Hauerina compressa, *D'O.*	Miliola Seminulum, *Linn.*	Miocene.
28.	Pavonina flabelloides, *D'O.*	? Orbiculina adunca, *F. & M.*	Recent.

IV. *Orbitolitidea* (Reuss).

No.	Name.	Type.	Locality.
29.	Cyclolina cretacea, *D'O.*	Patellina concava, *Lam.*	Chalk-marl.
30.	Orbitolites macropora, *Lam.*	Orbitolites complanata, *Lam.*	Mästricht Chalk.

II. FORAMINIFERA WITH POROUS SHELLS.

A. With Hyaline, finely Porous Calcareous Shells.

I. *Spirillidea* (Reuss).

No.	Name.	Type.	Locality.
31.	Spirillina punctata, *D'O.*	?	Tertiary and recent.

II. *Ovulitidea* (Reuss).

No.	Name.	Type.	Locality.
32.	Ovulites margaritacea, *Lam.*	Ovulites margaritacea, *Lam.*	Eocene.

III. *Rhabdoidea* (Reuss).

No.	Name.	Type.	Locality.
33.	Lagena simplex, *Rss.*		Upper Chalk.
34.	—— vulgaris, *Will.* (*L. lævis*, Montagu.)	Lagena sulcata, *W. & J.*	Recent.
35.	Fissurina carinata, *Rss.* (*L. marginata*, Montagu.)		Tertiary.
36.	Nodosaria tetragona, *Rss.*		Gault.
37.	—— inflata, *Rss.* (A short *N. Raphanistrum.*)	Nodosarina Raphanus, *Linn.*	Upper Chalk.
38.	—— lepida, *Rss.* (A long *N. Radicula.*)		Upper Greensand.
39.	Orthocerina quadrilatera, *D'O.*	Orthocerina Murchisoni, *Rss.*	Recent.
40.	Dentalina acuminata, *Rss.*		Upper Chalk.
41.	—— Lorneiana, *D'O.*		Upper Chalk.
42.	Vaginulina Badensis, *D'O.*		Upper Tertiaries.
43.	—— transversalis, *Rss.*		Gault.
44.	—— cristellaroides, *Rss.*	Nodosarina Raphanus, *Linn.*	Lower Greensand.
45.	Rimulina glabra, *D'O.*		Recent.
46.	Frondicularia Lanceola, *Rss.*		Upper Greensand.
47.	—— Goldfussii, *Rss.* (*Fr. complanata*, Defr.)		Upper Greensand.
48.	—— turgida, *Rss.*		Chalk-marl.
49.	Rhabdogonium acutangulum, *Rss.*	Orthocerina Murchisoni, *Rss.*	Lower Greensand.
50.	—— Martensi, *Rss.*		
51.	Amphimorphina Haueri, *Neugel.*		Miocene.
52.	Dentalinopsis semitriquetra, *Rss.* (A triangular *Dentalina.*)		Lower Greensand.
53.	Flabellina oblonga, *V. Münst.*		Tertiary.
54.	—— cordata, *Rss.* (*Fl. oblonga*, V. M.)		Upper Chalk.
55.	Psecadium ellipticum, *Rss.* (A globose or Glanduline *Marginulina.*)	Nodosarina Raphanus, *Linn.*	Miocene.
56.	Lingulina costata, *D'O.*		Miocene.
57.	Lingulinopsis Bohemica, *Rss.* (A Linguline *Marginulina.*)		Chalk-marl.
58.	Pleurostomella fusiformis, *Rss.* (An extreme form of *Virgulina.*)	Bulimina Preslii, *Rss.*	Gault.

No.	Name.	Type.	Locality.
	IV. *Cristellaridea* (Reuss).		
59.	Marginulina Ensis, *D'O.*	Nodosarina Raphanus, *Linn.*	Upper Chalk.
60.	—— bullata, *Roem.*		Upper Chalk.
61.	Cristellaria Josephina, *D'O.*		Middle Tertiary.
62.	—— rotulata, *Lam.*		Cretaceous.
63.	Robulina deformis, *Rss.* (First stage of *C. rotulata.*)		Tertiary.
	V. *Polymorphinidea* (Reuss).		
64.	Bulimina pupoides, *D'O.* (*β.*)	Bulimina Preslii, *Rss.*	Tertiary and recent.
65.	Virgulina pertusa, *Rss.* (*V. squamosa*, D'O.)		Tertiary.
66.	Uvigerina pygmæa, *D'O.*	Uvigerina pygmæa, *D'O.*	Tertiary.
67.	Polymorphina complanata, *D'O.*	Polymorphina lactea, *W. & J.*	Miocene.
68.	Pyrulina Gutta, *D'O.*		Tertiary.
69.	Globulina æqualis, *D'O.*		Upper Tertiary.
70.	Guttulina Austriaca, *D'O.*		Tertiary.
71.	Sphæroidina Austriaca, *D'O.* (*Sph. bulloides*, D'O.)	Sphæroidina bulloides, *D'O.*	Tertiary.
72.	Dimorphina obliqua, *D'O.* (A Dentaline *Marginulina.*)	Nodosarina Raphanus, *Linn.*	Tertiary.
	VI. *Cryptostegia* (Reuss).		
73.	Chilostomella ovoidea, *Rss.* (A Biloculine *Miliola*?)	? Miliola Seminulum, *Linn.*	Tertiary.
74.	Allomorphina cretacea, *Rss.* (A Quinqueloculine *Miliola*?)		Upper Greensand.
	VII. *Textilaridea* (Reuss).		
75.	Textilaria Conulus, *Rss.* (*T. agglutinans*, D'O.)	Textularia agglutinans, *D'O.*	Upper Chalk.
76.	Proroporus complanatus, *Rss.* (The first stage of *Bigenerina.*)		Gault.
77.	Sagraina pulchella, *D'O.*		Recent.
78.	Vulvulina Gramen, *D'O.*	Bulimina Preslii, *Rss.*	Recent.
79.	Bolivina Beyrichi, *Rss.*	Textularia agglutinans, *D'O.*	Tertiary.
80.	Schizophora Neugeboreni, *Rss.* (Bigenerine *Vulvulina Pennatula.*)	....	Miocene.
	VIII. *Cassidulinidea* (Reuss).		
81.	Cassidulina crassa, *D'O.*	Cassidulina lævigata, *D'O.*	Recent.
82.	Ehrenbergina serrata, *Rss.* (*Cassidulina serrata*, Rss.)		Miocene.

B. Foraminifera with very Porous Calcareous Shells.

	I. *Rotalidea* (Reuss).		
83.	Rotalia Brongniarti, *D'O.* (*Pulvinulina auricula*, F. & M.)	Pulvinulina repanda, *F. & M.*	Miocene.
84.	—— Girardana, *Rss.* (*Rotalia Soldanii*, D'O.)	Rotalia Beccarii, *Linn.*	Tertiary.
85.	—— bulimoides, *Rss.* (*Bulimina elegantissima*, Will.)	Bulimina Preslii, *Rss.*	Tertiary.
86.	Siphonina reticulata, *Rss.* (*Planorbulina reticulata*, Rss.)	Planorbulina farcta, *F. & M.*	Miocene.

No.	Name.	Type.	Locality.
87.	Asterigerina Planorbis, *D'O.* (*Discorbina rosacea*, D'O.)	Discorbina Turbo, *D'O.*	Tertiary.
88, 89.	Siderolithes calcitrapoides, *Lam.*	Calcarina Spengleri, *Gm.*	Chalk of Mästricht.
90.	Planorbulina Mediterranea, *D'O.*	Planorbulina farcta, *F. & M.*	Recent.
91.	Globigerina bulloides, *D'O.*	Globigerina bulloides, *D'O.*	Tertiary.
92.	Orbulina universa, *D'O.*	Orbulina universa, *D'O.*	Tertiary and recent.
	C. With Calcareous Shells traversed by an intermediate Canal-system.		
	I. *Polystomellidea* (Reuss).		
93.	Polystomella aculeata, *D'O.*	Polystomella crispa, *Linn.*	Tertiary and recent.
94.	Nonionina communis, *D'O.* (*N. Scapha*, F. & M.)	Nonionina asterizans, *F. & M.*	Tertiary.
95.	—— bulloides, *D'O.* (*Pullenia sphæroides*, D'O.)	Pullenia sphæroides, *D'O.*	Tertiary and recent.
96.	Fusulina cylindrica, *Fisch.*	Fusulina cylindrica, *Fisch.*	Carboniferous Limestone.
	II. *Nummulitidea* (Reuss).		
97.	Amphistegina Quoyi, *D'O.*	Amphistegina vulgaris, *D'O.*	Recent.
98.	Operculina, sp. (after *Carpenter*)	Nummulina perforata, *Montf.*	Recent.
99.	Heterostegina, sp. (after *Carpenter*)	Heterostegina depressa, *D'O.*	Recent.
100.	—— costata, *D'O.*	Heterostegina depressa, *D'O.*	Miocene.

V.—*On* Ægeon Alfordi, *a new British Sea-Anemone.* By Philip Henry Gosse, F.R.S.

[Plate VII.]

Family **Antheadæ**.

Genus Ægeon, mihi.

Base adherent to rocks with a moderate tenacity; broader than the medium diameter of the column.

Column irregularly distensible, not mucous, somewhat versatile, but generally forming a tall, erect, thick pillar, the summit expanding; the margin tentaculate; the surface longitudinally fluted (as if composed of a multitude of slender vertical cylinders placed in contact side by side), each cylinder studded with a single vertical row of minute warts. No suckers or loopholes. Substance pulpy, membranous.

Disk expanded, membranous, concave, revolute.

Tentacles numerous, in several rows, long, lax, irregularly flexuous, scarcely retractile.

Mouth not ordinarily set on a cone, but pouted after the reception of food; lip thin. Gonidial tubercles prominent.

Acontia wanting (?).

Ægeon Alfordi, mihi.

The only known species. Colours and dimensions as follows:—

Basal disk brick-red.

Column pea-green, suffused with a purplish hue, as if from within the skin, more marked towards the extremities than in the medial region; the whole covered with red dots, so minute as to be distinguished only with the aid of a lens. The warts have each but one speck of crimson, which is central and much larger than the other dots. The red hue on the warts being thus limited to a single speck, the area of the warts appears of a brighter, clearer green than the rest of the body.

Disk. Inner half purplish grey, abruptly divided from the outer half, which is of a most lustrous satiny green; radii faint lines of grey.

Tentacles lustrous satiny green throughout, each bearing a faint line of grey along its outer side.

Mouth. Lip and throat grey.

When fully expanded, it is sometimes 4 inches in height by $1\frac{1}{2}$ inch in diameter; at other times it will be 2 inches in each direction. Expanse of flower $6\frac{1}{2}$ inches.

Locality. The Scilly Islands.

This very fine Anemone, which might well put in a claim to be considered *pulcherrima*, if we had but a Paris to judge, and which is by very far the noblest acquisition to our British marine zoology that I am aware of since the publication of my 'Actinologia,' we owe to the researches of the Rev. D. P. Alford, M.A., Chaplain of the Scilly Islands. On the 29th of March last, this gentleman observed "some very bright green tentacles reaching out from beneath a large stone," which, though he at first supposed them to indicate an *Anthea cereus*, proved to belong to an unknown treasure. "Here was an Anemone with high-standing column like an *Aiptasia*, but with the surface warted, and with tentacles like the richest green velvet, throwing into the shade the brightest of Antheas. Moreover the tentacles were of the same colour to their very tips, without the least tinge of pink or purple." "I put into the same bottle," continues Mr. Alford, "a *Nereis* 4 inches long; and by the time I got home (within a quarter of an hour), the poor worm had been seized in the middle by the lovely green tentacles, and only its head was to be seen protruding from the Anemone's mouth. With his good dinner, my friend became active, far more lively than I have ever found *Aiptasia*. He soon fastened firmly to the *side* of the basin; but his tentacles and column were perpetually on the move. He shows himself off to most advantage when he curves his column upwards so as to present his *full* flower just beneath the surface of the water. After referring carefully to your 'History,' I found much resemblance in the column to the *Bunodes Ballii*, but far more likeness in all other respects to the *Aiptasia*. Its column has the crimson specks of the former; but it has the size and flexibility of the latter. It also resembles *Aiptasia* in the *length* of its tentacles, in the fact that these often become extremely attenuated, in never quite closing the disk, in its well-marked radii, and also in having the margin *crenate*; for all the finer specimens of *Aiptasia* which I have observed have the margin *crenate*, not *tentaculate*."* "The green of the tentacles is very much that of the common *Ulva*; and, like that, it keeps its brilliant colour by lamp-light, when *Anthea* loses much of its beauty."

Mr. Alford immediately submitted his prize to me for examination. We had both thought that it might possibly prove to be *Actinia pustulata* of Dana; but a reference to the figures and descriptions in that author's great work on 'Zoophytes' at once set this suspicion at rest†. I have no hesitation in pronouncing it hitherto unrecognized. With very obvious affinities to both *Aiptasia* and *Anthea*, the character of the column well distinguishes it from either. The surface in *Aiptasia* is minutely corrugated, in *Anthea* cancellated by the intersection of furrows; in *Ægeon* there are frequently seen transverse wrinkles; but the warts are very manifest when, from a peculiar curve of the body, these cross wrinkles are quite obliterated. It has much more of an erect column than *Anthea*. After very many protracted watchings with a powerful lens, when the body was in the most favourable conditions for observation, I could never discern the slightest trace of *cinclides*; nor has any amount of provocation educed the emission of *acontia*.

The cylinders of which the skin of the column is built up are alternately larger and smaller: each of the former terminates in a short process (the marginal tentacles), the latter are truncate. This structure is seen to most advantage when the animal is greatly distended.

With respect to its habits in captivity, several circumstances indicate that this charming species is very eligible for the aqua-

* I have considered these marginal processes as budding tentacles in both species. Perhaps I am wrong, but it may suffice to say that in this respect *Ægeon* agrees with *Aiptasia*. They are the projecting summits of the cylinders or flutes, and alternate with the outermost row of tentacles proper.

† *A. pustulata*, *A. veratra*, *A. clematis*, and *A. florida* of Dana appear to constitute a genus of *Actiniadæ* (as limited in Act. Brit. p. 171), agreeing with *Actinia* in the possession of marginal spherules, and differing from it in having a warted column. M. Milne-Edwards (Corall. i. 274) has given the name of *Phymactis* to this genus.

rium. In the first place, it possesses a wonderful tenacity of life, as the following facts will show. On the 4th of April, Mr. Alford enclosed the specimen in a small canister, and sent it to me by post. On the 12th, an ample missive under the great seal of the General Post Office informed me that a package addressed to me was detained by the postmaster at Plymouth, on account of the exudation of water, according to statute in that case made and provided. Hope pretty nearly died within me; but I wrote to a friend at Plymouth, who kindly obtained the offending package, gave the prisoner a twenty-four hours' bath, and then re-posted him on to me. On the evening of the 17th I turned him out, and, before night, had the pleasure of seeing him adhering, and expanding in all his beauty, none the worse for his fortnight's captivity.

From that day to this (June 10) he has luxuriated in a little cylindrical vase of sea-water, always displaying his full glories in the most ungrudging manner. He is always ready for dinner, and swallows large lumps of raw meat with a very vigorous appetite. The liveliness and versatility of his movements greatly augment the interest which attaches to him as a tenant of the tank. Mr. Alford's first evening's impressions of his character —"I have had him close beside me all this evening, and he has never been alike in shape or size for two minutes together"— have been justified by my more lengthened experience.

At present the specimen remains unique; but my friend is on the *qui vive* *, and we may hope that more examples may soon be discovered among the sea-beaten rocks of those rocky outposts of England.

As it devolved on me to give the illustrious stranger a pair of names, I have borrowed one from a hundred-armed hero of antiquity—

> "Ægeon qualis, centum cui brachia dicunt,
> Centenasque manus" † ;

and the other from the fortunate discoverer.

EXPLANATION OF PLATE VII.

Ægeon Alfordi, of the natural size, in its ordinary state of distention.

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* I will add an interesting fact from a letter of Mr. Alford's:—"The *great* abundance of *Aiptasia* seems the most marked feature of these islands, as far as Anemones are concerned. Other species and varieties are well represented; but amongst the rocks in Porth Crassa Bay, at the back of my house, the *Aiptasiæ* are innumerable—*far more common than Actinia mesembryanthemum*."

† Virg. Æneid. x. 565.

VI.—*On the Presence of certain Secreting Organs in* Nematoidea. By Alexander Macalister, F.R.C.S.I., Demonstrator of Anatomy, Royal College of Surgeons, Ireland.

The existence of special secreting organs in the Nematoid Entozoa is by no means a discovery of very modern date; for several of the earlier helminthologists have described various parts of the animals in this class as subservient to the function of secretion. Of late, however, our knowledge of these structures has been much extended, mainly through the increasing perfection of the microscope, which has thrown light upon all branches of invertebrate anatomy, and has shown us greater complexities of structure in those creatures which had previously been regarded as of simpler organization.

Four series of these glandular organs have been already described in different Nematoids; and I think that the apparatus which I am about to notice is entitled to rank as a fifth kind of secreting organ, separate in function from any of those at present known. Those already recognized are—(1) The salivary cæca described by Owen in *Gnathostoma spinigera*, consisting of four small blind tubes communicating with the mouth: similar organs Siebold has noticed in *Strongylus striatus*; and although some have doubted the function assigned to them (Bagge, in Appendix to 'Thesis de Evolutione *Strongyli auricularis*,' &c.), yet I think we are justified in adopting Owen's view as being correct. (2) Cloquet, in his work on the anatomy of *Ascaris lumbricoides*, describes the thickened parietes of the œsophagus as being glandular, probably secreting a fluid to assist in the assimilation of the food. (3) There are in many species intestinal cæca with which Owen associates an hepatic function. Mehlis, in the 'Isis' for 1831, figures and mentions several of these; and Siebold, in his 'Anatomy of the Invertebrata,' refers to their occurrence in several species, especially in *Ascaris heterura*, *A. semiteres*, *A. depressa*, *A. angulata*, *A. ensicaudata*, *A. mucronata*, and *A. osculata*. Leidy, in the 'Smithsonian Contributions,' pt. 5. p. 49, pl. 7, figures and describes one of these organs in *Thelastomum appendiculatum*; and Diesing notices another in a species of *Ascaris* infesting the Dugong. The 4th and last-described gland (leaving out of account the secreting parts of the reproductive apparatus) is the curious tubular organ described by Siebold (Bagge, *loc. cit. suprà*) in the *Strongylus auricularis* and *Ascaris brevicaudata*, *A. acuminata*, *A. paucipara*, and *A. dactyluris*, which opens near the middle of the body on the ventral aspect, and which in the last-named species I have on several occasions traced with considerable facility.

To these four I think we may add another group of organs which seem as distinctly glandular as any of those above referred to. These are present in the *Ascaris dactyluris*, Rud., a small white Entozoon, which inhabits in enormous quantities the large intestine of *Testudo græca*. In the interior of these parasites, as I have elsewhere described*, the lowest part of the club-shaped intestine exhibits a small dilatation, immediately inferior to which it suddenly contracts into a narrow rectum, that passes downwards and forwards to the anus, forming an obtuse angle (re-entrant forwards) with the upper part of the alimentary canal. Surrounding the constriction which marks the origin of the rectum, are four small ovate or pyriform bodies, granular in appearance, usually seeming as though solid, in other subjects appearing slightly excavated. Their inner aspect is placed in very close apposition to the wall of the gut; so that at first it seemed to me as if they opened directly into the narrowed commencement of the rectum; however, when carefully examined by reflected light, my friend Dr. Barker has shown to me that, at least in some specimens, such is but an apparent and not a real attachment, and that the true connexion between these oval bodies and the intestine is by means of long fine ducts, which open into that canal immediately above the anus†. Sometimes these tubes pass from the inner or intestinal side of the glands; in other subjects the masses narrow into a somewhat flask-like shape, and have their attenuated necks continuous with the duct: in the former case the organs were globular, in the latter they seemed rather pyriform. In another specimen the sacs were calcarate, with their curved projecting spurs directed upwards and outwards. No appearance of nerves or nerve-ganglia was visible in connexion with them; and the lateral and antero-posterior tegumentary lines dipped inwards to come almost into contact with their outer coat.

Whether these bodies exist in other species of Nematoids or not, I cannot say; but, as far as my observations have extended, I have not succeeded in finding either themselves or any notice of such an organization elsewhere. In the species under consideration, however, they are unmistakeably distinct and constantly present; for out of many specimens examined by Dr. Barker and myself, both separately and conjointly, we were able to detect their existence in every individual.

It would be difficult, if not almost impossible, to predicate as to the exact nature of these bodies; but I can only conceive of

* "On the Anatomy of *Ascaris dactyluris*," read before the Dublin Natural History Society, June 1865.

† This, however, does not seem to be the invariable mode of attachment; for I have failed to find the duct-like processes in many individuals.

two tenable hypotheses regarding them. They have evidently nothing to do with the reproductive apparatus, as they are equally present in both males and females, and seem to have no connexion in either with the sexual organs. They might, however, be either secreting glands or intestinal cæca. The latter hypothesis I should be inclined to regard as very improbable; for though cæca are described and figured by Leidy, of Philadelphia, and others, as I have before mentioned, yet in all those species in which they occur we find them placed much higher in the alimentary canal, often at the point where the stomach or intestine joins the œsophagus: they are usually single or unsymmetrical, always hollow; and though often communicating with the intestine by a narrow neck, yet rarely or never is that structure so suddenly attenuated and duct-like as is constantly the case in these secreting organs in *Ascaris dactyluris*. We are thus led to adopt the last hypothesis, that they are special glandular structures—an opinion which, I think, is supported by their numbers, by their thick, solid, granular walls, by their long ducts, when present, and by their invariably low position with regard to the alimentary canal. This latter point is also of much importance in relation to the function fulfilled by these bodies, if glandular; for as their secretion would be poured into the lowest portion of the rectum, it could not be to any extent excrementitious in its nature, but must be directly evacuated before absorption could take place; so we may regard these organs as a means of evolving effete matter from the system: mayhap they might be among the earliest examples of a renal apparatus in the animal kingdom; and if so, certainly they are the first examples of such having been found in the Entozoa. Indeed, as a general rule among the lower departments of animal life, the appearances of renal organs are more or less equivocal: even in the Insecta the Malpighian tubes (by far the most distinct urinary apparatus in the Articulata) were often mistaken for hepatic organs, until Brugnatelli and Wurtzer proved that these canals contained urate of ammonia in the Silkworm, as Meckel afterwards demonstrated in *Melolontha* (Archiv für Physiologie, 1816, 1818, 1826). In Myriapoda the same tubular structure obtains with tolerable distinctness; and in Crustacea we have the urinary system represented by the tubes traced by Milne-Edwards in *Maia*, by Duvernoy in *Portumnus*, and by Meckel in *Palæmon* and others. Usually these are cæca, which open sometimes into the pylorus but occasionally into the rectum. No representative organ has been, to my knowledge, described in Annelida. In Echinodermata Jäger has referred to the slightly branching sinuous tubes of Holothuridæ as being renal in their nature; but Müller, who describes these structures under the name of the Cuvierian organs, seems rather doubtful as to their function. Below these in the scale of nature we meet with no distinct vestiges of urinary excreting organs; so if my hypothesis regarding the nature of these above-described bodies be accepted, they will rank as either the first or the second early traces of such glands as yet found in the animal kingdom.

VII.—*Description of a new Species of* Corvina *from the Gambia.* By Dr. Albert Günther.

Mr. Moore, Curator of the Liverpool Free Public Museum, has kindly sent for my inspection a Sciænoid Fish collected by J. Lewis Ingram, Esq., at Bathurst, on the River Gambia, which proves to be an undescribed species of the genus *Corvina*, for which I propose the name of

Corvina Moorii.

D. $8|\frac{1}{25}$. A. $\frac{2}{7}$. L. lat. 64. L. transv. $7/x$.

This species is distinguished by its broad and obtuse head, similar to that of *Collichthys*. The eye is comparatively small, about one-ninth of the length of the head, and only one-half of the extent of the snout. Interorbital space very broad, convex, its width being one-third of the length of the head. Hind margin of the præoperculum obliquely descending backwards, with short spinous teeth at the angle and along the margins. Snout very obtuse; jaws with narrow bands of short cardiform teeth, those of the outer series being much larger and conical. Cleft of the mouth of moderate width, situated at the lower side of the snout, the maxillary extending to behind the hind margin of the orbit.

The length of the head is more than the depth of the body, and one-fourth of the total length (without caudal). Scales of moderate size, irregularly arranged. Pectoral fin considerably longer than the ventral, as long as the post-orbital part of the head. Dorsal spines of moderate strength, not flexible; the second is the longest, and rather more than half as long as the head; the soft dorsal fin of moderate height. Caudal fin convex, slightly produced in the middle. The second anal spine strong, two-thirds as long as the first soft ray, and nearly one-third as long as the head.

Uniform blackish brown, the centre of each scale being lighter; fins black.

The specimen is 20 inches long.

Numerous species of Acanthopterygian fishes, especially from the west coast of Africa, show osseous tumours in some parts of their skeleton. The seat of these tumours is chiefly the neural or hæmal processes, more rarely the interneurals and interhæmals. In the typical specimen of *Corvina Moorii* a date-like osseous tumour is attached to the spine of the second dorsal fin; and a second specimen which we have seen, from the same locality, has, singularly enough, a perfectly similar tumour on the same spine.

We have formerly (Fishes, ii. p. 296) expressed our opinion that these peculiar tumours are anomalous deposits of osseous matter, and that species founded on such a character (like *Corvina clavigera*, Cuv. & Val.), are extremely doubtful. Indeed we have now not the least doubt that this *Corvina clavigera* is identical with *C. nigrita*, of which we have seen an example, likewise belonging to the Liverpool Museum, which has the ventral and anal spines excessively thickened, in consequence of a similarly abnormal deposition of bony substance.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Jan. 10, 1865.—Dr. J. E. Gray, F.R.S., in the Chair.

On the Anatomy and Habits of the Water-Ousel (Cinclus aquaticus). By Edwards Crisp, M.D., F.Z.S, etc.

I have for a long time been occupied in preparing a work on the British Birds, more especially in reference to their structure, in connexion with their habits, the nature of their food, &c.; and there is no bird that has puzzled me so much as the Water-Ousel, and it is on this account that I bring the subject before the Society, hoping that I may obtain some information from the members present. I need not go very minutely into the history of this bird; but it will, I think, be interesting to compare some parts of its anatomy with those of the other *Merulidæ*. The object of my paper will be to endeavour, first, to ascertain by what means this bird, so unlike all aquatic birds in form, is enabled to dive and remain some time under water and capture its prey; secondly, to inquire respecting the nature of its food, and its supposed depredations on the ova and fry of fishes. I may premise that I have shot several of these birds in Scotland for the purpose of ascertaining the character of their food, and that I have had many opportunities of observing their habits. The three specimens on the table were sent to me recently (Nov. 30) by my friend Mr. Grierson, of Thornhill, Dumfriesshire; and I have dissected and examined them, as I had done on former occasions, in relation to the two questions above referred to. As the evidence of one inquirer in reference to the habits of this or of any other bird is comparatively valueless, let me quote a few authorities upon the subject.

Montagu, in his Ornithological Dictionary, says he "discovered the nest of this bird in consequence of the old bird flying, with a fish in its bill, to the young. These were nearly fledged, but incapable of flight; and the moment the nest was disturbed, they fluttered out and dropped into the water, and, to our astonishment, instantly vanished, but in a little time made their appearance at some distance down the stream, and it was with difficulty two out of five were taken, as they dived on being approached. The motion under water," he says, "is effected by short jerks from the shoulder-joint, not, as in all other diving-birds, with extended wings."

Yarrell dissected this bird, and found nothing in its structure to account for its diving and remaining on the ground without any muscular effort.

Mr. Macgillivray (Naturalist, vol. i. p. 105) says, "I have seen the Dipper moving under water in situations where I could observe it with certainty, and I readily perceived that its actions were similar to those of the Divers, Mergansers, and Cormorants, which I have often watched from an eminence as they pursued the shoals of sand-eels along the sandy shores of the Hebrides. It in fact flew, not merely using the wing from the carpal joint, but extending it considerably, and employing its whole extent as if moving in the air. The general direction of the body is obliquely downwards; and great force is evidently used to counteract the effects of gravity, the bird finding it difficult to keep at the bottom."

Other observers have given similar testimony, some asserting that bubbles of air appeared on the surface after the bird was submerged: but these must have arisen from the disturbance of the earth at the bottom of the river; for no diving-bird, I believe, emits air from its lungs when under water. The air is got rid of before the act of diving takes place. But let me now speak of some parts of the anatomy of this bird, before I attempt to answer the first question. The average weight of this bird is said to be $2\frac{1}{2}$ oz.; but in four that I have weighed the average weight has been about $2\frac{1}{4}$ oz., the males being a little heavier than the females; the length $7\frac{1}{4}$ inches, and 11 inches from the tip of each wing. The brain weighed 10 grains, the eyes 12 grains, the skin and feathers 132 grains, the pectoral muscles 135 grains. The gizzard moderately thick, and lined with a tough cuticle. The length of the whole alimentary tube was 16 inches; the œsophagus, as in the other *Merulidæ*, not dilated into a crop. The trachea of nearly uniform calibre, and consisting of 36 rings; the vocal muscles largely developed, as in the other members of this family. The tail-glands comparatively of large size.

I have depicted all the above parts in the drawing before the Society; but the parts of the anatomy of this bird to which I am anxious to direct attention are the shortness of the wing and the great development of the wing-muscles—features which I believe will in a great measure account for the diving-powers of this bird and its progress under water. As might be expected, too, from the frequent motion of the tail, the caudal muscles are much developed. On comparing the visceral anatomy of this bird with that of the other

British *Merulidæ*, all of which I have dissected, with the exception of White's Thrush (*Turdus Whitei*), very little proportional difference is observed. The length of the intestinal tube in the Redwing (*T. iliacus*) is 14 inches; the brain weighs 16 grains, the pectoral muscles 170 grains, the weight of the body being about $2\frac{1}{2}$ oz. In the Fieldfare (*T. pilaris*), weighing $4\frac{1}{2}$ oz., the brain weighs 26 grains, and the intestinal tube measures 22 inches. In the Ring-Ousel (*T. torquatus*), weight 3 oz. 180 grains, the alimentary canal is $13\frac{1}{2}$ inches in length, and the weight of the brain is 26 grains; and these parts in the Missel-Thrush (*T. viscivorus*), in the Blackbird (*T. merula*), and Song-Thrush (*T. musicus*) are of nearly the same proportionate length and weight. In the young Water-Ousel that I have dissected, I observed nothing remarkable in its anatomy. So that, as regards the visceral anatomy, there is no important difference between the Water-Ousel and the other members of this group, although among the British Merules this is the only bird that feeds exclusively on animal food; but, to show how the habits of a bird may be altered in this respect, I have mentioned a young Water-Ousel that was reared under a Bantam, and fed on porridge (P. Z. S. 1859, p. 200).

Some writers upon this bird have spoken of the claws as being well adapted for holding on to stones and other objects at the bottom of the water; but on comparing the claws of the Water-Ousel with those of the other *Merulidæ*, it will be seen that the bird has no advantage of this kind, although the comparatively blunted form of the claw would lead to the inference that it is used for the purpose mentioned.

The bones of the Water-Ousel, like those of the other British members of this group, contain no air*; and it is singular that the skeleton of the Fieldfare, Redwing, and Missel-Thrush (birds of passage) should in this respect resemble that of the short-flighted Water-Ousel.

As regards the food, I am afraid that we cannot entirely acquit this bird of occasionally destroying the fry of fish; but I know of no reliable evidence to prove that it takes the ova. In the three specimens before the Society, the gizzards of all contained Entomostraca, and one of them a Gordian (*Gordius aquaticus*). In others that I have dissected, I have discovered chiefly Entomostraca and the larvæ of *Phryganea*; indeed I have found that its food is very similar to that of the young Salmon (*Salmo salar*).

Mr. Gould, in his present work 'The Birds of Great Britain' (part 1), mentions that he examined five of these birds that were shot on the River Usk, in Nov. 1859, and that no trace of spawn was found in any of them; their hard gizzards were entirely filled with the larvæ of *Phryganea* and the Water-beetle (*Hydrophilus*). One had a small Bullhead (*Cottus gobio*), which the bird had doubtless taken from under a stone. Mr. Gould thinks that, by destroying insects and their larvæ that may attack the ova and fry of fishes, these birds may do great service.

* I need scarcely say that some of the cranial bones of birds, like those of mammals, contain air.

Mr. Macgillivray found beetles and water shells (*Lymnea* and *Ancylus*) and the larvæ of *Ephemera, Phryganea,* and other aquatic insects.

Sir W. Jardine, in his 'Birds of Great Britain,' says, "In one part of Scotland, sixpence per head is given for these birds. In another district, 548 were killed in three years." He adds, "The ova of any kind of fish we have never detected in the stomach or intestines; nor do we think that they habitually frequent the places where the spawn would be deposited; and if they did, we would deem it almost impossible that they could reach it after it was covered in the spawning-bed," &c.

So that I hope we may fairly acquit this interesting little bird of the depredations of which it has so often been accused; but I hope that we shall ere long see the Water-Ousel, with the Little Grebe (*Podiceps minor*), in the Society's fish-house, where a better opportunity will be afforded of learning its habits.

As is well known, this bird has been variously classed by different writers. Mr. Gould, in the work before quoted, says he regards *Cinclus* as one of the isolated forms of ornithology, and that it has some remote alliance with the genera *Troglodytes* and *Scytalopus* and their allies.

Description of a New Species of Entozoon from the Intestines of the Diamond-Snake of Australia (Morelia spilotes). By W. Baird, M.D., F.L.S.

Bothridium (Solenophorus, Creplin) arcuatum, Baird.

Length of the largest specimen (which, however, is not quite perfect at lower extremity) 10 inches. Breadth, about the middle of its length, 4 lines. Head, consisting of its two tubular bothria, about 7 lines in length and 3 lines in breadth. Bothria smooth, cylindrical, arched outwardly, and connected together throughout their whole extent, and each of about the same diameter at the top as at the bottom. Upper openings circular and large; lower openings very small and quite terminal. Neck none. Articulations at anterior extremity extremely small, appearing like mere rugæ. Articulations of rest of body, in adult specimens, very numerous, narrow, much broader than long, and crowded together; in smaller and apparently younger specimens (which, however, look as if perfect in length), the articulations near the posterior extremity are, comparatively speaking, much larger, longer than broad, and are more like those of *B. laticeps* or *B. pythonis*. The most distinguishing character is the size and shape of the head.

Hab. Intestines of the *Morelia spilotes,* from Australia. (*Mus. Brit.*).

For the specimens of this species I am indebted to Dr. A. Günther, who found them attached to the inner surface of the intestines of a specimen of an Australian Python, the Diamond-Snake, *Morelia spilotes*.

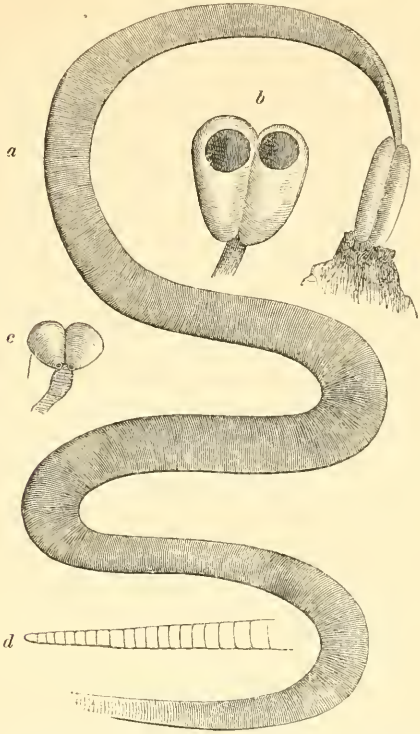


Fig. *a*. Worm of natural size, attached to inner surface of intestine.
Fig. *b*. Bothria, slightly enlarged, showing the upper openings.
Fig. *c*. The same, showing lower openings.
Fig. *d*. Posterior extremity of a young specimen, showing the, comparatively speaking, larger articulations.

Jan. 24, 1865.—E. W. H. Holdsworth, Esq., in the Chair.

The Secretary read the following extract from a letter addressed to him by Dr. Bennett, F.Z.S., dated Sydney, Nov. 18th, relating to a living specimen of the Lyre-bird of New Holland (*Menura superba*), which the Acclimatization Society of that city were intending to transmit by the first favourable opportunity to this Society:—

"After repeated trials of keeping this wild and restless bird in captivity, and having procured and lost in one year numerous living birds of all ages, from the young bird to the adult, we have so far succeeded as to preserve one alive and in excellent health, and feeding well, since the 23rd of August last; to this day it continues in good health and condition. It is a young bird, at present in immature plumage, and the sex cannot yet be determined. It is placed in a large wire compartment with the Talegallas or Brush-Turkeys, and it appears to enjoy their society very much. Whether their company reconciles it to confinement I cannot say; but, at all events, it feeds well and thrives, and displays a great amount of activity for a great part of the day, running about the cage incessantly, scratching the ground. It feeds on the larva of the *Tettigonia* or "Locust" of the colonists, meat chopped very small, slugs, and worms. This bird was captured at Broughton's Pass, Illawarra district. Should we be fortunate enough to keep it alive till the time of the departure of the 'La Hogue,' it will be sent to the Zoological Society under Mr. Broughton's care, when it will have every chance of reaching England alive."

February 14, 1865.—Dr. J. E. Gray, F.R.S., in the Chair.

The Secretary read the following letter, addressed by Dr. H. Burmeister, of Buenos Ayres (Foreign Member), to Dr. J. E. Gray, containing the description of a new species of Whale, proposed to be called *Balænoptera patachonica*, together with some particulars as to specimens of certain other Cetacea in the Museum of Buenos Ayres.

Dr. Gray stated, in reference to the new Whale, that it was of much interest as being the first well-described Fin-Whale from the southern hemisphere. Dr. Gray considered it evidently a typical species of the genus *Physalus*, distinguishable from all the northern species by the shortness of the lateral rings compared with the diameter of the bodies of the cervical vertebræ.

"Buenos Ayres, 22nd December, 1864.

"I now send you drawings of the Whale in the Buenos Ayres Museum, drawn by myself, and, as I believe, exact to nature.

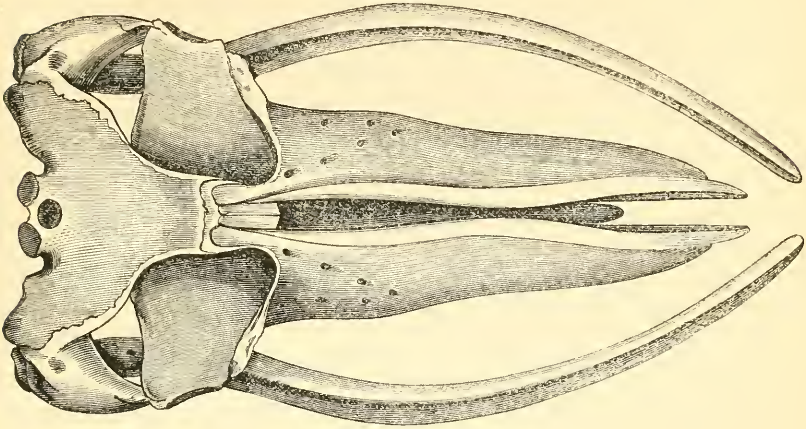
"Fig 1. The skull. We have two specimens—one complete, the other consisting only of the hinder part, without the jaws. In the former the upper jaws are no longer in position, but separated from the cranium, and therefore little importance can be attached to the width of the opening between the intermaxillary bones in the anterior part of the cleft between them; it may be somewhat exaggerated. All the other parts are entirely exact from nature, and well preserved.

"Length of the intermaxillary, 7 feet 2 inches; length of the maxillary, 7 feet; length of the under jaw, 10 feet 2 inches. Breadth of the frontal bones between the orbits, 5 feet; breadth of the vertex behind, 2 feet 8 inches.

"The baleen is entirely black, without any other colour. We have two kinds in the Museum—one $5\frac{1}{2}$ feet and the other 1 foot 8 inches in length. This last only may be from the *Balænoptera*; the other perhaps from a *Balæna*, because it is much more slender and more fringed.

"Comparing my drawing (fig. 1) with that of Cuvier from the Cape *Balænoptera* (Oss. Foss. pl. 26. fig. 2), you will find that the suture between the frontal bone and the parietal is situated much more towards the external part of the frontal bone, being in my skull

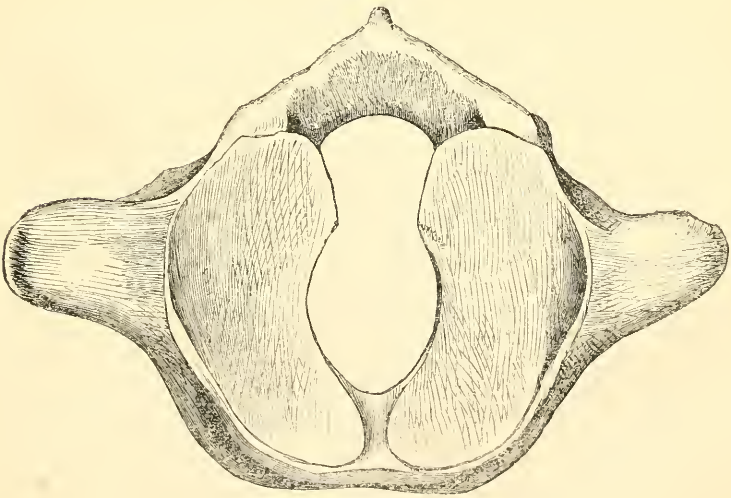
Fig. 1.



Skull seen from above.

exactly in the angle where both bones are united, and therefore not seen from above in my drawing. Another difference of the species

Fig. 2.



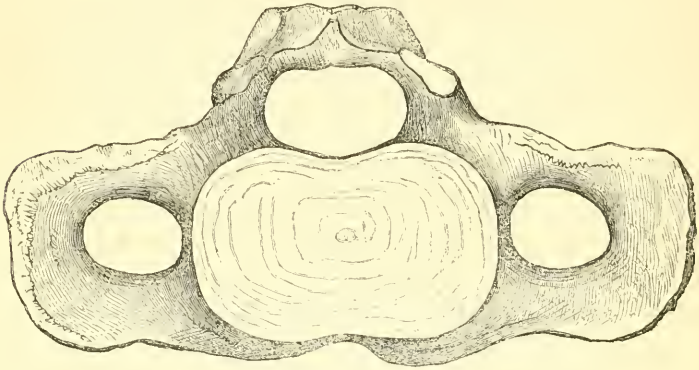
First cervical vertebra

is indicated by the longitudinal carina in the vertex of the Cape species, there being no trace of such carina in either of my specimens.

"Unfortunately the tympanic bones are wanting in both, and I can tell you nothing of them. But the zygomatic bone is preserved, and is of the same form as that figured in Cuvier's work, figs. 1 and 3, but somewhat smaller than the latter figure.

"The seven cervical vertebræ are free, separate from each other, and the body of every one has the epiphyses on each side, the specimen being that of a young individual. But in the atlas and front side of the axis these epiphyses do not exist. I send you drawings of the first (fig. 2), the second (fig. 3), the fourth (fig. 4), and the sixth (fig. 5)

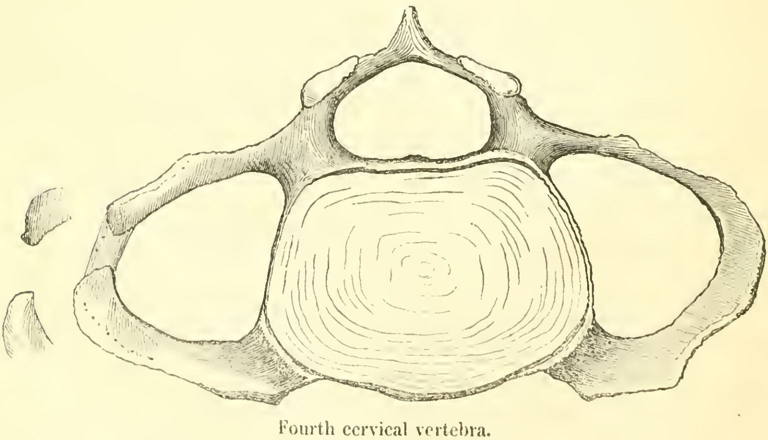
Fig. 3.



Second cervical vertebra.

vertebræ; the third exactly resembles the fourth, and the fifth only differs in a small opening in the lateral arc, indicated in my drawing of the fourth, on the left side. The seventh has no inferior

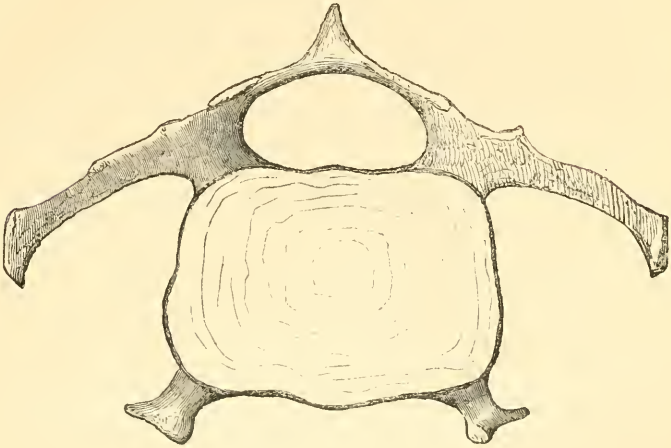
Fig. 4.



Fourth cervical vertebra.

process at all, but a much stronger superior one, of the same form. All the five vertebræ after the second are very thin, 2 inches in

Fig. 5.



Sixth cervical vertebra.

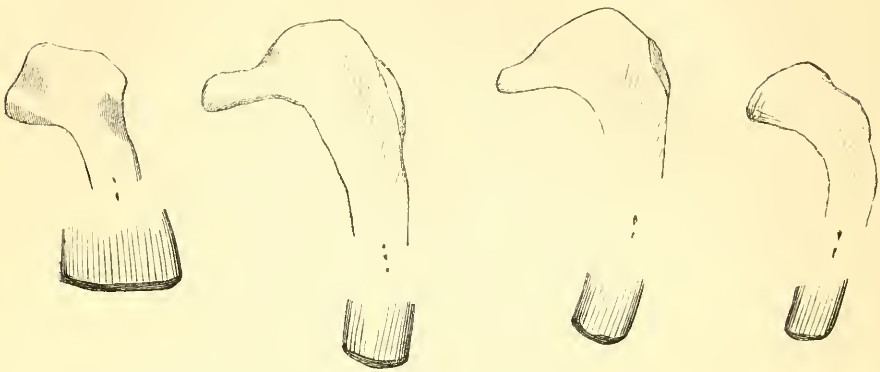
diameter, the third being the thinnest of all, and the following ones somewhat thicker; the seventh is $2\frac{1}{4}$ inches in thickness.

"Of costal or dorsal vertebræ we have fourteen, very well indicated by the flattened end of the transverse processes being united with the ribs. The first of these dorsal vertebræ is very thin, 3 inches in diameter; and the second somewhat thicker, $3\frac{1}{2}$ inches; after these the bodies are much stronger, from 6 to 8 inches in diameter. The three first dorsal vertebræ have transverse processes more rounded, and directed forward. After the third they are more flat and broad, and directed transversely to the sides. After these fourteen vertebræ follow twelve others with thinner transverse processes, rounded and sharp at the end, and with bodies of much larger diameter—from 10 to 12 inches. Then follows a strong vertebra, the thirteenth, 12 inches in diameter, with a smaller and shorter transverse process, which seems to me the first caudal; but as the epiphysis is wanting, there is no attachment for the hæmapophysis on its hinder end. Indeed its body is flattened on the under side, not carinated as the body of the antecedent; which also seems to me to prove that it is the first caudal. Of hæmapophyses we have four in the Museum, of unequal size, the first 5 inches high, the largest 8 inches, and 3 to 4 inches broad between the laminæ.

"The ribs are not perfect as regards number, but the first seven or eight are preserved. I send you drawings of the upper and lower extremities of the first four (figs. 6, 7, 8, 9).

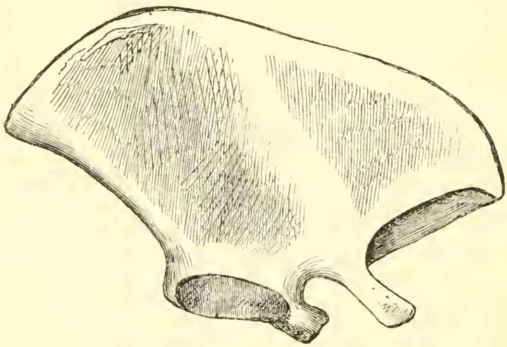
"The sternum is wanting, and of the os hyoideum we have only the corpus, of precisely the same form as that figured in Cuvier's Oss. Foss. pl. 25. f. 14.

Fig. 6. Fig. 7. Fig. 8. Fig. 9.



"Of the pectoral fin we have only the scapula, of which I send you a drawing (fig. 10); both processes are well developed and somewhat compressed.

Fig. 10.



Scapula.

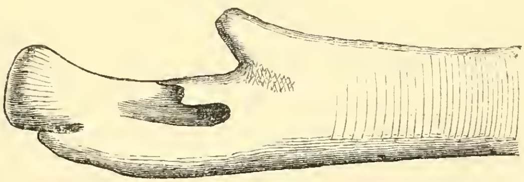
"The animal was found some leagues from Buenos Ayres, on the banks of the River Plata, where it came ashore some thirty years ago. It was brought to the gardens of Rosas, at Palermo, where the skeleton was exhibited a long time, till, after the fall of the tyrant, it was transferred to the Museum. The parts now deficient were then lost.

"I suppose that the species might be the same as that you have indicated in your synopsis as *Balænoptera australis*, Desmoulins (Voy. Ereb. and Terror, Mamm. p. 20); but as I have never seen that animal, I am unable to speak concerning its external appearance. Therefore I believe it is better to describe the species in question under a new name, and I propose to you, if you please to accept it, that of *Balænoptera patachonica.*

"Since I have received the excellent books you sent me, and for which I give you my best thanks, I have found in them figures of the two skulls of Dolphins in the Buenos Ayres Museum. The larger is your *Delphinus Eurynome* (p. 38, pl. 17), and the smaller your *Delphinus microps* (p. 72, pl. 25). Both are inhabitants of the Atlantic in our latitude. The new *Phocæna* is wanting in your list. I propose to give the name *Phocæna spinipinnis* to it, from the numerous spines on the dorsal fin. We have the entire animal, with the skull, which I will examine when it is taken from the dry skin in which it is enclosed. By the next French steamer I will send you an accurate drawing and complete description of it."

"P.S.—I have told you nothing of the under jaw of *Balænoptera patachonica,* because the surface of the bone is much destroyed by long exposure to the air, rain, and sun; but the hinder part, with the coronoid process, is represented in fig. 11."

Fig. 11.



A letter was read, addressed to the Secretary by Prof. J. J. Bianconi, of Bologna, stating that, in the course of researches upon the osteology of the extinct genus *Æpyornis,* he had come to the conclusion that that form belonged to the Vulturidæ, and not to the Struthious birds.

Dr. A. Günther gave an account of the present state of his researches into the British species of Salmonoid fishes, which he had undertaken whilst engaged in preparing the catalogue of the specimens of this family in the collection of the British Museum. Dr. Günther stated that the genus *Salmo* was essentially an arctic group, inhabiting the northern portions of both hemispheres, and becoming more abundant in species upon receding from subtropical into temperate latitudes. Dr. Günther was disposed to believe that the species of this genus to be found within British waters would be ultimately found to be much more numerous than had been hitherto suspected. From the materials at present at his command, he had already been able to distinguish what he believed would turn out to be four new species of the non-migratory group of true *Salmo,* besides identifying several others heretofore imperfectly distinguished.

Dr. Günther requested the assistance of the Fellows of the Society and their friends in furnishing him with series of specimens of our native Salmons and Trouts from every part of the British islands, stating that in this difficult group of fishes no certain conclusions could be arrived at without a large number of specimens for comparison. Dr. Günther exhibited the subjoined table as giving a list of the British species of *Salmo* with which he was acquainted :—

Subgenus I. Charrs (*Salvelini*).

1. *Willughbii* .... Windermere, &c.
2. *Perisii*.............. Llanberris Lakes, N. Wales.
3. *alpinus* .... Scotland.
4. *Grayii*.............. Lough Melvin, Ireland.
   Colii .... Lough Eske and Lough Dan, Ireland.

Subgenus II. Salmons (*Salmones*).

a. *Migratory Species.*

1. *salar* .... True Salmon of British rivers.
2. *cambricus* .... "Sewin" of South Wales.
3. *trutta* .... "Sea Trout" of Scotland.

b. *Non-migratory Species.*

4. *fario* .... England.
5. *Gaimardi* .... Scotland and N. W. England.
6. *nigripinnis*, sp. nov. .. Mountain-lochs of Wales (and Scotland).
7. *levenensis* .... Loch Leven, Scotland.
8. *ferox* .... "Gt. Lake Trout" of Scotland and Wales.
9. *orcadensis*, sp. nov..... Lakes of Orkneys.
10. *brachypoma*, sp. nov. .. Firth of Forth.
11. *stomachicus*, sp. nov. .. Ireland.

Description of Two New Australian Birds. By John Gould, Esq., F.R.S., etc.

1. Malurus leuconotus.

The entire head, neck, under surface, rump, and tail deep blue; back, shoulders, greater and lesser wing-coverts, and secondaries silky white; primaries brown; bill black; feet brownish black.

Total length $5\frac{1}{2}$ inches; bill $\frac{1}{2}$; wing 2; tail $3\frac{7}{8}$; tarsi $\frac{7}{8}$.

Hab. Interior of Australia; precise locality unknown.

Remark.—In size this new species is very similar to *M. Lamberti*, while in its colouring it assimilates to *M. leucopterus*; from both, however, it may be at once distinguished by the whiteness of its back, which has suggested the specific name I have assigned to it.

2. Artamus melanops.

Lores, face, rump, and under tail-coverts black; stripe over the eye, ear-coverts, sides of the face, throat, and under surface delicate vinous grey; two middle tail-feathers black, the remainder black largely tipped with white; upper surface of the wings grey, their under surface white; bill leaden grey, darkest at the tip; feet blackish brown.

Total length $6\frac{3}{4}$ inches; bill $\frac{3}{4}$; wing $4\frac{3}{4}$; tail, 3; tarsi $\frac{3}{4}$.

Hab. Central Australia.

Remark.—This large and fine species is unlike every other known member of the genus. It is most nearly allied to *A. albiventris*, but differs from that bird in the jet-black colouring of its under tail-coverts, and from *A. cinereus* in its smaller size and the greater extent of the black on the face. The specimen from which the above description was taken has been kindly sent to me by Mr. S. White, of the Reed-beds, near Adelaide, South Australia, who informs me that it was shot by him at St. Becket's Pool, lat. 28° 30′, on the 23rd of August, 1863, and who in the note accompanying it says, "I have never seen this bird south. It collects at night, like *A. sordidus*, and utters the same kind of call. It seems to be plentiful all over the north country. I saw it at St. Becket's Pool, feeding on the ground, soaring high in the air, and clinging in bushes, like the others. The two sexes appeared to be very similar in outward appearance. The stomachs of those examined were fleshy, and contained the remains of small Coleoptera.

On some recently discovered Bones of the largest known Species of Dodo (Didus nazarenus, Bartlett). By Alfred Newton, M.A., F.L.S., F.Z.S.

The three bones which I now have the pleasure of exhibiting have been recently received by me from my brother Mr. Edward Newton, a Corresponding Member of this Society, who himself found two of them in a cave on the south-west side of the island of Rodriguez, which he visited on the 2nd of November last. The third was obtained on the same island, about the same time, by Captain Barkly, a son and aide-de-camp of the Governor of Mauritius. All three belong, without doubt, to the largest known species of Dodo, to which Mr. Bartlett (P. Z. S. 1851, p. 284) applied the name *Didus nazarenus*, and which was so unaccountably overlooked by Messrs. Strickland and Melville in their excellent monograph of the curious group *Didinæ*. These authors, as Mr. Bartlett showed (*loc. cit.*), did not distinguish between this very large bird and the smaller and more slender "Solitaire" (*Pezophaps solitaria*), which, if we are to trust the evidence before us, was, equally with *Didus nazarenus* and *D. ineptus*, an inhabitant of Rodriguez.

The two bones found by my brother were picked up near the entrance of a very dry cave, where little, if any, stalagmitic deposit was forming, at least at the time of his visit. One is a perfect left *tarso-metatarsus*, and the other a left *humerus*, wanting its extremities, as is so often the case in specimens of this bone found under circumstances which lead to the belief that the bird to which it belonged had been eaten by men or dogs.

The bone found by Captain Barkly is a right *femur*. Though nearly perfect, it seems to have been much exposed to the action of the weather, and, in consequence of its condition, it has sustained a little damage by the crumbling away of some part of its extremities. This has probably happened since its discovery; but one advantage results from the circumstance—namely, that the cellular structure of the bone is thereby rendered plainly visible.

I proceed to give the dimensions of these specimens, and, for convenience of comparison, I shall, as far as possible, follow Dr. Melville's plan of measurement ('The Dodo and its Kindred,' page 116).

Fragment of left *Humerus.*

	inches.	lines.
Transverse diameter of shaft	0	6
Antero-posterior diameter of shaft	0	$4\frac{2}{3}$

Left *Tarso-metatarsus.*

Length from middle trochlear groove to inter-condyloid tubercle	6	10
——— —— external trochlear to external condyloid fossa	6	4
——— —— internal trochlear to internal condyloid fossa	6	7
Breadth of upper extremity	1	6
Antero-posterior diameter of the same	1	3
Breadth of lower extremity	1	7
Projection of ento-calcaneal process	0	8

Right *Femur.*

Length from inter-condyloid notch to upper surface of neck	6	0
——— —— upper edge of trochanter major to external condyle	6	9
Transverse diameter of shaft	0	10
Antero-posterior	0	$7\frac{1}{2}$
Transverse diameter of upper extremity	2	$0\frac{2}{3}$
Transverse diameter of lower extremity	1	10

All these specimens, unlike those in the Paris Museum, are entirely free from incrustation.

I believe there are no other examples of the *humerus* and *femur* of this species in this country. The specimen of the *tarso-metatarsus* figured in illustration of Mr. Bartlett's paper, to which I before referred (P. Z. S. 1851, Aves, pl. XLV. fig. 1) is, as I learn from Mr. Gerrard, now in the British Museum, and there are other examples of it in the Andersonian Museum at Glasgow.

I must here tender my thanks to Mr. W. K. Parker for the kind assistance he has rendered me in accurately measuring these bones.

And now I wish to make one suggestion. It is well known that at Oxford there is an old picture of a Dodo, painted by one of the Saverys, which seems hitherto to have been referred without hesitation to *Didus ineptus*. Mr. Strickland, in speaking of it, says:— "A remarkable feature in it is its colossal scale, the Dodo standing about 3 feet 6 inches high, and being double the size which the picture in the British Museum, the description of eye-witnesses, and the existing remains warrant us in attributing to the bird. It is difficult to assign a motive to the artist for thus magnifying an object already sufficiently uncouth in appearance" ('The Dodo,' &c. p. 31). Is it not possible that the artist may in this painting have taken a life-sized portrait of the large species (*Didus nazarenus*, Bartlett) to which these bones belong?

In conclusion, I have to state that I should be very glad if these remarks were the means of exciting further search for the remains of the Dodo and its allies. In Rodriguez the bones must be far from scarce, and, as the present instance shows, they may be found with little trouble. My brother picked up two of them, as I have said, in a cave during a very hasty visit. It is a matter of the greatest regret that a regularly organized search is not instituted by some resident in that island, or by some visitor to whom time is no object. We may depend upon it that a rich reward awaits the careful explorer of the Mascarene caverns and alluvial deposits.

Notice of the Skull of a New Species of Bush-Goat (Cephalophus longiceps), sent from the Gaboon by M. Du Chaillu. By Dr. J. E. Gray.

M. Du Chaillu has lately sent to the British Museum several skins and skeletons of the Gorilla (showing how abundant it must be at the Gaboon), the skin and skeleton of a Chimpanzee, three skeletons of the African Manatee, and the head of a Bush-Goat or *Cephalophus*.

The skull of the *Cephalophus* on examination proves quite distinct from any that has previously occurred to me; and as it indicates the existence of a large species of the genus, I have sent a notice of it to the Society in hope that we may before very long have a complete specimen of the animal to describe.

Cephalophus.

Section I. *Horns decumbent.*

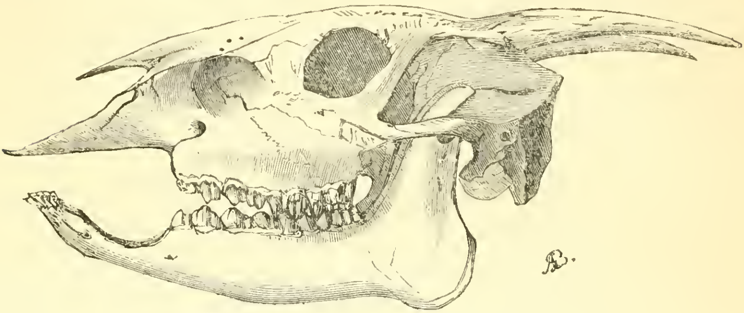
Cephalophus longiceps.

The skull elongate; face elongate, compressed in front of the eyes; the nose in front of the eyes narrow, sides only very slightly tapering; nasal bone very long, produced between the frontal behind, much longer than the medial suture of the frontal. The horns elongate, conical, diverging at the tips, decumbent, in a line with the forehead; forehead convex between the orbits.

Length of skull 10 inches 9 lines; width at zygoma 4 inches 7 lines; length of horn-cores 5 inches; length of lower jaw 9 inches.

The only species with which the animal can be compared, on account of its size, is *C. sylvicultrix*; but the skull of the latter is short and ventricose, and that of *C. longiceps* is elongate and slender. The face of *C. sylvicultrix* is short, and the nose between the impression for the suborbital glands broad and tapering; the forehead is much more convex and rounded. The following are the measurements of the skull of an adult male :—Length of skull 10 inches 1 line ; width at zygoma 4 inches 7 lines ; length of lower jaw 8 inches 9 lines.

The skull of *C. longiceps* resembles in general form and some other particulars the figure of the skull of the male *C. altifrons*, figured by Dr. Peters (Reise n. Mossamb. t. 38. f. 1). But that skull is not above half the size of the one here described ; and the form of the core of the horns is different, the one being conical and elongate, and the other angular and converging at the tip.



Skull of *Cephalophus longiceps.*

The skulls of the larger species of *Cephalophi* may be divided into two groups, according to the position of the horns, as compared with the frontal line.

In some the horns are decumbent and bent back, being nearly in a line with the forehead, as in *Cephalophus coronatus, C. sylvicultrix, C. Ogilbyi, C. natalensis* (figured in Cat. Ungulata, B.M. t. x. f. 1), *C. longiceps*, and *C. altifrons*, Peters. In others the horns are ascending, placed at an obtuse angle with regard to the line of the forehead, as in *Cephalophus Grimmius* and *C. ocularis* of Peters (Reise nach Mossambique, Säugeth. t. 39, 40).

The forehead in all the *Cephalophi* with decumbent horns is convex and rounded ; but in *C. Ogilbyi* it is very much rounded—more than in any other species I know ; it is much higher than the base of the horn. In the species which Dr. Peters has called *C. altifrons* it does not appear to be so high as usual in the genus. In *C. Grimmius,* with ascending horns, it is flat between the eyes. The following observation is founded on the comparison of a series of skulls of males :—The skulls differ in the length of the face, thus :—In *C. natalensis* the face is short ; the distance from the orbit to the upper end of the intermaxillary bone is shorter than the length of the intermaxillary bone. In *C. sylvicultrix, C. Ogilbyi,* and *C. ocularis* the distance above defined and the length of the intermaxillary are nearly equal. In *C. Grimmius* they are rather longer. In *C. longiceps* the distance from the front edge of the orbit to the tip of the intermaxillary is much longer than the length of the intermaxillary.

In some skulls the nasal bones are the same length as the upper suture of the frontal one, as in *C. natalensis*, *C. sylvicultrix*, and *C. Ogilbyi*. In *C. altifrons*, according to Dr. Peters's figure, they are shorter. In *C. coronatus* and *C. rufilatus* they are much shorter—only about two-thirds the length. In one skull of *C. Grimmius* they are longer, and in another skull shorter, and in *C. longiceps* much longer.

The above observations are made only on a few, sometimes only on one specimen of the species; and when I have three or four specimens of the same species, as is the case with *C. Grimmius*, the skulls present some variations in the form of the nasal bones and in the length of the intermaxillaries as above noted.

Dr. Peters figures as the skull of a young female of *C. altifrons* a skull of a very different form from that of the skull with the horns of the male above referred to. I have not observed such a difference in the skulls of the females of any of the species of *Cephalophus* that have occurred to me. I have some doubt if it does belong to the same species, as the figure of the young female animal is very like the skull of a female *C. Grimmius*, which is an animal that has ascending horns in the male.

MISCELLANEOUS.

On the Pollen-grains of Ranunculus arvensis. By George Gulliver, F.R.S.

Finding, on reference to my note-book entries (of no less than five different examinations in the course of four years), that the pollen-grains of *Ranunculus arvensis* always appeared to differ remarkably from those of its British allies, I have recently examined the pollen of these plants again. The difference now to be described appears so constant and remarkable as to deserve a place in the descriptions of this species.

The examinations include all the British yellow-flowered Ranunculeæ with divided leaves, except *R. parviflorus*. This species I have not seen growing. All the others are as common about Edenbridge as elsewhere. Even *R. hirsutus*, which Prof. Babington marks "Waste land and corn-fields, rare," grows abundantly in patches in some of our lanes or by-roads; but happily the very noxious weed *R. arvensis* scarcely intrudes into pastures, though it is a sad pest in some of our stiff arable land, and too well known to our husbandmen under the name of the "hedgehog."

The pollen of each species was repeatedly compared in the same stage of development—a necessary precaution, the neglect of which has too often led to perplexing discrepancies in botanical descriptions. In the following measurements the average sizes only are mentioned, as made from the pollen shaken out of the anthers on to a dry piece of glass, and viewed by transmitted light.

Ranunculus auricomus: pollen-grains round and smooth, and $\frac{1}{800}$th of an inch in diameter.

R. acris: pollen-grains round and smooth, and $\frac{1}{840}$th of an inch in diameter.

R. repens: pollen-grains round and smooth, and $\frac{1}{666}$th of an inch in diameter.

R. bulbosus: pollen-grains round and smooth, and $\frac{1}{727}$th of an inch in diameter.

R. hirsutus: pollen-grains smoothish, with three depressed scars, and $\frac{1}{888}$th of an inch in diameter.

R. arvensis: pollen-grains round, rough, and so much larger than those of the other species as to measure $\frac{1}{470}$th of an inch in diameter. The roughness remains when the pollen-grains are treated either with dilute acids or water.

Hence the roughness and comparatively large size of the pollen-grains of *R. arvensis* are very evident, and this curious difference is certainly constant in our plants. It may be easily seen under a magnifying power of fifty diameters. When much more magnified, some inequalities may appear on the surface of the pollen-grains of the five preceding species. An examination of the pollen of *R. parviflorus* would be interesting.

On the Feathers of Dinornis robustus, *Owen.* By W. S. Dallas, F.L.S., Keeper of York Museum.

The acquisition by the Yorkshire Philosophical Society of a specimen of *Dinornis robustus*, Owen, in so perfect a state of preservation that it retains even portions of the muscular and integumentary systems, enables me to describe at least a part of the structure of the feathery covering of this remarkable bird, and thus to throw some further light upon its affinities among birds with which we are acquainted in the living state. The general condition of the skeleton was described by Mr. Allis in a paper read before the Linnean Society in June last; and Professor Owen has since made use of one or two portions of it for the completion of his description of the species, in a paper communicated to this Society; but the fact of the occurrence of the feathers, however imperfect, of a bird which, as far as our information goes, has long been extinct, seems to call for some special notice.

At first sight, indeed, it would seem that the fresh condition of many parts of this skeleton, and the preservation of traces of the soft parts, might warrant us in supposing that many years have not elapsed since the bird to which it belonged wandered over the hills of Otago; but all possibility of drawing from these circumstances any conclusions as to the period of its death is set aside by the fact that other parts of the skeleton are in a state of decay which would apparently require a free exposure to the weather for many years for its production.

The portion of skin which bears the remains of feathers covered the greater part of the flat, rhombic region of the pelvis immediately above the commencement of the tail, and extended, on the left side, beyond the ridge bounding this part of the pelvis, and for some distance down the slope of its side, where it has beneath it the aponeurotic portion of some of the great muscles of the thigh. The feather-bearing portion forms a sort of broad, irregular, transverse band across this region of the pelvis, encroached upon anteriorly by a wide semicircular notch, and posteriorly, a little to the right of the centre, by an irregular worn space exhibiting numerous perforations, indicating the former positions of feathers which have disappeared. The skin itself is rather thick and coarse. The remains of feathers occur only on that part of the skin which covered the flat back of the pelvis, in which their insertions give rise to strongly marked papillæ. The skin on the sloping left side of the pelvis bears no feathers, and presents no traces of their insertion. It appears, however, to have lost some of its outer layers, and certainly does not furnish evidence sufficient to prove the existence of a featherless space at this part, which would be opposed to Nitzsch's description of the pterylography of the *Struthionidæ*.

The feathers are all very imperfect, consisting only of the basal portions of the shaft and accessory shaft, with here and there some traces of the barbs. The latter occur most abundantly towards the left side, and especially in the feathers situated upon the left ridge, from which the specimen here figured (fig. 1) was taken. The shafts are always evidently imperfect; the longest fragment existing in the skin is only about 2 inches in length. The stem tapers gradually, the quill being the widest part and about $\frac{1}{24}$th of an inch in diameter. The quill is inserted about $\frac{3}{16}$ths of an inch into the skin, and the webs appear generally to have commenced about $\frac{1}{12}$th of an inch from the junction of the quill with the shaft. From these data it is of course impossible to form any opinion as to the original length of the feathers.

The accessory shafts are considerably smaller than the main shafts, but still of sufficient size to constitute an important portion of the plumage. The longest accessory shaft that I have been able to find measures $1\frac{1}{2}$ inch in length, and is imperfect; there is little doubt that the accessory shafts were both shorter and more slender than the true feathers.

The shaft is somewhat convex above, and marked with a fine longitudinal furrow beneath. It is of a brown colour beneath, but pale horn-colour above, probably from exposure to external influences. The accessory shaft is of a pale horn-colour, and appears to be nearly cylindrical.

The structure of the web is somewhat different from that which occurs in the Emu and the Cassowary. Towards the base of the shaft the barbs spring in groups of four or five together from nearly the same spot, and thus this part of the web assumes a tufted aspect. As we advance towards the apex this arrangement speedily ceases; the number of barbs springing from the shaft gradually diminishes, until each side bears only a single series of these appendages. The barbs consist of slender, flattened fibres, bearing long, silky, and very delicate barbules, without any trace of barbicels, but presenting a distinctly beaded appearance when examined by a simple lens. Under the microscope, with a moderate power, this beaded aspect is lost, and the barbule appears merely divided by faint transverse partitions into a series of cells, some of which, towards the apex, exhibit small tooth-like projections representing the rudiments of barbicels (fig. 3). All the barbs remaining on the feathers appear to be imperfect.

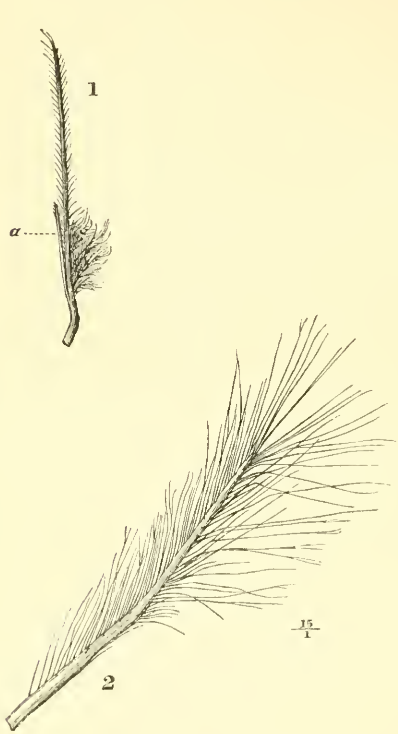


Fig. 1. The basal portion of a feather detached from the skin, of the natural size: *a.* The accessory shaft.
2. Part of a barb with the barbules; magnified 15 diameters.
3. Apical portion of a barbule; magnified 150 diameters.

The barbs of the accessory plume are of the same general structure as those on the main shaft, but they appear to form a single series on each side from the base.

The barbs nearest the base of the feather, both in the main web and the accessory plume, are destitute of barbules for some distance from their base; but this distance gradually decreases until the barb is furnished with barbules throughout its whole length.

It is evidently impossible to determine from these mere fragments of feathers what was the precise structure of those organs when perfect; we cannot even decide whether the basal barbs possessed the hair-like tips characteristic of those of the Emu and Cassowary, and still less whether the apical portion of the feather supported simple barbs such as occupy that position in those birds. The only fact of importance, indeed, that I can hope to make known by this paper is that the *Dinornithes* undoubtedly possessed a large accessory plume, thus adding another proof of their relationship to the green-egged Emus and Cassowaries existing in the Australian region, and of their difference from the white-egged group of Struthiones represented in Africa and South America.—*Proc. Zool. Soc.* March 14, 1865.

On the Metamorphoses undergone by certain Fishes before acquiring the Adult Form. By Professor Agassiz.

I have lately observed in Fishes metamorphoses as considerable as those known to take place in the Amphibia. Now that pisciculture is followed with so much success and on so large a scale, it is surprising that this fact has not been long since observed; but this may perhaps be attributed to the circumstance that these metamorphoses usually commence after the hatching of the young, at a period when they die rapidly, if kept in captivity. At this age, moreover, they are for the most part too small to be conveniently studied in their natural element. Nevertheless this is the most important period of their growth, if we wish to study their natural affinities. I intend shortly to show how certain small Fishes, at first resembling Gadoids or Blennioids, pass gradually to the type of the Labroids and Lophioids. I shall also be able to show how certain embryos resembling the tadpoles of the Frog or Toad, gradually acquire the form of Cyprinodonts,—how certain Apodal Fishes become transformed into Jugular and Abdominal Fishes, and certain Malacopterygians into Acanthopterygians, and, lastly, how we may found a natural classification of Fishes upon the correspondence existing between their embryonic development and the complication of their structure in the adult state.

Quite recently I have discovered that the metamorphoses of certain members of the Scomberoid family are perhaps still more unexpected than any of those which I have previously observed. Every ichthyologist knows the characters of the Dory (*Zeus faber*), and the peculiarities which connect this fish with the family of the Scomberoids. Another less-known but very curious fish, *Argyropelecus hemigymnus* (Cocco), which likewise inhabits the Mediterranean, has been generally referred to the Salmon family, or placed with the Salmons as a subfamily. Systematic authors have generally regarded the Scomberoids and the Salmons as very different fishes, the former being referred to the Acanthopterygii and the latter to the Malacopterygii. Nevertheless *Argyropelecus hemigymnus* is neither more nor less than the young state of *Zeus faber*.

I expect that all ichthyologists will reject this assertion as erroneous. Nevertheless nothing can be more true; and therefore, instead of seeking to prove it by long arguments, I shall, for the present, merely request my *confrères* to procure small specimens of the Dory (of 8 to 10 centimètres in length), and to compare them with authentic specimens of *Argyropelecus*, feeling certain that they will admit the identity of the two fishes as soon as they have made the comparison.—*Comptes Rendus*, January 23, 1865, p. 152.

Description of the Egg of Parra gallinacea.
By John Gould, F.R.S. &c.

The ground-colour of the egg of this species is of a dark shining raw-sienna tint, over which are traced in various directions a series of broad and fine hair-like contorted lines of brownish black, which, by occasionally uniting laterally and crossing each other, form here and there large blotches. Although these markings are of the same character on each egg, they are somewhat differently distributed: thus, on one of the two I possess, they are more numerous at the larger end, and absent at the smaller; while on the other they are more abundant at the smaller, and less so at the larger extremity. The eggs are one inch and an eighth in length by seven eighths of an inch in breadth. They are, moreover, rendered remarkably conspicuous by the singularly pointed form of the smaller end, and by their small size as compared with that of the bird, but above all by the form and disposition of the markings, which are as if traced by the hand of a person who had amused himself by attempting to cover the surface with fantastic streaks, blotches, and contorted curves from end to end.—*Proc. Zool. Soc.* Dec. 13, 1864.

On a new Form of Brachiolaria. By M. Sars.

M. Sars has discovered a new Echinodermatous larva belonging to the Brachiolarian type. It presents a greater affinity to the *Bipinnariæ* than those observed by Johannes Müller. Its development is also very similar to that of the *Bipinnariæ*,—the Starfish in course of formation presenting the same relations of position and union with the body of the larva. There are, however, some differences. In the *Bipinnariæ* the rudiment of the ambulacral system makes its appearance very early, in the form of a rosette of five cæca; in the *Brachiolariæ*, on the contrary, these cæca are not brought together in a group, but distant from each other, and their circle is open on one side. This condition persists until after the formation of the perisoma, with its five arms and their spines.

The *Brachiolariæ* are really distinguished from the *Bipinnariæ* only by the presence of their contractile arms at the anterior extremity. M. Sars has ascertained that these organs, whose function has hitherto been doubtful, act as an apparatus of attachment. They may be compared with the very similar organs of attachment of the larvæ of *Echinaster sanguinolentus* and *Asteracanthion Mülleri*. Thus these various types of larvæ, so different in appearance, are united in an unexpected manner.—*Videnskabsselskabets Forhandlingar*, 1863; *Abstract in Bibl. Univ.*, May 1865, *Bull. Sci.*, p. 62.

Investigation of the Structure of the Encephalon of Fishes, and of the Homological Signification of its different Parts. By M. Hollard.

The type of the encephalon in Fishes is inferior to that prevailing in Mammalia, not only in its general development, but also in the absence of several organs. This type is not only inferior, but it is also special, and susceptible of numerous modifications. The peculiarities presented by it have given rise to very various interpretations, often founded on deceptive analogies of form, and most of them incapable of demonstration. With the exception of some determinations which are evident at the first glance, most of them are still in the condition of simple hypotheses, or mere probabilities, or are completely erroneous. In order to arrive at results such as science can accept, we must (1) commence by referring the different parts of the encephalon of Fishes to the divisions which embryogeny furnishes for this brain as for those of other Vertebrata, and (2) ascertain with precision the organs composing each of these divisions, and distinguish among these organs those which are fundamental and those which belong to the development of higher types.

By proceeding in this manner, tracing the series of three encephalic regions which correspond successively to the three primitive cerebral vesicles of vertebrate animals (the epencephalic, mesencephalic, and prosencephalic), and ascertaining that the epencephalon is divided into two subregions, namely, that of the postcerebrum or *calamus* and that of the cerebellum, and that the prosencephalon is also divided, forming an anterior and an intermediate cerebrum, the author found no difficulty in determining, at first in a general way, but afterwards in detail, the cerebral organs which are developed in each of these regions in Fishes.

For the postcerebrum, or region of the *calamus*, we have here two pairs of small grey masses, superposed upon the roots of the fifth, eighth, and ninth pairs of encephalic nerves. These little lobules, commonly known as the posterior lobes or *lobi vagi*, correspond to the streaks of grey matter which border the fourth ventricle in the higher Vertebrata, and especially the posterior pyramids, forming what are called the valves of Tarin.

The posterior brain, which usually forms a large single lobe supported by two lateral peduncles and emitting two anterior processes, is a well-characterized cerebellum; and by contrasting with that of the Batrachia and Reptiles, but more or less resembling that of Birds, it constitutes one of the features of the cerebral type of Fishes.

The mesencephalon is concealed beneath the posterior part of the prosencephalon. It is composed of tuberculiform masses seated on a floor which covers a true aqueduct of Sylvius: it is here that the processes of the cerebellum terminate; and we may easily recognize the *tubercula geminata* in the hollow grey masses which cover this small ventricular region.

The greatest difficulty of determination is presented by the prosencephalon, and especially by the posterior subregion or intermediate cerebrum. This region, more complex than the others in all Vertebrata, presents peculiar arrangements in Fishes; and to decipher it we must recall the constitution of the intermediate cerebrum in the higher Vertebrata. It is at once the peduncular region, the region of the third ventricle, of the cerebral nucleus—or at least of the fundamental portion of that nucleus, which is composed of the peduncular fasciculi, the optic lobes, and the striated bodies.

In Fishes we readily detect this peduncular region, composed inferiorly of two large pyramidal fasciculi, superiorly of the continuation of the other fasciculi of the medulla. Two pairs of lobes, one inferior, one superior, are attached to it. The superior lobe is composed of a semicircular nucleus, from which originate two superposed layers, the fibres of which cross, and which give to the lobe a great superficial development. The outer layer is the principal root of the optic nerve. These can only be regarded as the optic lobes.

The inferior lobes are more problematical. The inferior pyramidal cords are divided between these and the preceding lobes; this was already known. But the other medullary fibres, after traversing the optic lobes, also penetrate the inferior lobes, instead of passing directly, as has been supposed, to the anterior cerebrum. Another newly ascertained fact is, that it is from the inferior lobes that the medullary fasciculus originates which spreads in the anterior lobes of the cerebrum in Fishes; so that the true serial position of the inferior lobes is that of a continuation of the optic lobes, and preceding the hemispheres. This position is occupied in the higher animals by the *corpora striata*, with which the inferior lobes of Fishes may therefore be identified.—*Comptes Rendus*, April 17, 1865, p. 768.

Description of a new Species of Rock-Kangaroo (Pterogale longicauda) *from New South Wales.* By Gerard Krefft.

Hair remarkably soft and long (3 inches in length upon the back and sides), dark grey at the base, tipped with pale yellow and black, giving the fur a mottled appearance. Head and neck grey, a lighter patch extending from the base of the ears to the nostrils. Ears grey at the base, black at the tip; sides slightly fringed with yellow. Shoulders and fore legs dark grey, grizzled with white, which colour extends to about the middle of the body. The hair of the back and haunches is of much longer growth, silky to the touch, of a mottled brownish-grey colour, and changing into rusty yellow near the base of the tail. The tail at its root is sandy-coloured, but soon changes into dark brown, the hair being very coarse and long, forming into a broad brush at the end.

	Inches.
Length from tip of nose to root of tail	$29\frac{1}{4}$
Tail	27
Face to base of ear	$4\frac{1}{4}$
Arms and hands	6
Tarsi and toes	7
Ear	$2\frac{1}{4}$

Petrogale longicauda is easily distinguished from all other species by its remarkably long and bushy tail, which is about a foot longer than that of any other Rock-Wallaby. A single specimen of this interesting animal has been procured by Mr. George Masters, Assistant Curator of the Australian Museum, at Dabee Rylstone, 250 miles N.W. of Sydney. Mr. Masters informs me that this Wallaby is very quick and difficult to approach, and that, after watching for two nights, only one specimen could be secured. The skull was completely broken, so that no description could be given of it.—*Proc. Zool. Soc.* March 28, 1865.

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VIII.—*On the Homology of the Buccal Parts of the Mollusca.* By Dr. OTTO A. L. MÖRCH, of Copenhagen.

[Plate VI.]

THE oral organs have, throughout the animal kingdom, furnished some of the most important systematic characters. Linnæus first based the system of Mammalia, and Fabricius that of Insects, upon the structure of these parts. It was, however, not until 1847 that Prof. Lovén* placed the natural classification of the Mollusca on a scientific base, chiefly founding it on the dentition of the tongue (radula). Another part of the oral organs, the mandibles, has been much neglected. Most authors understand by this name all hard bodies near the entrance of the mouth. I believe it is necessary to distinguish two (or perhaps three) different kinds of oral plates corresponding to the mandibles and maxillæ of the Arthropoda. The maxilla is a median, unequal-sized, corneous plate attached to the bulbus pharyngeus over the oral aperture, and serving to divide the food into morsels. It is found in all Land Pulmonata (Phyllovora, Gray). According to its structure, I have distinguished the following groups:—*Oxygnatha*, with a smooth maxilla; *Aulacognatha*, with a closely sulcated maxilla, crenulated at the edge; *Odontognatha*, with a strongly ribbed maxilla, forming projecting teeth on the edge; *Goniognatha*, with the maxilla composed of oblique plates (genus *Orthalicus*)†. Among the Land Pulmonata, the maxillæ are wanting in the *Agnatha* (Vermivora, Gray), which swallow their prey entire and alive (genera *Onchis, Testacella, Helicophanta, Caffra, Daudebardia, Streptaxis, Urocoptis, Glandina*). Among the marine Mollusca, it is only found in *Ægirus* and, perhaps, *Siphonodentalium*.

* Öfversigt af Kgl. Vetenskaps Akademiens Förhandlingar, 1847.

† Mörch, Malacozoologische Blätter, 1859.

The maxilla of the aquatic Pulmonata is provided with a lateral, linear, moveable appendage on each side, the real homology of which is not yet quite ascertained, nor even whether it is a part of the maxilla or independent of it.

The maxilla is divided into two* in the case of the young *Limax* before it leaves the egg. The two halves are afterwards united by an intermediate piece, which, in a more advanced period of growth, is indicated by a notch in the projecting middle tooth. I do not believe this circumstance shows that the maxilla is formed by a union of the lateral mandibles.

A superior and inferior maxillæ are only found in the Cephalopoda, and perhaps in the larval state of some Pectinibranchiata; but it is not placed beyond doubt that the beak of the Cephalopod is really homologous with the maxilla in the Pulmonata. The maxilla of *Succinea* is not unlike the upper maxilla in the Cephalopoda. Prof. Van Beneden's figure of the "mâchoire supérieure et inférieure" of *Amphipeplea glutinosa* (Exercices Zootomiques, f. 6–9) looks very like the beak of a Cephalopod; but it may be erroneous, because the radula is represented (f. 7) as forming a part of the lower maxilla. A similar mistake was committed by Moquin-Tandon, who represented in *Neritina* as superior and inferior maxillæ what, according to Claparède, are only the edges of a corneous membrane lining the oral cavity.

Messrs. Alder and Hancock have shown, in *Acanthodoris pilosa*, a solitary inferior maxilla represented by a flat plate with a split in front protruding from the mouth; but this part seems to me more likely to belong to the lingual cartilages.

Perhaps the "anterior or lower lip, armed with teeth," represented by Macdonald† in *Clio caudata* is the edge of an inferior maxilla.

The *mandibulæ* are two lateral concave plates, not unlike a bivalve shell‡, the free edge of which (masticatory edge § of Bergh) is either tuberculated or denticulated. From the position of the muscles and from the form of the pectinated edge in *Phyllodesmium*, Ehrb. (Bergh, 'Anatomie'), it appears that the mandibles cannot be used for mastication, but are only adapted for use as a pair of forceps to hold the food during the triturating action of the radula. By the umbones of the mandibles (umbilicus, Midd., Bergh) the two halves are united with muscular ligaments. This kind of lateral mandibles is found in the Pleurognatha Gymnobranchiata (*Æolidiæ, Diphyllidiæ*, &c). In

* Heynemann, Malacozoologische Blätter, 1861, p. 143. The same is the case with *Vitrina* in its young state.

† Trans. Royal Soc. Edinb. vol. xxiii. pt. 2. p. 188, t. 9. f. 3.

‡ Described as such by Brown in *Binghamia paradoxa*.

§ Cutting edge (Alder and Hancock).

Proctonotus mucroniferus Alder and Hancock have discovered a "corneous transverse arch or strap" uniting the two halves, and reminding us of the middle maxilla in the Pulmonata. The nature of the mandibles described by Troschel (Gebiss der Schnecken, t. iii. f. 18) in *Pneumodermon* is, in my opinion, very doubtful.

The *cheek-plates**, or immoveable mandibles, are two lateral plates, without cutting edges, composed of scaly or acicular † particles, which seem only of use to protect the inside of the mouth from injury by the spinous tongue. Sometimes the two plates are united above by a ligament. This kind of mandible is found in nearly all the *Tænioglossata,* as well in those provided with a *rostrum* (*Cyclostomus, Valvata, Rissoa, Jeffreysia, Crepidula, Vermetus, Trichotropis,* &c.) as in those with an *haustellum* (*Marsenia, Natica, Cypræa, Cassis, Triton, Strombus,* &c.): *vide* Troschel, Gebiss der Schnecken. These plates are apparently wanting in all the *Rhachiglossata* (*Murex, Fusus, Nassa,* &c.). The linear horny plates described in *Buccinum undatum* by Cuvier (Anat. des Mollusq. figs. 11, 12) and by Valenciennes (Archives du Muséum, t. v. p. , t. 25. f. 6) are probably appendages of the tongue, and used as a handle in perforating the shells on which they prey.

The *prehensile collar* (Hancock) is a circular band composed of conical, often forked, erectile spines. Sometimes it is entire, as in *Ancula cristata* and *Goniodoris nodosa*; in others it is divided into two lateral parts, not unlike cheek-shields, as in *Idalia pulchella* and *Acanthodoris pilosa.*

Evertile cheek-cushions ("lames latérales," Lacaze-Duthiers ‡), two large evertile lateral sacs, covered with close-set lanceolate plates, like pavement, in *Pleurobranchus.* They seem to be an intermediate form between the prehensile collar and the evertile arms of the Gymnosomata and Cephalopoda.

Cheek-hooks or *cheek-crooks* (harpagæ §); mandibles, Eschricht, in *Clione*; "les cæcums de la bouche, avec un tube corné dans l'intérieur" (Van Beneden ||); "evertile tubes serving as prehensile organs" (Troschel ¶) (this author has not detected these organs in *Clione* and *Pneumodermon*); "lateral or cheek-pouches" (Macdonald**. Eschricht †† first showed that these tentacle-

* "Mandible-like parts, indumentum epitheliæ, the horn sheaths of the inner lip" (Bergh).

† In Thecosomata (*Hyalæa,* &c.) they are composed of four or five band-like plates (*vide* Troschel, Gebiss).

‡ Ann. des Sc. nat. sér. 4. vol. xi. t. 7. f. 4.

§ I intentionally use this form of the word.

|| Exercices zootomiques.

¶ Gebiss d. Schn.

** *Loc. cit.* and Linn. Trans. xxii. 1858, p. 248.

†† Anatomiske Undersögelser over *Clione borealis,* 1838.

like organs, which are always provided with corneous hooks, are evertile; but this has been established by Eydoux and Souleyet* in the genera *Pneumodermon* and *Clione*.

The long arms of the decapod Cephalopods seem to me without doubt the same organs as the cheek-hooks of Gymnosomata; they have the same latero-ventral position, and are retractile within a cavity or pouch inside the short arms, which may be considered as a single fissured veil, and perform the same function in the animal. Prof. Lovén considered the long arms of Decapoda homologous with the tentacula (vibracula) of the Gasteropoda, and compared them specially with the rhinophores of *Doris*. I do not believe that this homology is natural, because the tentacula are always *dorsal*, and the "long arms" of Cephalopoda always *latero-ventral*. It seems also very doubtful whether an organ of prehension can be homologous with an organ of smell. If the Cephalopoda have no tentacula at all, the "crêtes auriculaires" (D'Orb.) or "paupières inférieures" (D'Orb.) of the Myopsid Decapods may be considered as their homologue. The triangular filaments over the eyes of *Octopi* are perhaps, too, a form of tentacula. I believe they are provided with a nervous ganglion at their base, like those of *Doris*.

The "organe en pioche," in *Conus*, of Quoy and Gaimard is a tubular sac, provided with arrow-like corneous hooks with a hollow channel, which are considered venomous. I have had an opportunity of confirming the exactness of the anatomy represented in the 'Voyage de l'Astrolabe.' As these hooks are not situated in the true oral tube, it is still very doubtful whether they really can be considered to belong to the radula. I suppose these arrow-like hooks are more allied to the cheek-hooks of Gymnosomata. As the hooks turn their points in opposite directions in the two arms of the pouch, it is probable they are evertile each in a different direction, but how and through what aperture is not yet discovered.

On the Palpi and Lips.

There are often in the Gasteropoda two different apertures in the same animal, called mouths. The true mouth is the anterior opening of the bulbus pharyngeus, frequently prolonged into an haustellum. This opening is only provided with the hard plates described above. The outer or false mouth is a simple slit in the skin, containing the lips or palpi, but never any mandibles; and it forms a passage for the protrusile haustellum, which, in a retracted state, is concealed in a cavity behind this slit.

In the Acephala the palpi are represented by two pairs of

* Voyage de la Bonite; Mrs. Gray's figures of Moll. t. 255. f. 3.

foliaceous expansions, grooved (sulcated) inside, and destined to conduct the particles of food to the mouth, and they may thus be considered passive prehensile organs.

In the Calyptræidæ the same organ is composed of a single pair, which is represented in all drawings of these mollusks as two intertentacular tubercles. In reality these tubercles are flat inside, grooved as in the Acephala, and probably used as a pair of forceps, as appears from their relative position in different specimens. In *Capulus* the palpi form a long haustellum-like tube, with a narrow slit on the upper side. In *Dentalium* and *Siphonodentalium* they form a closed, flat tube.

In the *Doridæ* the palpi are situated near the outer oral aperture, and are sometimes of a linear form, with a longitudinal groove on the middle, sometimes foliaceous (*Hexabranchus*) or meeting together in a semicircle (*Lamellidoris*), or they become the oral veil.

In *Conus, Terebra,* and perhaps *Pleurotoma* this veil is developed into a large infundibuliform sucking-cup, which disappears when the haustellum is protruded. This veil was for a long time regarded as the proboscis, until Dr. Gray* showed its real nature. In *Conus tulipa* and *C. striatus* the edge is divided into many digitations. (Voyage de l'Astrolabe; Mrs. Gray's figures, i. t. 10. f. 6, and 12. f. 2.)

In the gymnosome Pteropoda the oral veil is divided into several conical "arms," provided with numerous suckers, and probably corresponding to the grooves in the labial palpi of Acephala and Calyptræidæ.

In the Cephalopoda these "arms" are still more developed, and united by a membrane, which sometimes extends to the tips (*Cirroteuthis,* Eschricht).

Under the name "velum," as employed by Lovén, very different organs are confounded. I believe three kinds may be distinguished:—

1. The *oral veil,* formed by the palpi or lips, an organ for prehension or locomotion (Cephalopoda, larva of Opisthobranchia, e. g. *Doris*), or even partly available as a male organ (hectocotyl of the Cephalopoda), as in the Spiders. The "membrane orale" of D'Orbigny, found in the decapod Cephalopoda, seems to me a kind of suspensorium, like the "brids" of the funnel.

2. The *tentacular veil,* situated further from the mouth. It is placed, in *Pleurobranchus,* above the mouth, and formed by the union of the anterior tentacula (vibracula in *Aplysia*). In

* "On the Head of the genus *Conus*," Ann. Nat. Hist. Aug. 1853, p. 176.

Clione its two halves can cover the arms entirely, like a hood (see Eschricht's 'Anatomie'), and resemble the "crêtes auriculaires" and "paupières inférieures" of D'Orbigny, above mentioned.

3. The *post-tentacular veil* is only found in the larval state of *Rissoa*, Lovén (Öfversigt, 1847), and in the genera *Chiropteron* of Sars* and *Macgillivrayia* of Macdonald.

In analogy with the names of the foot given by Prof. Huxley, these three kinds of velum may be called Prohistion, Mesohistion, and Metahistion.

That the short arms of Cephalopoda cannot be considered the homologue of the foot, is evident from the circumstance that the same kind of arms is found in the Pteropoda Gymnosomata simultaneously with an undoubted foot. Prof. Lovén first showed that the *funnel* must be the foot of Gasteropoda, and he suggests that the interior *valvula* of most Decapods and of *Nautilus*† corresponds to the solea pedis of Gasteropoda—a proposition which, I believe, is correct. The funnel would thus correspond to the epipodium in the Gymnosomata; its dorsal wings, attached to the neck of nearly all Decapod Cephalopoda, are provided with three cartilages which may be compared to a tripartite operculum‡, thus proving that the lobus operculigerus of Lovén§ is a part of the epipodial line (Huxley), and not of the true foot (solea).

Pedipes afra, as represented by Adanson (Hist. Nat. du Sénégal, tab. 1) and by Lowe (Zool. Journ. vol. v. pl. 13. f. 8, 9), is the only example of a foot divided into the *propodium*, *mesopodium*, and *metapodium* of Prof. Huxley.

EXPLANATION OF PLATE VI.

Fig. 1. *Pneumodermon*: intestinal channel, with the labial suckers, salivary glands, stomach, rectum, and anus. The cheek-pouches are united at their ends by a muscular band.

Fig. 1*b*. The œsophagus opened, to show the entrance of the cheek-pouches, with the prehensile hooks in the centre, on both sides of the radula.

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* *Chiropteron semilunare*, Sars (Beskrivelser og Jagttagelser 1835, t. 14. f. 38), is probably the larva of *Aporrhais*.

† R. Owen, 'On the Pearly Nautilus,' t. 3. f. 2 *e*.

‡ The middle cartilage is articulated to the inside of the front of the shield or dorsal plate, and the two lateral cartilages to similarly excavated plates in the inner margins of the mantle.

§ The *dorsal part* of the metapodium (Huxley, "On the Morphology of Cephalous Mollusca," Phil. Trans. 1853, p. 29).

Fig. 1*c*. *Pneumodermon,* with everted prehensile hooks (harpagæ). (Figs. 1, 1 *b*, and 1 *c* from 'Voyage de la Bonite.')

Fig. 1 *d*. One of the sacs opened, to show the evertile hooks, with some detached corneous spines. (From Van Beneden's 'Exercices zootomiques.')

Fig. 2. *Clione limacina,* Phips.: the anterior part of the œsophagus. The harpaga of the right cheek-pouch is everted; the left retracted, and seen through an opening.

Fig. 2 *a*. The harpaga, with from 24 to 32 corneous hooks. From Eschricht's 'Undersögelsé om *Clione borealis*.'

Fig. 3. *Onychoteuthis,* from the ventral side, with protruded arms. It is doubtful whether the metacarpal suckers are really destined to act against each other, as represented by Férussac and D'Orbigny.

Fig. 4. *Conus tulipa*: the oral veil expanded at the edge, and opened to show the haustellum.

Fig. 4 *a*. The oral veil in a contracted state.

Fig. 4 *b*. The intestinal channel and its glands, the two liver-lobes, and an intermediate small so-called "gland," perhaps the true stomach. Over the nervous ring is the "organe en pioche," attached to the œsophagus by muscular bands; but I have not been able, in a specimen of *C. consors,* to discover any communication with the interior of the œsophagus. It cannot, therefore, represent the papillæ of the tongue, which in *Littorina* and *Patella* are of enormous length. At the insertion of the "organe en pioche," close to the base, is the long vermiform canal of the single "glande salivaire cucumiforme." The walls of this cylindrical organ are enormously thick and muscular; and it therefore seems to me not to be a salivary gland, but a suctorial stomach, like that of most haustellate insects. A similar unequal sac, in the same position, is found in the following Mollusca, all of which are provided with an haustellum:—

Murex cichoreus, Voyage de l'Astrolabe, t. 36. f. 1, et Suppl. t. 2. f. 1 *d*, troisième glande salivaire.

Dolium olearium, ibid. t. 41. f. 4.

Voluta fusus, Q. & G. ibid. t. 44. f. 9 *h*, "diverticulum ou cæcum œsophagien très-considérable;" and f. 10 and 11.

Ancillaria albisulcata, ibid. t. 49. f. 11 *d*, "diverticulum, espèce de cæcum."

The petiolate cheek-pouch in *Lamellidoris,* described by Mr. Hancock, is perhaps, too, a kind of instrument destined to produce a vacuum, like the suckers of Cephalopoda.

Fig. 4 *c*. The "organe en pioche" opened, to show the arrows turning the points in a different direction in each branch.

Fig. 4 *d*. Different forms of the arrows, hollow inside.

(Figs. 4–4 *d* from 'Voyage de l'Astrolabe,' t. 44.)

Fig. 5. Pharynx of *Pleurobranchus,* showing the "lames latérales" on both sides of the tongue. *a*. The hard parts of the "lames latérales," strongly magnified. (From Lacaze-Duthier's 'Anatomie du Pleurobranche orange,' *l. c.*)

IX.—*Descriptions of recently discovered Spiders collected in the Cape de Verde Islands by* John Gray, Esq. By John Blackwall, F.L.S.

Tribe Octonoculina.

Family Lycosidæ.

Genus Lycosa, Latr.

Lycosa helva.

Length of the female $\frac{3}{4}$ths of an inch; length of the cephalothorax $\frac{13}{48}$, breadth $\frac{3}{16}$; breadth of the abdomen $\frac{1}{4}$; length of a posterior leg $\frac{5}{6}$; length of a leg of the third pair $\frac{7}{12}$.

The eyes, which are unequal in size, are disposed in front and on the sides of the anterior part of the cephalothorax; four, much smaller than the rest, form a transverse row immediately above the frontal margin, the two lateral ones being rather smaller than the intermediate ones of the same row; the other four describe a trapezoid, the two anterior eyes, which are the largest of the eight, forming its shortest side. The cephalothorax is long, convex, clothed with short adpressed hairs, compressed before, rounded in front and on the sides, which are marked with furrows converging towards a narrow, dark-brown indentation in the medial line of the posterior region; it is of a dull yellow colour, with a broad brown band, mingled with yellow, extending along each side, a short brown line directed backwards from each eye of the posterior pair, and a small dark brown streak on each angle of the frontal margin. The falces are powerful, conical, vertical, convex in front, and armed with teeth on the inner surface; and the lip is somewhat quadrate, being rather broader at the base than at the apex. These organs have a very dark-brown hue, the lip being the paler. The maxillæ are straight and enlarged and rounded at the extremity; the sternum is oval, glossy, and thinly clothed with whitish hairs. The legs are robust, provided with hairs and sessile spines, and the metatarsi and tarsi have hair-like papillæ distributed on their inferior surface; the fourth pair is the longest, then the first, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is merely rudimentary; the palpi have a curved, pectinated claw at their extremity. These parts are of a dull yellow colour. The abdomen is oviform, convex above, and projects over the base of the cephalothorax; it is clothed with short hairs, and is of a pale yellow-red colour; at the anterior extremity of the upper part there is a brown angular mark, having its vertex directed downwards; and an obscure band of the same hue, which has a projecting point on each side, near its middle, and whose posterior extremity is bifid, extends from within the anterior angle along the middle; between the termination of this band and the spinners there are several faint, brown, angular lines, whose vertices are directed forwards, and numerous minute spots of a similar colour occur on the sides, the extremity of the spinners being of a darker brown; the sexual organs are minute, and have a red-brown hue.

Captured in the Island of St. Antonio.

Genus Hersilia, Savigny.

Hersilia versicolor.

Length of the female (not including the spinners) $\frac{3}{16}$ths of an inch; length of the cephalothorax $\frac{1}{12}$, breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{10}$; length of a leg of the second pair $\frac{7}{16}$; length of a leg of the third pair $\frac{1}{4}$.

The cephalothorax is short, broad, slightly compressed and elevated before, rounded in front and on the sides, moderately convex, and has an indentation in the medial line; it is of a dull brownish-yellow colour, with a brownish-black angular mark in the middle of its posterior half, whose vertex is directed forwards, and some large spots of the same hue on the lateral margins. The falces are conical, somewhat inclined towards the sternum, provided with long hairs, and are of a dark-brown colour, the extremity having a red-brown hue. The maxillæ are short, powerful, strongly inclined towards the lip, and obliquely truncated at the extremity, which is pointed on the inner side; the lip is somewhat quadrate, being broader at the base than at the extremity; the sternum is broad and reniform. These parts have a dull yellowish-white hue. The legs are long, provided with hairs, and of a dark-brown hue, with narrow whitish annuli; the second pair is longer than the first, and the third pair is the shortest; the fourth pair was mutilated, but the femora were entire, and exactly corresponded in length with those of the second pair; the slender metatarsi and tarsi have each only one joint, the latter being terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The palpi, which are long and resemble the legs in colour, have a curved, pectinated claw at their extremity. The eyes are disposed on the anterior part of the cephalothorax in two transverse curved rows, having their convexity directed forwards; they are situated high above the frontal margin, the lateral eyes of the anterior row being very much the smallest, and the two intermediate ones of the same row, which are rather wider apart than those of the posterior row, much the largest of the eight. The abdomen is rather broader in the middle than at the extremities, convex above, and projects over the base of the cephalothorax; on the upper part and sides it is densely clothed with coarse, adpressed, reddish, yellowish, and whitish hairs intermixed, and has black and white bristles, more or less erect, distributed over the surface of those parts; a brownish-black band extends from the anterior extremity of the upper part to its middle; this band, which is enlarged about its middle, is bifid at its extremity, and from each diverging branch a row of spots of the same hue passes to the spinners; the sides are marked with oblique brownish-black streaks, and the under part, which is downy, has a very pale dull yellowish hue; the sexual organs are highly developed, prominent, and of a red-brown colour; the superior spinners are long, triarticulate, and have the spinning-tubes disposed on the inferior surface of the elongated terminal joint, which tapers to a point; this joint has a brownish-black hue on the upper and exterior surfaces of its base, the colour of the other parts of these spinners and of the intermediate and inferior pairs being pale dull yellow.

Captured in the Island of St. Jago.

Family Salticidæ.

Genus Salticus, Latr.

Salticus simplex.

Length of the male $\frac{3}{16}$ths of an inch; length of the cephalothorax $\frac{1}{10}$, breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{16}$; length of a posterior leg $\frac{3}{16}$; length of a leg of the second pair $\frac{1}{7}$.

The legs are robust, especially those of the anterior pair, and are provided with hairs and a few spines; the fourth pair is rather the longest, then the third, and the second pair is the shortest; they are of a reddish-brown colour, the femora being the darkest, and the tarsi much the palest; each tarsus is terminated by two curved claws, below which there is a small scopula. The palpi are short, and have a dark-brown hue; the radial joint projects a pointed apophysis from its extremity, on the outer side; the digital joint is oval, convex, and hairy externally, compact at the extremity, concave underneath, at the base, comprising the palpal organs, which are well developed, not very complex in structure, and of a red-brown colour. The minute intermediate eye of each lateral row is nearer to the anterior than to the posterior eye of the same row. The cephalothorax is somewhat quadrilateral, sloping abruptly at the base, and very gradually to the front, which projects a little beyond the base of the falces; it is of a dark-brown colour, and is clothed with reddish-brown hairs; a broad patch of yellowish-white or pale yellow hairs is situated below the lateral eyes; a spot immediately behind each posterior eye, and a short streak on the upper part of the posterior slope, are composed of yellowish-white hairs; and a narrow longitudinal band of white hairs occurs above each lateral margin. The falces are conical and vertical; the maxillæ are straight, and enlarged and rounded at the extremity; and the lip and sternum are oval. These parts are of a dark-brown colour; the sternum, which is the darkest, is supplied with some long white hairs, and the extremity of the falces, maxillæ, and lip is tinged with red. The abdomen is oviform, pointed at the spinners (which are prominent), convex above, and projects a little over the base of the cephalothorax; it is of a very dark-brown colour, and is well clothed with hairs, those in the medial line of the upper part forming a broad, dull yellowish-brown band that tapers to the spinners; a spot in the middle of the anterior extremity, and three spots disposed in a row on the upper part of each side, of which the anterior one is the largest, are composed of white hairs; and the under part is abundantly supplied with hoary hairs.

Captured in the Island of St. Nicholas.

Salticus lepidus.

Length of the male $\frac{5}{24}$ths of an inch; length of the cephalothorax $\frac{1}{8}$, breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{12}$; length of a posterior leg $\frac{1}{4}$; length of a leg of the second pair $\frac{1}{5}$.

The minute intermediate eye of each lateral row is nearly equidistant from those constituting its extremities. The cephalothorax is large, glossy, somewhat quadrilateral, sloping abruptly at the base, and very gradually to the front, which projects a little beyond the base of the falces; it is of a brownish-black colour, the cephalic region and narrow lateral margins being the darkest; the middle of the posterior half is tinged with red, and there is a spot composed of white hairs nearly intermediate between the posterior pair of eyes; the front and a broad longitudinal band extending above each lateral margin are densely clothed with white hairs. The falces are short, conical, and vertical; the maxillæ are straight, and enlarged and rounded at the extremity, and the lip is oval. These parts are of a dark-brown colour, the extremity of the maxillæ and the apex of the lip having a dull-yellow hue; the sternum is oval and of a pale dull-yellowish colour. The legs are robust and provided with hairs and a few sessile spines; the fourth pair is the longest, then the first, and the second pair is the shortest; they are of a dull-yellow colour, with a dark-brown spot at the extremity of the joints, the tarsi having a slight tinge of red; the anterior pair, which are the darkest, have a broad brownish-black band extending along the anterior surface of the femora, genua, and tibiæ, and the metatarsi are of the same hue; each tarsus is terminated by two curved claws, below which there is a small scopula. The palpi are short, and of a pale yellow colour, the axillary joint, the base of the humeral joint, and the outer surface of the radial joint having a brown-black hue; the radial joint projects a curved, finely pointed, black apophysis from its extremity on the outer side, which is directed obliquely forward and outward; the digital joint is oval, convex, and hairy externally, concave within, comprising the palpal organs, which are moderately developed, with a black filiform spine curved from the outer side round the base and inner side, and have a pale brownish-red hue. The abdomen is oviform, pointed at the spinners (which are prominent), convex above, and projects a little over the base of the cephalothorax; it is densely covered with adpressed hairs, and has a broad yellow-brown band in the medial line, which tapers to the spinners; on each side of this band there is a longitudinal band composed of white hairs, which overlie and almost conceal a black band whose outline is somewhat irregular near its posterior extremity, on the inner side; a narrower black band passes along the lower part of each side, and the space between these black bands has a yellow-brown hue; the under part is of a pale dull-yellowish colour, with a large oval soot-coloured spot in the middle, and the spinners have a dark-brown hue.

Captured in the Island of St. Nicholas.

Salticus sedulus.

Length of an immature male $\frac{1}{4}$th an inch; length of the cephalothorax $\frac{1}{10}$, breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{12}$; length of a posterior leg $\frac{5}{24}$; length of a leg of the second pair $\frac{3}{20}$.

The cephalothorax is glossy and somewhat quadrilateral, sloping abruptly at the base, and gradually to the front, which projects a little beyond the base of the falces; it is of a yellowish-brown colour, the cephalic region, the narrow lateral margins, and a fine parallel line situated immediately above them having a black hue; there is a broad, longitudinal, brown band on each side of the medial line, and the frontal margin is densely clothed with long white hairs, which extend to the sides. The falces are short, conical, and vertical; the maxillæ are straight, and enlarged and rounded at the extremity; and the lip and sternum are oval. These parts have a yellowish-brown hue, the falces, maxillæ, and lip being the darkest at the base; and the sternum, which is the palest, has brownish-black lateral margins. The legs are robust, provided with hairs and sessile spines, two parallel rows of the latter occurring on the inferior surface of the tibiæ and metatarsi of the first and second pairs; the fourth pair is the longest, then the third, and the second pair is the shortest; they are of a brownish-yellow hue, with some brownish-black spots and streaks, a longish one of the latter occurring on the anterior surface of the femora, with the exception of those of the fourth pair; each tarsus is terminated by two curved claws, below which there is a small scopula. The palpi are short, and paler than the legs; the digital joints of the specimen described were very tumid, indicating that it had to undergo its final ecdysis before it arrived at maturity. The minute intermediate eye of each lateral row is rather nearer to the posterior than to the anterior eye of the same row. The abdomen is oviform, pointed at the spinners (which are prominent), convex above, and projects a little over the base of the cephalothorax; it is of a yellowish-white colour, with a broad, dark-brown band, somewhat irregular in outline, extending from the anterior extremity of the upper part along each side of the medial line to the spinners; and, parallel to these bands, a narrower one of the same hue passes along each side; the spinners are of a dark-brown colour, and an obscure soot-coloured spot occurs at their base, on the under part.

Captured in the Island of St. Nicholas.

Family Thomisidæ.

Genus Thomisus, Walck.

Thomisus piger.

Length of an immature female $\frac{5}{24}$ths of an inch; length of the cephalothorax $\frac{1}{10}$, breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{10}$; length of a leg of the second pair $\frac{1}{3}$; length of a leg of the third pair $\frac{1}{7}$.

The eyes are disposed on the anterior part of the cephalothorax in two transverse curved rows, forming a crescent whose convexity is directed forwards; the eyes of each lateral pair, which are larger than the intermediate ones, are seated on a conspicuous tubercle, the anterior ones being the largest of the eight. The cephalothorax is convex, slightly compressed before, truncated in front, with a few bristles directed forwards from its anterior margin, rounded on the sides, and abruptly depressed at the base; the falces are subconical, vertical, and provided with a few bristles near the base in front; the maxillæ are obliquely truncated at the extremity, on the outer side, and inclined towards the lip, which is triangular; the sternum is heart-shaped; the legs are very unequal in length, and are provided with hairs and spines, two parallel rows of the latter occurring on the inferior surface of the tibiæ and metatarsi of the second pair, which is much longer and more robust than the third and fourth pairs, the third pair being the shortest; the legs of the first pair were missing, but, judging from the coxæ, they probably did not differ materially in dimensions from those of the first pair; each tarsus is terminated by two curved claws having one or two minute teeth at their base; the palpi are short, and have a small curved claw at their extremity. These parts are of a pale dull-yellow colour; numerous very minute, slightly raised, dark-brown spots occur on the cephalothorax; a pale brown band passes from each lateral pair of eyes towards its base, and the tubercles on which those eyes are seated have a soiled white hue. The abdomen is sparingly clothed with short hairs, convex above, broader towards the posterior than at the anterior extremity, which has the appearance of having been cut in a direct line across, and projects over the base of the cephalothorax; it is of a pale dull yellowish colour, obscurely freckled with dull white; on each side of the upper part there is a curved series of small soot-coloured spots, which are most conspicuous in the posterior region; the two series converge towards their extremities, and describe a large oblong oval; a soot-coloured band passes along the upper part of each side, nearly to the spinners, its posterior extremity being broken into irregular spots.

Captured in the Island of St. Antonio.

Family Drassidæ.

Genus Drassus, Walck.

Drassus nigromaculatus.

Length of the female (not including the spinners) $\frac{5}{12}$ths of an inch; length of the cephalothorax $\frac{3}{16}$, breadth $\frac{3}{20}$; breadth of the abdomen $\frac{1}{6}$; length of a posterior leg $\frac{1}{2}$; length of a leg of the third pair $\frac{7}{20}$.

The cephalothorax is compressed before, truncated in front, rounded on the sides, which are somewhat depressed, abruptly sloped at the base, and has a slight narrow indentation in the medial line of the posterior region; it is of a pale reddish-brown colour, is clothed with yellowish-grey hairs, which are densest on the sides, and has some long black ones, more or less erect, distributed over its surface; three black spots form a row on each side, the anterior one being the largest and most irregular in form; it has a large triangular brown-black mark at its base, and the narrow lateral margins are of the same hue. The eyes are disposed on the anterior part of the cephalothorax in two transverse, slightly curved rows; the convexity of the anterior row is directed upwards, and the two intermediate eyes are the largest and darkest of the eight; the convexity of the posterior row is directed forwards, and the two intermediate eyes are rather nearer to each other than they are to the lateral eyes of the same row; the lateral eyes of both rows are separated by a wide interval. The falces are powerful, conical, convex at the base, and vertical; the maxillæ are convex at the base, hollowed on the inner side, and strongly curved towards the lip, which is longer than broad and rounded at the apex. These parts are of a dark-brown colour tinged with red, the falces being the darkest, and the extremity of the maxillæ having a yellowish-white hue. The sternum is short, oval, hairy, and of a yellowish-brown colour. The legs are robust, provided with hairs and spines, the latter being most numerous on the tibiæ and metatarsi of the third and fourth pairs; they are of a yellow-brown colour, marked with a few obscure soot-coloured spots, the metatarsi and tarsi, which are the darkest, being tinged with red; the fourth pair is the longest, then the first, and the third pair is the shortest; the tarsi are supplied with hair-like papillæ on their inferior surface, and are terminated by two curved, pectinated claws. The palpi are short, and resemble the legs in colour; and the digital joint, which is provided with strong spines, has a curved, pectinated claw at its extremity. The abdomen is oviform, densely clothed with hairs, convex above, and projects a little over the base of the cephalothorax; it is of a dull yellowish-grey colour, with a broad band of black hairs curved round its anterior extremity, and extended along each side in an irregular line more or less interrupted; from the middle of the curved band an obscure, longitudinal, brown band extends, which tapers to its posterior extremity; and on each side of it there is a series of irregular black spots that become confluent as they approach the spinners, which are cylindrical, prominent, and of a pale red-brown colour, with a black line on the sides and under part of their base; the sexual organs are moderately developed, and have a red-brown hue, that of the branchial opercula being yellowish brown.

The male is smaller than the female, but it resembles her in colour. The radial joint of its palpi is rather smaller than the cubital joint, and projects a straight, pointed, dark-brown apophysis from its extremity on the outer side; the digital joint is oval, convex, and hairy externally, concave within, comprising the palpal organs, which are moderately developed, rather prominent, with a slender, curved spine on the outer side, and two processes at their extremity, the inner one of which is much the smaller; their colour is red-brown.

One male and four females of this species were taken in the Island of St. Jago, and three females in the Island of Fogo. It belongs to Walckenaer's family *Lithophilæ* and first race *Lucifugæ* of the genus *Drassus*.

Drassus assimilatus.

Length of the male (not including the spinners) $\frac{11}{24}$ths of an inch; length of the cephalothorax $\frac{5}{24}$, breadth $\frac{1}{8}$; breadth of the abdomen $\frac{1}{8}$; length of an anterior leg $\frac{3}{4}$; length of a leg of the third pair $\frac{1}{2}$.

The legs are long, provided with hairs and sessile spines, and of a dull yellowish-white colour, the metatarsi and tarsi, which are strongly tinged with brown, having numerous hair-like papillæ on their inferior surface; the first pair is the longest, then the fourth, and the third pair is the shortest; each tarsus is terminated by two curved pectinated claws. The palpi resemble the legs in colour, and the radial, which is much longer than the cubital joint, has no apophysis at its extremity; the digital joint is of a narrow oblong-oval form; it is convex and hairy externally, compact and somewhat pointed at the extremity, and has a shallow concavity near its base, on the under side, comprising the palpal organs, which are small, little complicated in structure, with a fine, curved, black spine towards the inner side, and a shorter one at their extremity; these organs have a pale red-brown hue. The eyes, which are seated on black spots, are disposed on the anterior part of the cephalothorax in two transverse, slightly curved, parallel rows; the posterior row is the longer, and the two intermediate eyes, which are somewhat oval, and nearer to each other than they are to the lateral eyes of the same row, describe with the intermediate eyes of the anterior row, which is situated immediately above the frontal margin, an oblong-quadrangular figure; each lateral eye of the posterior row is seated on a minute tubercle, and the intermediate eyes of the anterior row are the largest and darkest-coloured of the eight. The cephalothorax is large, compressed before, truncated in front, rounded on the sides, thinly clothed with hairs, convex, glossy, with a narrow indentation in the medial line of the posterior region; it is of a yellow-brown colour, the anterior part, which is the darkest, being faintly tinged with red, and the narrow lateral margins have a brown hue. The falces are subconical, rather prominent, and armed with a few teeth on the inner surface; the maxillæ are convex at the base, enlarged at the extremity, which is obliquely truncated on the inner side, and slightly curved towards the lip, which is long, and truncated and hollowed at the apex. These parts are of a dark-brown colour, the maxillæ and lip, which are the palest, being tinged with yellow at the extremity. The sternum is oval, glossy, of a pale dull yellowish colour, and is supplied with long hairs, which are densest on the narrow dark-brown lateral margins. The abdomen has an oblong subcylindrical figure, tapering a little to the spinners; it is slightly convex above, projects but little over the base of the cephalothorax, and is clothed with hairs; the upper part is of a brown colour, obscurely intermixed with yellowish white, and has some long black hairs at its anterior extremity; the under part and the spinners, which are cylindrical and prominent, have a yellowish-white hue, the latter being tinged with brown.

This spider, which was captured in the Island of St. Antonio, is very closely allied to *Drassus lapidicolens*, but differs from it not only in colour, but also in the relative length of its legs and in the structure of its palpi and falces.

Family Ciniflonidæ.

Genus Orithyia, Blackw.

Orithyia luteola.

Length of the female $\frac{1}{5}$th of an inch; length of the cephalothorax $\frac{1}{16}$, breadth $\frac{1}{16}$; breadth of the abdomen $\frac{1}{10}$; length of an anterior leg $\frac{3}{10}$; length of a leg of the third pair $\frac{3}{20}$.

The eyes, which are unequal in size and seated on brown spots, are disposed on the anterior part of the cephalothorax in two transverse curved rows, whose convexity is directed forwards; the anterior row, which is the less curved, is situated immediately above the frontal margin, and the two intermediate eyes are seated on a protuberance; the lateral eyes of both rows are placed on minute tubercles, and are wide apart, those of the anterior row being the smallest of the eight. The cephalothorax is short, broad, convex, somewhat oval, with two furrows on each side converging towards a shallow indentation in the medial line of the posterior region; it is clothed with coarse, pale-yellowish hairs, and is of a yellowish-brown colour; a dark-brown band passes from the eyes to its base, and a broad one of the same hue extends along each side. The falces are short, strong, subconical, and vertical; the maxillæ are nearly straight, powerful, and greatly enlarged at the extremity, which is obliquely truncated and protuberant on the inner surface; the lip is triangular; and the sternum is oblong heart-shaped, hairy, and has eminences on the sides, opposite to the legs. These parts have a dull brownish-yellow hue. The legs are very unequal in length, the first pair being much the longest and most robust; the fourth pair surpasses the second, and the third pair is the shortest; they are provided with hairs, and the metatarsus of each posterior leg has a calamistrum situated in a curve at its superior surface; the femora, genua, and tibiæ of the anterior legs are of a brownish-black hue, the inferior surface being much the palest; a pale yellowish annulus occurs on the first, and is situated nearer to its extremity than to its base, which is the darkest-coloured; the metatarsi and tarsi are disproportionally slender, and have a brownish-yellow hue; the second, third, and fourth pairs of legs are of a pale brownish-yellow colour, marked with brownish-black annuli. The palpi are short, hairy, and of a pale brownish-yellow colour, the extremity of the humeral joint, the cubital joint, and the base of the radial joint having a brown-black hue. The abdomen is oviform, pointed at the spinners, convex above, with a conical protuberance on each side of the upper part, near its anterior extremity, and projects over the base of the cephalothorax; the upper part is of a pale yellowish colour, a fine black line, which is rather the broadest near its anterior extremity, extending along the middle; a space above the spinners, the sides, and under part are strongly tinged with brown, a spot of a darker hue occurring on each side of the latter nearly midway between the branchial opercula and the spinners; the sexual organs are moderately developed, and have a brownish-yellow process directed backwards from their anterior margin: the spinners are eight in number; those constituting the inferior pair, which are the shortest, consist of a single joint each, and are united throughout their entire length.

Two adult females of this species were taken in the Island of St. Nicholas.

Orithyia gnava.

Length of the female $\frac{1}{5}$th of an inch; length of the cephalothorax $\frac{1}{16}$, breadth $\frac{1}{20}$; breadth of the abdomen $\frac{1}{10}$; length of an anterior leg $\frac{7}{24}$; length of a leg of the third pair $\frac{1}{8}$.

In the relative size and disposition of its eyes, also in the relative length and proportions of its legs, and in its general structure, this species is similar to *Orithyia luteola*. The cephalothorax has a black hue, a short longitudinal streak in the middle, and a triangular mark at the base, whose vertex is directed forwards, being of a yellowish-white colour. The falces, maxillæ, and lip have a pale brownish-yellow hue, the base of the lip and maxillæ, the extremity of the falces, and the sternum being of a dark-brown colour. The femora, genua, and tibiæ of the anterior legs have a black hue, and that of the slender metatarsi and tarsi is brownish yellow; the colour of the second, third, and fourth pairs of legs is brownish black, with a few pale brownish-yellow annuli. The palpi are of a pale brownish-yellow colour, the extremity of the humeral joint, the cubital and radial joints, and the extremity of the digital joint having a brownish-black tint. The abdomen is soot-coloured, mingled with white, the sides being the darkest and the under part the lightest-coloured; the anterior extremity, contiguous to the cephalothorax, has a white hue, and comprises a vertical black bar, which is enlarged at its lower extremity, and is crossed at its upper extremity by a shorter one of the same hue.

The collection contained two females; but the abdomen of each was so corrugated that it was not possible to define with accuracy the design formed by the distribution of its colours; the characters given above, however, are sufficient to distinguish this spider from other known species of the genus. Both specimens were captured in the Island of St. Nicholas.

Family Theridiidæ.

Genus Theridion, Walck.

Theridion fallax.

Length of the female $\frac{1}{3}$rd of an inch; length of the cephalothorax $\frac{1}{8}$, breadth $\frac{1}{9}$; breadth of the abdomen $\frac{1}{4}$; length of an anterior leg $\frac{5}{6}$; length of a leg of the third pair $\frac{3}{16}$.

The cephalothorax is convex, nearly oval, slightly compressed before, rounded on the sides, which are marked with furrows converging towards a large indentation in the medial line, and is thinly clothed with short, whitish hairs; the falces are conical and vertical; the maxillæ are obliquely truncated at the extremity, on the outer side, and are inclined towards the lip, which is semicircular; and the sternum is heart-shaped. These parts have a very dark-brown hue; the extremity of the falces is tinged with red, particularly on the inner side, and the extremity of the maxillæ, the apex of the lip, and a spot on the sternum opposite to the base of the lip have a yellowish-brown tint. The eyes are disposed on the anterior part of the cephalothorax in two transverse, nearly straight, parallel rows; the four intermediate ones form a square, the two anterior ones, which are seated on a protuberance, being the largest and darkest-coloured of the eight; the eyes of each lateral pair are placed on small tubercles, and are separated by a considerable interval. The legs are long, robust, and provided with hairs, the metatarsi and tarsi being disproportionally slender; they are of a yellowish-brown colour, the metatarsi and tarsi, which are much the palest, having a slight tinge of red; and the extremity of the femora and tibiæ, and the genua, have a brownish-black hue; the first pair is the longest, then the fourth, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The palpi are short, and have a curved, pectinated claw at their extremity; they resemble the legs in colour, but are without any brownish-black marks. The

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abdomen is short, broad, oviform, thinly clothed with hairs, very convex above, and projects greatly over the base of the cephalothorax; it is of a dark-brown colour above, minutely spotted with white; in the medial line of the anterior part there are a few irregular white lines encompassing small dark-brown spaces; several rather obscure, slightly curved, whitish, transverse lines occur above the spinners, and at the base of those organs, on each side, there are two minute spots of the same hue; the sides are of a pale dull yellowish-white colour, reticulated with brown, and are marked with long, oblique, whitish bands curved downwards and narrowly bordered with brownish black; these bands, which taper to their lower extremity, comprise in their broader part a dark-brown space, and their superior extremity, which is abruptly contracted, is curved upwards; the under part is paler than the sides, and has a large white mark in the middle, reticulated with pale and bordered with dark brown; the anterior part of this mark is the broadest, and comprises an oblong-oval, brownish-black spot on each side of the medial line; and the middle of its posterior extremity is produced in the form of a small semicircle; the branchial opercula have a brown hue, and that of the sexual organs, which are well developed and rather prominent, is dark red-brown.

One female of this species, which is nearly allied to the spiders of the genus *Latrodectus* by the disposition of its eyes, was taken in the Island of St. Antonio. In consequence of its abdomen being much disfigured, it was not possible to describe with perfect accuracy the design formed upon it by the distribution of its colours; however, from the characteristics given above, there can be no difficulty in identifying it.

Theridion quinquenotatum.

Length of the female $\frac{3}{20}$ths of an inch; length of the cephalothorax $\frac{1}{16}$, breadth $\frac{1}{20}$; breadth of the abdomen $\frac{1}{12}$; length of a posterior leg $\frac{1}{6}$; length of a leg of the third pair $\frac{1}{12}$.

The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones describe a square, the two anterior ones, which are rather the smallest and darkest-coloured of the eight, being seated on a slight protuberance; the eyes of each lateral pair are placed obliquely on a tubercle, and are contiguous. The cephalothorax is oval, convex, glossy, with an indentation in the medial line of the posterior region, and slopes gradually from the anterior extremity to the base; the falces are conical, vertical, and armed with a few teeth at the extremity on the inner surface; the maxillæ are obliquely truncated at the extremity, on the outer side, and strongly inclined towards the lip, which is semicircular; and the sternum is heart-shaped. These parts have a red-brown hue, the lateral margins of the cephalothorax and sternum and the base of the lip being soot-coloured. The legs are slender, provided with hairs, and of a red-brown hue, with the exception of the femora, which are black, and the extremity of the tibiæ of the first and fourth pairs, which are soot-coloured; the fourth pair is the longest, then the first, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The palpi resemble the legs in colour, and have a curved pectinated claw at their extremity. The abdomen is oviform, thinly clothed with hairs, convex above, projecting over the base of the cephalothorax, and is of a brownish-black hue; an oblique white spot is situated on each side of its anterior extremity, another near the middle of the upper part of each side, and an oblong one immediately above the spinners, in the medial line; the branchial opercula have a brownish-yellow hue, and that of the sexual organs, which are moderately developed, is dark red-brown.

Two females of this species were taken in the Island of St. Antonio.

Theridion sagax.

Length of an immature male $\frac{3}{8}$ths of an inch; length of the cephalothorax $\frac{3}{20}$, breadth $\frac{1}{8}$; breadth of the abdomen $\frac{1}{4}$; length of an anterior leg $\frac{3}{4}$; length of a leg of the third pair $\frac{11}{24}$.

The cephalothorax is convex, glossy, and nearly oval, being slightly compressed before, and rounded on the sides, which are marked with furrows converging towards an indentation in the medial line; the falces are short, conical, and vertical; the maxillæ are obliquely truncated at the extremity, on the outer side, and inclined towards the lip, which is semicircular; the sternum is heart-shaped; the legs are long, and provided with hairs; the first pair is the longest, then the fourth, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base; the palpi are short; the radial is larger than the cubital joint, and the tumid digital joint is somewhat oviform; but, as the palpal organs were not developed, it is evident that the spider was immature. These parts are of a yellowish-brown colour, the base of the lip and an oblique transverse bar near the extremity of the maxillæ having a red-brown hue. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones form a square, the two anterior ones, which are seated on a protuberance, being rather the smallest and darkest-coloured of the eight; the eyes of each lateral pair are placed obliquely on a tubercle, and are contiguous. The abdomen is large, glossy, sparingly clothed with hairs, somewhat oviform, convex above, and projects greatly over the base of the cephalothorax; it is of a black hue, and has a curved yellowish-white band at its anterior part, contiguous to the cephalothorax, which passes nearly to the middle of the upper part of each side, and whose enlarged extremities are directed upwards; there is a triangular point in the middle of the interior of this curve; and a series of triangular yellowish-white spots, comprising a brown longitudinal streak, and diminishing in size as they approach the spinners, extends along the middle; a few obscure slightly curved lines of the same hue occur above the coccyx, and on each side, near the enlarged extremity of the anterior curved band, there is an oblong yellowish-white spot; the colour of the under part is yellowish white, irregularly marked with dark brown, and a brown quadrangular space in the middle has a yellowish-white border.

Captured in the Island of St. Antonio.

Family Epeïridæ.

Genus Epeïra, Walck.

Epeïra mœsta.

Length of the male $\frac{1}{8}$th of an inch; length of the cephalothorax $\frac{1}{16}$, breadth $\frac{1}{24}$; breadth of the abdomen $\frac{1}{24}$; length of an anterior leg $\frac{1}{6}$; length of a leg of the third pair $\frac{1}{10}$.

The legs are slender, provided with hairs, and have a brown-black hue, with yellowish-brown annuli on the tibiæ, metatarsi, and tarsi; the first pair is the longest, then the second, and the third pair is the shortest; each tarsus is terminated by claws of the usual number and structure. The palpi are short, and of a brown colour, the digital joint being much the darkest; the radial joint is stronger than the cubital, and has a few long, fine, curved hairs at its extremity, in front; the digital joint is of an oblong-oval form, with a process at its base curved outwards; it is convex and hairy externally, concave within, and the palpal organs connected with it are highly developed, prominent, complex in structure, with a fine prominent spine near the base, a curved one on the under side, and a short bifid one near their extremity; these organs have a yellow-brown hue; and the convex sides of the digital joints are directed towards each other. The cephalothorax is oval, convex, glossy, with a large indentation in the medial line of the posterior region; it is sparingly supplied with short white hairs, and is of a brown-black colour, the anterior margin being the brownest. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows at a moderate elevation above the frontal margin; the four intermediate ones nearly form a square, the two anterior ones, which are placed on a protuberance, and are wider apart than the two posterior ones, being the largest of the eight; the eyes of each lateral pair are the smallest, and are seated obliquely on a minute tubercle near to each other, but are not in contact. The falces are conical, and inclined towards the sternum, which is heart-shaped, with small eminences on the sides, opposite to the legs; the maxillæ are short, powerful, and greatly enlarged at the extremity, which is produced on the inner side; the lip is semicircular, and prominent at the apex. These parts have a black hue tinged with brown, the sternum being the darkest, and the extremity of the maxillæ and apex of the lip the palest. The abdomen is somewhat oviform, with a small conical protuberance on each side of its posterior extremity, which extends considerably beyond the spinners; it is moderately convex above, projects over the base of the cephalothorax, and has a black hue; a small spot composed of short white hairs occurs at the extremity of each conical protuberance, and a third at the base of the coccyx.

Captured in the Island of St. Nicholas.

Epeïra blanda.

Length of the male $\frac{1}{6}$th of an inch; length of the cephalothorax $\frac{1}{10}$, breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{12}$; length of an anterior leg $\frac{3}{8}$; length of a leg of the third pair $\frac{3}{16}$.

The cephalothorax is compressed before, rounded on the sides, somewhat pointed in front, convex, glossy, and has a large indentation in the medial line of the posterior region; it is of a brown colour, with a tinge of yellow in the middle and in the region of the eyes, and the narrow lateral margins are soot-coloured. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones nearly form a square, the two anterior ones, which are the largest and darkest-coloured of the eight, and are rather wider apart than those of the posterior row, being situated immediately above the frontal margin; the eyes of each lateral pair are seated obliquely on a minute tubercle, and are near to each other, but not in contact, the posterior ones being the smallest. The falces are subconical, slightly divergent at the extremity, and inclined towards the sternum; they are of a brown colour, the inner surface and extremity having a pale-yellow hue. The maxillæ are short, straight, powerful, and enlarged and rounded at the extremity; the lip is semicircular, but somewhat pointed at the apex; and the sternum is heart-shaped. These parts are of a yellow-white colour, the base of the maxillæ and lip and the margins of the sternum having a dark-brown hue. The legs are long, and provided with hairs and spines, the tibial joint of the second pair having numerous short, black, pointed spines on its anterior surface; the colour of the femora is pale yellow at the base and dark brown at the extremity, the dark-brown hue being most extensive on the anterior pair, and merely forming an annulus on the third pair; the other joints of these limbs have a brownish-yellow hue, and are marked with dark-brown annuli; the first pair is the longest, then the second, and the third pair is the shortest; each tarsus is terminated by claws of the usual number and structure. The palpi are short, and of a pale-yellow colour, with the exception of the digital joint, which has a brown hue; the cubital joint projects two long curved hairs from its anterior extremity, in front; the radial is larger than the cubital joint, prominent on its external and internal surfaces, and supplied with long hairs; the digital joint is oval, with a glossy process at its base curved outwards; it is convex and hairy externally, concave within, and the palpal organs connected with it are highly developed, prominent, with several short, curved processes at their extremity, and are of a dark-brown colour mingled with yellow. The convex sides of the digital joints are directed downwards. The abdomen is oviform, convex above, projecting over the base of the cephalothorax, and is thinly clothed with long dark and light-coloured hairs; on the upper part there is a large brownish-black, leaf-shaped mark, which gradually decreases in breadth to the spinners, and whose sinuous margins have an obscure, white, lateral border, forming at its anterior extremity a conspicuous spot on each side of the base of a triangular black spot situated at the anterior part of the abdomen and having its vertex directed forwards; the leaf-shaped mark comprises in the middle of its anterior part a fusiform mark faintly bordered with white; the sides are of a brownish-black colour mingled with dull white, and the brownish-black under part has a curved yellowish-white line on each side, whose posterior extremity is the palest and most conspicuous.

Captured in the Island of St. Nicholas.

Genus Nephila, Leach.

Nephila Grayii.

Length of the female $1\frac{1}{12}$ inch; length of the cephalothorax $\frac{5}{12}$, breadth $\frac{3}{10}$; breadth of the abdomen $\frac{1}{2}$; length of an anterior leg 2; length of a leg of the third pair $\frac{15}{16}$.

The legs are long, provided with fine spines and hairs, a dense brush of the latter occurring on the inferior surface and sides of the tibiæ of all the legs except those of the third pair; they are of a yellow colour, with the exception of the extremity of the femora and tibiæ, the genua, and the metatarsi and tarsi, which are of a black hue, the base of the metatarsi of the first and second pairs having a tinge of yellow; the first pair is the longest, then the second, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi are short, and have a yellow hue, the digital joint, which has a slightly curved, pectinated claw at its extremity, being strongly tinged with brown. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones nearly form a square, the two anterior ones, which are seated on a protuberance, and are rather nearer to each other than the two posterior ones, being the largest of the eight; the eyes of each lateral pair are placed obliquely on a prominent tubercle; they are the smallest, and are separated by a considerable interval. The cephalothorax is long, rather convex above, truncated in front, compressed before, moderately rounded on the sides, which are marked with furrows converging towards a transverse pair of indentations in the medial line of the posterior region, and has two convex, glossy eminences situated transversely near its middle; it is of a brownish-black colour, which is almost concealed by a covering of short, adpressed, white hairs having a silvery lustre. The falces are powerful, conical, vertical, convex at the base, in front, and armed with teeth on the inner surface; the maxillæ are short, strong, and greatly enlarged and rounded at the extremity; the lip is somewhat oval. These parts are of a brownish-black colour, the falces being the darkest, and the extremity of the maxillæ and the apex of the lip have a dull yellow hue. The sternum is oblong heart-shaped, glossy, with eminences on the sides, opposite to the legs, and is of a yellow colour, with brownish-black lateral margins. The abdomen is oviform, glossy, sparingly clothed with short pale hairs, convex above, and projects over the base of the cephalothorax; it is of a brown colour, tinged with olive, and has a large, crescent-shaped, yellow mark near the anterior extremity of its upper part, followed by four spots of the same hue in the medial line, which diminish in size as they approach the spinners; an obscure, curved, yellowish band passes above each branchial operculum, and a dull spot of the same hue occurs on the upper part of each side; four minute yellow spots on the under side form a transverse row immediately below the sexual organs, and a large, irregular, yellow spot is situated midway between those organs and the spinners; the sexual organs are moderately developed, and, with the branchial opercula and spinners, are of a dark-brown colour. Some specimens have the yellow spots in the medial line of the upper part of the abdomen divided, which then form two longitudinal series.

The name of John Gray, Esq., of Wheatfield House, near Bolton, is associated with this fine species of *Nephila* (which abounds in the Island of St. Antonio, and constructs its web among the branches of trees), in acknowledgement of the obligation I am under to him for the interesting spiders described in this paper, and for numerous specimens of *Araneidea* collected in Algeria and Rio de Janeiro.

Genus Argyopes, Savigny.

Argyopes Clarkii.

Length of the female $\frac{7}{12}$ths of an inch; length of the cephalothorax $\frac{1}{4}$, breadth $\frac{5}{24}$; breadth of the abdomen $\frac{5}{16}$; length of an anterior leg $1\frac{1}{5}$; length of a leg of the third pair $\frac{2}{3}$.

The cephalothorax is compressed before, rounded in front and on the sides, slightly convex, with a broad shallow indentation in the medial line of the posterior region; it is of a dark-brown colour, which is concealed by a thick covering of short, adpressed, white hairs, which have a silvery lustre. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones are seated on a prominence and form a square, the two anterior ones being the largest of the eight; the eyes of each lateral pair are placed obliquely on a tubercle, and are near to each other, but not in contact, the anterior ones being much the smallest. The falces are powerful, conical, vertical, and armed with teeth on the inner surface; the maxillæ are short, strong, and greatly enlarged and rounded at the extremity; the lip is semicircular, but pointed at the apex; and the sternum is heart-shaped, supplied with hoary hairs, and has eminences on the sides, opposite to the legs. These parts are of a dark-brown colour, the inner surface and extremity of the falces, the extremity of the maxillæ, the apex of the lip, a streak in the medial line of the anterior part of the sternum, and an oval spot at its extremity having a yellow hue. The legs are long, provided with hairs and spines, and have a very dark brown hue, the inferior surface of the coxæ being tinged with yellow; the first pair is the longest, then the second, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi are rather paler than the legs, and have a curved, pectinated claw at their extremity. The abdomen, which is oviform, is more convex on the under than on the upper part; it projects over the base of the cephalothorax, and its posterior extremity extends beyond the spinners; the sides are festooned, four somewhat conical obtuse prominences occurring on each, and there is a smaller and more pointed one on each side of its anterior extremity; the upper part is densely clothed with adpressed silky hairs, and is of a pale-yellow colour, with small black spots, many of which are disposed in transverse rows; there are two short, curved, black lines near the middle, whose concave sides are directed towards each other; and along each side a strongly dentated black line extends; the anterior surface of the lateral prominences, the branchial opercula, spinners, and under part have a dark-brown hue; and an irregular spot on each side of the last, a small one in front of the spinners, and a streak at their base, on each side, are of a pale yellow colour; the sexual organs, which are well developed, prominent, and of a very dark brown colour, have a strong process directed from their posterior margin obliquely forward and downward, whose extremity is enlarged, convex, and glossy.

This distinctly marked species of *Argyopes*, which was captured in the Island of Brava, is dedicated to the Rev. Hamlet Clark, who, in conjunction with Mr. Gray, has favoured me with many exotic spiders of great interest.

Genus Tetragnatha, Latr.

Tetragnatha maculata.

Length of the female $\frac{1}{5}$th of an inch; length of the cephalothorax $\frac{1}{12}$, breadth $\frac{1}{16}$; breadth of the abdomen $\frac{1}{10}$; length of an anterior leg $\frac{1}{24}$; length of a leg of the third pair $\frac{1}{5}$.

The abdomen is short, broad, oviform, sparingly clothed with hairs, convex above, projects over the base of the cephalothorax, and is of a brownish-black colour marked with white; the anterior extremity is white, and near it, on each side of the medial line of the upper part, there is a rectangular mark, to which succeed six spots disposed in pairs, more or less contiguous, and diminishing in size as they approach the spinners; two spots occur on the posterior half of each side, the anterior one of which is the larger, and somewhat triangular, and situated lower on the anterior half there is a slightly curved line; four spots are disposed in a square on the under part, and there are two minute ones on each side of the spinners, at their base; these marks and spots are white, more or less reticulated with brown, and reflect a silvery lustre: the sexual organs are moderately developed, and of a dark red-brown colour. The cephalothorax is compressed before, rounded in front and on the sides, convex, glossy, with an indentation in the medial line of the posterior region, and is of a pale brownish-yellow colour, with narrow, soot-coloured lateral margins. The eyes are seated on black spots, and are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones nearly form a square; the two anterior ones are the largest of the eight, and are placed on a slight protuberance; the eyes of each lateral pair, which are the smallest, are seated on a minute tubercle, and are almost in contact. The falces are powerful, conical, vertical, and armed with teeth on the inner surface; the legs are long, slender, and provided with hairs; the first pair is the longest, then the second, and the third pair is the shortest; the palpi are slender, and have a slightly curved claw at their extremity. These parts have a pale brownish-yellow hue. The maxillæ are slightly divergent, and increase in breadth from the base to the extremity, which is somewhat angular on the outer side; and the lip is semicircular and prominent at the apex. These organs are of a brown colour tinged with yellow, the base of the lip being the darkest. The sternum is heart-shaped, glossy, supplied with some long hairs, and has a black hue.

The male is smaller than the female, but resembles her in colour. The cubital and radial joints of its palpi are short, the latter being rather the larger; the digital joint is oval, with a process at its base curved outwards; it has a yellowish-brown hue, is convex and hairy externally, and concave within, comprising the palpal organs, which are well developed, not very complex in structure, convex, glossy, and terminate in a point that extends beyond the extremity of the joint: the colour of these organs is yellowish brown. The convex sides of the digital joints are directed towards each other.

One male and three females of this *Tetragnatha*, which belongs to Walckenaer's second family of the genus, the *Coadunatæ*, were captured in the Island of St. Nicholas.

Tribe **Senoculina**.

Family Scytodidæ.

Genus Scytodes, Latr.

Scytodes pallida.

Length of an immature male $\frac{1}{5}$th of an inch; length of the cephalothorax $\frac{1}{12}$, breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{16}$; length of a leg of the second pair $\frac{1}{2}$; length of a leg of the third pair $\frac{5}{12}$.

The eyes, which are small and disposed in pairs on the anterior part of the cephalothorax, are seated on black spots; those of each lateral pair are placed obliquely on a slight tubercle, and are almost in contact, the anterior ones being the largest of the six; the eyes of the anterior pair are situated transversely, in advance of the lateral pairs, high above the prominent frontal margin, and are contiguous or nearly so. The cephalothorax is compressed before, rounded in front and on the sides, moderately convex, glossy, and has an indentation in the medial line; the falces are conical, rather prominent, and are armed with a short curved fang, and a single pointed tooth on the inner side, near the extremity; the maxillæ are curved towards the lip, and touch at their extremity, which is truncated on the inner side; the lip is large and somewhat triangular, but rounded at the apex; the sternum is nearly circular, and glossy; the legs are long, slender, provided with hairs, and each tarsus is terminated by two curved, pectinated claws; the second pair is the longest, the fourth pair rather surpasses the first, and the third pair is the shortest; the palpi are moderately long; the radial joint is much longer than the cubital, and the digital joint, which has an oblong-oviform figure, is tumid, but compact, proving by its undeveloped state that the specimen had not arrived at maturity. These parts are of a pale dull yellowish colour, the falces and lip having a tinge of red, and the anterior part of the cephalothorax a slight tinge of brown. The abdomen is of an oblong-oviform figure; it is somewhat convex above, projects a little over the base of the cephalothorax, and is clothed with pale soot-coloured hairs, particularly on the upper part; it has a brownish-white hue, with a faint brownish band, which tapers to its posterior extremity, extending from the base of the upper part, contiguous to the cephalothorax, a little beyond the middle.

This spider, which was taken in the Island of St. Iago, belongs to Walckenaer's family *Depressæ* of the genus *Scytodes*, and is very closely allied to the *Scytodes erythrocephala* of Koch (Die Arachniden, Band v. p. 90, tab. 168. figs. 399, 400), but may readily be distinguished from it, even when immature, by marked differences in the structure of the palpi, and especially by the form of the digital joint.

X.—*Contributions to an Insect Fauna of the Amazons Valley.* Coleoptera: Longicornes. By H. W. Bates, Esq.

[Continued from vol. xv. p. 394.]

29. *Colobothea nævigera*, n. sp.

C. modice elongata, postice regulariter attenuata, nigricans, sericea, vertice thoraceque supra lineis duabus, elytris maculis paucis discretis, cinereis; his truncatis, angulis externis spinosis. Long. $4\frac{1}{2}$–$7\frac{1}{2}$ lin. ♂ ♀.

Head black, forehead with three ashy lines, cheeks with a spot of the same colour, and vertex marked with two ashy lines diverging on the occiput. Antennæ greatly elongated and robust, black, sixth joint ringed with white, tenth joint with an exterior white line (♂), in the ♀ the eighth and eleventh joints also streaked with white. Thorax blackish, clothed with an olivaceous silky pile, the upper surface with two tawny-ashy, slender, nearly parallel lines; sides each with a single similar line, besides a broader streak above the coxæ. Elytra broad at the base, with prominent and not markedly oblique shoulders, regularly attenuated thence to the apex, which is truncated and has the external angles produced into spines; the surface has a few fine punctures surmounted by acute granulations towards the base, and beset with short black bristles; the colour is blackish, clothed with silky olivaceous pile, and ornamented with a small number of scattered and distinct, rounded, tawny-ashy spots, the extreme apex having an ashy-white border decreasing in width from the suture to the external angle. Body beneath black, thinly clothed with ashy tomentum; the sides of the breast have a tawny-ashy streak in continuation of the one on the prothorax, and the sides of the abdomen are spotted with the same colour. The legs are blackish, ringed with grey.

♂. Terminal ventral segment narrowed to the apex, truncated, with the angles produced into stout spines; dorsal segment obtuse. Legs stout; anterior tarsi moderately dilated and fringed. In the smaller males the legs are not perceptibly thicker than in the females.

♀. Terminal abdominal segment projecting considerably beyond the apex of the elytra, broad; dorsal segment notched, ventral truncated, angles not produced.

A common insect at Ega and S. Paulo, Upper Amazons.

30. *Colobothea lucaria*, n. sp.

C. modice elongata, nigra, vertice lineis duabus divergentibus, thorace lineis tenuibus quatuor, elytris maculis paucis hic illic congregatis, griseis; his apice cano marginatis, oblique truncatis, angulis externis spinosis. Long. 5 lin. ♂.

Head black, forehead with three obscure grey lines, vertex with two divergent lines of similar colour, and the posterior part of the orbits also grey. Antennæ black, base of fourth, eighth, and tenth joints grey on one side, sixth joint with a whitish ring. Thorax black, with a silky olivaceous gloss, upper surface with two slender parallel grey lines, each side also with a similar line visible in part when the insect is regarded from above; there is also a grey line above the coxæ. Elytra prominent, and scarcely oblique at the shoulders, thence gradually attenuated to the apex, which is on each side obliquely truncated, *i. e.* the sutural portion is more advanced than the lateral angles, which are produced into spines; the surface is finely punctate-granulate, and of the same colour as the thorax; the grey spots are nearly all of equal size and distinct; but they are collected partly into groups, and here and there confluent; the grey apical margin is of equal width from the sutural to the external angle. Body beneath thinly clothed with grey pile; sides of breast not striped with thicker tomentum. Legs black, ringed with grey.

♂. Terminal ventral segment truncated, angles produced into short spines; dorsal segment rounded. Anterior tarsi moderately dilated and fringed.

S. Paulo, Upper Amazons. Very closely related to *C. nævigera,* differing only in the oblique truncature and somewhat different arrangement of spots of the elytra.

31. *Colobothea crassa,* n. sp.

C. major, robusta, nigra, tomento olivaceo-griseo vestita, vertice thoraceque dorso lineis duabus divergentibus, elytris maculis numerosis, minimis, discretis, fulvo-griseis, apice cano marginatis. Long. 8–10 lin. ♂ ♀.

Differs from *C. nævigera* in being of much larger size, in the spots of the elytra being very much smaller and more numerous, and in the dorsal lines of the thorax being posteriorly divergent. In shape and in colour the two species offer no tangible point of difference. As in *C. nævigera,* there are only two thoracic lines visible from above, although there is a lateral line on each side and a broader streak above the coxæ (yellower in colour and extending to the abdomen); the form of the terminal abdominal segment in both sexes offers also no difference in the two species. *C. crassa* is still more closely allied to a Cayenne species, *C. lineatocollis** (Dej. Cat.), which is similar to it in size and other respects, and differs chiefly in the multitudinous grey

* *Colobothea lineatocollis* (Dej. Cat. sec. Dom. Chevrolat). Elongata, antice et postice attenuata, nigra, obscure olivaceo-grisea, sericea, griseo lineata et maculata. Caput nigrum, griseo lineatum, vertice lineis griseis duabus postice divergentibus, genis griseo plagiatis. Antennæ validæ, nigræ, articulo sexto albo annulato. Thorax lineis tenuibus duabus dorsalibus subparallelis, alteris duabus lateralibus, vittaque utrinque supracoxali, griseis. Elytra postica modice attenuata, humeris parum obliquis, apicibus truncatis, angulis externis dentiformibus, supra sparse punctata maculis minutis griseis confluentibus, reliquo spatio subapicali immaculato, ipso apice albo marginato. Corpus subtus nigrum, griseo sparse tomentosum, abdomine maculato. Pedes nigri, griseo annulati. Maris segmento dorsali terminali truncato, angulis prominulis; ventrali profunde emarginato, angulis spinosis. Fœminæ segmento ultimo dorsali apice lato; ventrali profunde emarginato, angulis productis. *Hab.* in Cayenna.

specks of the elytra being confluent and forming irregular marbled lines. *C. Osculatii* of Guérin (Cat. des Ins. Col. recueillis par Gaetano Osculati, no. 261) appears to be another allied form similar in size and colours to *C. crassa* and *C. lineatocollis*; but the description given of the thoracic markings ("quatre fines lignes longitudinales blanches") leaves us in doubt whether there are not four lines on the upper surface, which would remove the species from the neighbourhood of the two mentioned; for, if the lateral lines are to be included, the description ought to mention six instead of four. The distinctive character of *C. crassa* is the minute and equal size, great number, and equidistant position of the grey specks of the elytra.

Common in the neighbourhood of Pará. *C. Osculatii* is probably a native of the banks of the Napo, where M. Osculati formed his collection.

32. *Colobothea ordinata*, n. sp.

C. elongata, postice attenuata, olivaceo-nigra, vertice postice bilineato; thorace supra lineis quatuor crassiusculis vittaque lata supracoxali fulvo-cinereis; elytris maculis numerosis subquadratis fulvo-cinereis in seriebus subordinatis; thorace ante basin utrinque breviter tuberculato. Long. $7\frac{1}{2}$ lin. ♂.

Head black, forehead with three slender lines, vertex with two divergent lines, and cheeks with a broad streak, tawny ashy; there is also a tawny-ashy streak behind each eye. Antennæ stout, black, sixth joint with a narrow white ring, the bases of the fourth, eighth, tenth, and eleventh joints with an ashy streak on one side (♂). Thorax slightly constricted at the base, and with a small tubercle on each side; surface black, with four rather thick tawny-ashy lines; there is also a broad tawny-ashy vitta above the coxa on each side. Elytra with prominent and rather acute shoulders, thence gradually attenuated to the apex, which latter is truncated, the external angles produced each into a longish spine; surface olivaceous black, marked with a large number of well-separated and squarish tawny-ashy spots, mostly arranged in rows, and leaving a distinct belt beyond the middle and another near the apex unspotted; apex itself edged with whitish. Body beneath ochraceous ashy. Legs greyish, varied with black.

♂. Terminal ventral segment broadly truncated, angles produced; dorsal segment obtuse, entire.

Ega; rare.

33. *Colobothea subtessellata*, n. sp.

C. elongata, postice attenuata, olivaceo-nigra, vertice postice bilineato, thorace lineis duabus dorsalibus crassiusculis alteraque laterali et vitta supracoxali cinereo-ochraceis; elytris maculis numerosis cinereo-ochraceis in seriebus subordinatis, spatio lato apicali immaculato; thorace absque tuberculis. Long. $8\frac{1}{2}$ lin. ♀.

Head black; forehead with three slender lines, vertex with two divergent lines, and cheeks with a broad streak tawny ashy. Antennæ stout, black, sixth joint with a broad white ring, tenth joint with an ashy streak on one side (♀). Thorax not constricted at the base, broadest at its basal angles, and free from tubercles; surface black, with two moderately thick tawny lines, sides each with a similar line, not visible from above, and a broad tawny vitta above the coxa. Elytra moderately broad at the shoulders, and narrowed thence to the apex, the latter truncated, with the outer angles spinose; surface olivaceous black, marked with a large number of tawny spots, which are in some examples arranged in rows, and in others more or less confused; there is a broad immaculate space at the apex, and the apex itself is broadly margined with white. Body beneath black, thinly clothed with ashy pile, and having a broad, distinct, ochreous lateral vitta. Legs blackish, ringed with grey.

♀. Terminal abdominal segment elongated and tapering; dorsal plate broadly notched; ventral truncated, angles acute.

Banks of River Tapajos; rare.

34. *Colobothea octolineata*, n. sp.

C. valde elongata, postice attenuata, olivaceo-nigra, vertice linea unica, genis utrinque lineis duabus cinereis; thorace lineis tenuibus cinereis octo, quarum quatuor dorsalibus; elytris humeris prominentibus, maculis cinereis discretis irregulariter dispersis. Long. $7\frac{1}{2}$–11 lin. ♂ ♀.

Head black, forehead with two greyish lines, vertex with a single narrow line, and cheeks on each side with two oblique greyish lines. Antennæ black, sixth joint thickened, with a ring of dense white hairs in both sexes. Thorax marked with eight slender, greyish or tawny lines, of which four are on the upper surface and two on each side, including the supracoxal streak, which in this species is slender, like the other lines. Elytra greatly elongated; shoulders very prominent, thence gradually narrowing to the apex, the latter truncated, with outer angles spinose; surface olivaceous black, marked with a moderate num- of larger and smaller spots, widely separated from each other, but very irregularly dispersed; apex edged with whitish. Body beneath black, marked with ashy or tawny streaks and spots. Legs black, ringed with tawny and grey.

♂. Terminal abdominal segment narrowed from the base; apex of both dorsal and ventral plates emarginate-truncate. Anterior tarsi very broady dilated and fringed.

♀. Terminal abdominal segment elongate and tapering; apex of both dorsal and ventral plates emarginate-truncate.

Pará, also Ega, Upper Amazons; common.

35. *Colobothea contaminata*, Serville.

Colobothea contaminata, Serv. Encycl. Méth. x. p. 337.

C. valde elongata, angustata, postice vix attenuata, olivaceo-nigra, vertice linea unica cinereo-fulva, thorace lineis quatuor, quarum externa utrinque usque ad oculum extensa et vitta supracoxali supra genas continuata; elytris maculis cinereo-fulvis passim confluentibus, vel cinereo-fulvis nigro irregulariter maculatis, fascia lata subapicali nigra; antennis utroque sexu nigris, articulo sexto annulo incrassato albo. Segmento ultimo abdominali maris attenuato, apice emarginato; fœminæ angustato, lamina dorsali obtusa, ventrali angulis productis; maris tarsis anticis valde dilatatis. Long. $6\frac{1}{2}$–10 lin. ♂ ♀.

Generally distributed and common throughout the Amazons region; also found at Cayenne.

36. *Colobothea geminata*, n. sp.

C. elongata, postice vix attenuata, olivaceo-nigra, vertice linea unica, thorace lineis duabus antice et postice conjunctis; elytris maculis numerosis in lineis curvatis confluentibus fulvo-griseis. Long. $7\frac{1}{2}$–$8\frac{1}{2}$ lin. ♂ ♀.

Head black, forehead with three tawny-grey lines, and vertex with a single line; cheeks with a tawny-ashy stripe. Antennæ black, sixth joint with a broad white ring. Thorax black, sides each with two tawny-ashy stripes joined together near the front and posterior margins, and continuous with the cheek-stripe. Elytra elongated, of very nearly the same width from base to apex in both sexes; external angle of the truncature spinose; surface blackish olivaceous, sprinkled with a large number of tawny-ashy spots, which are mostly confluent, and tend to form a pattern consisting of three irregular pale rings, on each elytron, enclosing a blackish space; apex edged with tawny whitish. Body beneath ashy, but tawny towards the sides; abdomen spotted with black. Legs ashy, ringed with black.

♂. Terminal abdominal segment short; ventral plate emarginate-truncate, angles produced; dorsal plate obtuse and notched in the middle. Anterior tarsi not dilated.

♀. Terminal abdominal segment tapering; dorsal plate notched in the middle; ventral truncate, angles not produced.

Guiana side of the Lower Amazons and banks of the Tapajos; also found at Cayenne.

37. *Colobothea concreta*, n. sp.

C. valde elongata, angustata, olivaceo-nigra, vertice linea unica, thorace vittis quatuor (quarum duabus externis usque ad oculos extensis) fulvo-cinereis; elytris basi thorace vix latioribus, apice truncatis, angulis externis spinosis, maculis cinereo-fulvis confluentibus dense vestitis, apice macula magna nigra. Long. 6–9 lin. ♂ ♀.

Head black, forehead streaked with tawny ashy, vertex with a single line; occiput on each side with a short line continuous with the external thoracic stripe, cheeks with a transverse stripe continuous with the supracoxal vitta. Antennæ black, sixth joint with a broad white ring. Thorax black, surface with four rather thick tawny-ashy lines, sides having only the supracoxal vitta. Elytra elongated, scarcely tapering; shoulders very oblique, and not at all prominent; apex truncate, external angles spinose; surface very thickly clothed with tawny or tawny-ashy spots, mostly confluent, but leaving a broad unspotted space at the apex, the latter margined with tawny white. Body beneath ashy, sides streaked with tawny; abdomen spotted with black. Legs black, ringed with tawny and grey.

♂. Terminal abdominal segment narrowed from the base; dorsal plate deeply notched; ventral plate semicircularly emarginated, with angles much produced. Anterior tarsi widely dilated and fringed.

♀. Terminal abdominal segment elongate and much narrowed; dorsal plate very obtuse, ventral truncated, angles slightly prominent.

Pará, and banks of the Tapajos.

38. *Colobothea bilineata*, n. sp.

C. valde elongata, postice vix attenuata, nigra, vertice linea unica, thorace lineis duabus usque ad oculos extensis, griseis; elytris griseis, nigro dense maculatis, apice macula magna nigra. Long. 7–10½ lin. ♂.

Head black, forehead streaked with ashy, vertex with a single line, occiput on each side with a short line continuous with the thoracic stripe; cheeks crossed by an ashy streak continuous with the supracoxal vitta. Antennæ black, sixth joint with a broad white ring. Thorax black, surface with only two ashy stripes, each continuous to the hind margin of the eye. Elytra elongate and scarcely tapering, very little broader at the base than the thorax, but shoulders prominent and conical; apex sinuate-truncate, the sutural angles being prominent and acute, the outer angles spinose; surface grey, thickly spotted with black; some of the spots confluent, and a large spot at the apex spotless; apex itself edged with white. Body beneath thinly clothed with grey; abdomen spotted with black. Legs black, ringed with grey.

♂. Terminal abdominal segment with the ventral plate semicircularly emarginated, angles acute; dorsal plate triangularly emarginated. Anterior tarsi dilated and fringed.

Ega and S. Paulo, Upper Amazons; rare.

39. *Colobothea lunulata*, Lucas.

Colobothea lunulata, Lucas, Voyage de Castelnau, Entomologie, p. 190, pl. 13. f. 5 (1857).
—— *Fryi*, Pascoe, Trans. Ent. Soc. vol. i. 41 (1861).

C. elongato-elliptica, nigra; vertice, thorace et elytris albo bivittatis, vittis longe ante apicem elytrorum convergentibus et annulo albo utrinque connexis. Long. $7\frac{1}{2}$–$9\frac{1}{2}$ lin. ♂ ♀.

This very distinct and handsome species was one of the commonest of its genus at Ega, on the trunks of fallen trees in the forest. The shoulders are extremely oblique and scarcely prominent, so that the insect has the form of an elongated ellipse truncated at the elytral end. The terminal abdominal segment in the male has both the dorsal and ventral plates truncated; in the female it is elongated, and the angles of the ventral plate are produced. The anterior male tarsi are widely dilated and fringed*.

* The following species of *Colobothea* have not yet been described:—

Colobothea hebraica (Chevrolat, MS.). Modice elongata, postice attenuata, fusco-nigra, griseo maculata. Caput nigrum, fronte griseo trilineata, occipite maculis duabus, genis vitta lata, griseis. Antennæ nigræ, articulis basi griseis. Thorax basi paulo angustatus, dorso linea abbreviata, disco utrinque maculis parvis, lateribus vitta latiuscula cinereo-griseis. Elytra apud humeros lata, deinde usque ad apices attenuata, truncaturæ angulis externis spinosis, supra fusco-nigra maculis cinereo-griseis (partim subagglomeratis) adspersa, apice haud pallide marginato. Corpus subtus griseum, lateribus cinereis, nigro maculatis. Pedes nigri, cinereo annulati. Fœminæ segmentum ultimum abdominale attenuatum; lamina dorsali apice rotundata, ventrali truncata, angulis productis. Long. 5–7 lin. ♀. *Hab.* in Mexico.

Colobothea fasciata. Modice elongata, postice valde attenuata, tomento brunneo fulvo-maculato vestita; elytris fascia lata nigro-velutina. Caput nigrum, fulvo-brunneo vestitum, vertice linea unica fulva. Antennæ breviores, nigræ, breviter setosæ, articulis basi griseis. Thorax fusco-niger, dorso vittis duabus fulvo-brunneis. Elytra apud humeros lata, deinde valde attenuata, apice sinuato-truncata, angulis externis longe spinosis, supra brunnea obscure fulvo maculata, pone medium fascia nigro-velutina apud dorsum dilatata, apices versus nigro liturata. Corpus subtus rufescens, medio nigricans. Pedes nigri. Maris segmentum ultimum ventrale subtumidum, apice obtuse truncatum; tarsi antici haud dilatati. Fœminæ segmentum ultimum paulo elongatum, valde attenuatum, lamina ventrali sinuato-truncata, haud spinosa. Long. 4–6. ♂ ♀. *Hab.* in Rio Janeiro.

Colobothea lateralis. Elongata, postice valde attenuata; corpore supra cinereo-ochraceo, rufo variegato, lateribus nigris. Caput nigrum, fronte fulvescente, vertice et maculis quatuor occipitalibus cinereis

Subtribe Lamiitæ.

Genus Tæniotes, Serv.

Serville, Ann. Soc. Ent. Fr. iv.

This well-known and handsome genus is the only one belonging to the typical Lamiaires found in the Amazonian forests, the allied genus *Ptychodes*, common in other parts of Tropical America, being absent from the low-lying Equatorial region. The other Tropical American representants of this subtribe, so rich in forms in the Old World (namely, *Plectodera, Hammoderus,* and *Deliathis*), seem to be confined to the northern portion of the zone—Central America, Mexico, and thence extending into the Southern States of North America.

1. *Tæniotes decoratus,* Castelnau.

Tæniotes decoratus, Casteln., Animaux articulés, ii. p. 479.

T. nigro-velutinus, capite fascia utrinque infra oculos, vitta laterali alteraque coronali per thoracem et scutellum continuata, maculisque rotundis elytrorum utrinque circa 13 læte flavis; corpore subtus vitta flava laterali: maris pedibus anticis vix elongatis, tarsis haud pilosis. Long. 13 lin. ♂ ♀.

I met with this fine species only in the neighbourhood of Pará, on felled trees in broad roads through the forest. The terminal ventral segment in both sexes is broadly truncated, with a distinct spine at each angle. M. Guérin-Méneville (Icon. Règne Animal, p. 243) believes this species to be the same as the *T. subocellatus* of Olivier (Ent. no. 67. pp. 69, 89, pl. 2. f. 12 *a, b*), and that the latter is founded on a worn or immature individual.

2. *Tæniotes D'Orbignyi,* Guérin.

Tæniotes D'Orbignyi, Guérin-Méneville, Icon. Règne Animal, p. 444.

T. nigro-velutinus, capite fascia utrinque infra oculos, vitta laterali, alteraque coronali per thoracem et scutellum continuata, vittaque elytrorum utrinque medio interrupta et maculiformi læte flavis; corpore subtus vitta flava laterali: maris pedibus anticis vix elongatis, tarsis haud pilosis. Long. 8–13 lin. ♂ ♀.

This species, originally discovered in the wooded plains of

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fulvo maculatis. Antennæ griseæ, articulis apice nigris. Thorax antice angustatus, dorso cinereo-ochraceus, rufo maculatus, lateribus nigris. Elytra apud humeros lata, deinde attenuata, apice truncata, angulis externis spinosis, supra cinereo-ochracea, rufo maculata, lateribus irregulariter nigris, nigredine ramos tres dentatos in discum emittente, his rufo marginatis. Corpus subtus cinereum, medio nigrum, segmentis primo et ultimo abdominalibus nigris. Fœminæ segmentum ultimum attenuatum, lamina ventrali truncata, dorsali medio emarginata. Long. $7\frac{1}{2}$ lin. ♀. *Hab.* in Brasilia.

Bolivia by M. D'Orbigny, was common on the Upper Amazons at Ega. The yellow (partially macular) stripe of the elytra varies a little in the degree in which it is broken up into spots; but it never forms a double row of distinct round spots from base to apex, as shown in *T. decoratus,* and can scarcely be considered a local form of the same stock.

3. *Tæniotes Amazonum,* Thomson.

Tæniotes Amazonum, Thoms. Archives Entomologiques, i. p. 172.

T. niger, capite linea curvata frontali, vitta utrinque laterali, altera coronali per thoracem scutellum et elytros continuata (hic dentata) pallide flavis; thorace utrinque linea tenuissima grisea; elytris maculis parvis numerosis, quarum duabus vel tribus discoidalibus majoribus, flavis; corpore subtus vitta flava laterali: maris pedibus anticis valde elongatis, tibiis curvatis, tarsis haud pilosis. Long. 9–16 lin. ♂ ♀.

A common insect in the forest at Ega, on the Upper Amazons. It is probably a local form of *T. scalaris,* Fabr., but differs much from the description given by that author. The terminal ventral plate is formed as in *T. decoratus.*

4. *Tæniotes farinosus,* Linnæus.

Cerambyx farinosus, Linn. Syst. Nat. ii. 626. 24; Oliv. Ent. lxvii. p. 50, f. 46 *a.*

—— *pulverulentus,* Oliv. Ent. lxvii. p. 50, f. 46 *b.*

T. niger, griseo vestitus; capite thoraceque lineis tenuibus tribus, elytris maculis numerosis parvis, flavo-griseis, his apice acutis; corpore subtus flavo maculato: maris pedibus anticis valde elongatis, tibiis curvatis, tarsis hirsutis. Long. 13 lin. ♂.

This species was a rare one in the Amazons region, and found only in the dry forests of the Tapajos. The spines of the terminal ventral segment are more elongated than in the other species.

Subtribe Oncideritæ.

Group *Onciderinæ.*

Genus Hypselomus, Perty.

Perty, Delectus Anim. Articul. Brasil. p. 95 (1830–34).

Syn. *Hypsioma,* Serv. Ann. Soc. Ent. Fr. p. 38 (1835).

This genus is distinguished from its allies by its short subtrigonal form of body, with projecting and often acute shoulders of the elytra. The claw-joint of the tarsi is not so much elongated as in *Oncideres,* or even *Clytemnestra.* It is very closely allied to the latter genus, but is distinguishable at once by the abrupt clavate form of the basal joint of the antennæ and the curved shape of the third. The males of most species have a short, slender, curved joint at the tip of the eleventh joint of the antennæ, which is sometimes visible (but much smaller) in the female.

1. *Hypselomus basalis*, Thomson.

Hypsioma basalis, Thomson, Classif. des Cérambyc. p. 117.

H. modice elongatus, brunneus; capite, thorace et elytrorum parte antica rufescenti-ochraceis; summa fronte acute bituberculata; antennis nigris, basi rufescenti-ochraceis, articulis cæteris basi rufescentibus; elytris basi utrinque vix elevatis, nigro tuberculatis humeris, apice nigris; abdomine lateribus rufo vittatis; pedibus nigricantibus, tibiis compressis, posticis (♂) apice dilatatis. Long. 6–9 lin. ♂ ♀.

A common insect throughout the Amazons region, being found, like the rest of the species, on dead branches, closely adhering to them, and gnawing the bark and wood all round, until the bough is sometimes severed. The face and parts of the mouth are much elongated and directed a little backwards between the anterior haunches, so that when the legs are extended, grasping a branch, the jaws are in a good position to gnaw effectually. The supplementary joint of the antennæ is very conspicuous in the males of this species.

2. *Hypselomus picticornis*, n. sp.

H. suboblongus, brunneus, elytris fascia obliqua indistincta pallidiore; antennis brunneis, articulo 2do toto et cæteris basi rufescentibus; elytris basi haud tuberculatis, humeris oblique conicis modice productis. Long. 7 lin. ♀.

Head brown, forehead near base of antennæ with two very small conical tubercles. Antennæ about the length of the body, setose beneath; basal joint strongly and abruptly clavate, third much bent, dark brown; second joint, basal half of third, and bases of each remaining joint pallid-reddish. Thorax scarcely uneven on the surface, uniform dingy brown. Elytra oblong trigonal; shoulders moderately prominent, and thence gradually narrowed to the apex, which is broadly rounded; surface convex; centrobasal ridges not at all prominent, and quite destitute of tubercles, the basal half of the elytra being simply punctured. Body beneath rufescent tawny, centre of abdomen black; legs brown, claw-joints of tarsi with their basal halves pale reddish.

Ega; rare.

3. *Hypselomus Amazonicus*, Thomson.

Hypsioma Amazonica, Thomson, Classif. des Céramb. p. 119.

H. convexus, brunneus; elytris humeris conicis, subuncinatis, pone medium fascia irregulari pallidiore, deinde ad apices pallide marmoratis; antennis articulis basi rufescentibus: maris tibiis posticis apice valde dilatato-compressis. Long. 9 lin. ♂ ♀.

Closely allied to *H. picticornis*, but larger and darker, with the elytra behind the middle much more variegated with pale ashy brown, and the conical protuberances of the shoulders strongly curved anteriorly. The antennæ are coloured as in *H. picticornis*, the second and basal half of the third, with bases of the remaining joints being pale reddish. The underside of the body is tawny brown, with the centre of the abdomen black. The elytra are smoothly and strongly convex from base to apex, without any trace of centrobasal ridge or tubercles.

Ega, Upper Amazons.

4. *Hypselomus dimidiatus*, n. sp.

H. modice convexus, fuscus, fulvo irroratus; elytris apud medium ochraceo fasciatis, deinde usque ad apices pallide ochraceo-brunneis fusco striatis et maculatis; thorace supra quinquetuberculato, lateribus acute tuberculatis. Long. 6–7 lin. ♂ ♀.

Head dingy brown. Antennæ dull brown, base of each joint, from the third, pallid-reddish. Thorax uneven, disk on each side with two prominent tubercles, and dorsal line elevated behind into a ridge, sides each with an acute tubercle; dingy brown. Elytra with very prominent shoulders, the anterior side of the subconical projection oblique; centrobasal ridges slightly elevated, but not tuberculated; dark brown, sprinkled with fulvous; behind the middle a pale oblique belt or broad triangular spot darker in the middle, thence to the apex light brown with darker lines and spots. Body beneath tawny brown, middle of abdomen black. Legs black, apex of thighs fulvous, claw-joint red, apex black. Posterior tibiæ in the male dilated at the apex; supplementary antennal joint in the same sex very short or wanting.

Ega. Rather variable in the colour of the posterior part of the elytra, the pale belt being sometimes extended into a large triangular patch, and sometimes blended with the pale-brown shade of the apical half of the wing-cases. The species seems to be very closely allied to *H. subfasciata*, Thomson (Classif. des Céramb. p. 118).

5. *Hypselomus rodens*, n. sp.

H. oblongus, nigro-fuscus, carneo-fulvo strigatus; thorace supra haud tuberculato; elytris humeris apice truncatis, postice uncinatis, pone medium fascia obliqua pallida. Long. 6 lin. ♀.

Head dingy black, crown sprinkled with reddish tawny. Antennæ black, sprinkled with tawny; base of each joint, from the fourth, pale. Thorax convex above, and free from tubercles, sides with an inconspicuous tubercle. Elytra oblong, shoulders prominent, but the apex of the cone largely truncated, with the posterior edge of the truncature projecting; surface coarsely punctured, blackish, streaked with reddish tawny, behind the middle tawny streaked with black, the tawny part separated from the anterior darker portion by a pale-ochreous fascia. Body beneath tawny, middle of abdomen black. Legs tawny, sprinkled with black, base of claw-joint reddish.

Pará.

[To be continued.]

XI.—*On the Occurrence of* Limopsis Belcheri, Corbula sulcata, *and some other recent Shells in the fossil state in Miocene Tertiary Beds near Melbourne.* By Frederick M'Coy, Professor of Natural Science in the University of Melbourne, and Director of the Melbourne National Museum, &c.

Having occupied myself lately, in my capacity of Palæontologist to the Geological Survey of Victoria, with the investigation of the Tertiary fossils collected by the Survey Staff from the strata of Bird-Rock Bluff, near the mouth of Spring Creek, about fifteen miles south of Geelong, I was much struck with the geographical distribution of the very few recent species found associated with the large majority of extinct species in a rich fossil fauna unmistakeably of the Lower Miocene age. The whole facies of the fossil contents of these beds resembles closely that of the Lower Miocene beds of Doberg (near Bünde, Westphalia), Malta, and some other European beds of the same age, as well as the so-called Upper Eocene North-American beds near Vicksburg on the Mississippi; and many of the genera, as well as the great majority of the species, are extinct. Amongst the extinct genera of shells, *Aturia* amongst the *Nautili* may be mentioned as conspicuous; and amongst Fishes, *Carcharodon* may be mentioned as an abundant Upper Eocene and Miocene genus of Sharks, not more than one species of which is found in our present seas, represented by the two best-known and most widely distributed Eocene and Miocene species found abundantly in such strata in England, Germany, and other parts of continental Europe, and in North America, namely, the *Carcharodon megalodon* (Ag.), specimens of which occur in our Spring-Creek beds (though not very commonly) perfectly identical with those from Malta or England, or the supposed Eocene beds of South Carolina, or the Miocene beds of Virginia and Maryland,—and the *Carcharodon angustidens* (Ag.), which occurs abundantly in our Australian beds so perfectly identical with specimens from the Lower Miocene of Doberg near Bünde, that, when compared side by side, it is impossible to distinguish them by the slightest difference; and as this species, according to Prof. Agassiz's recently published opinion, includes the Sheppey London-Clay *C. Toliapicus* amongst other varieties, I need only say that the best-marked Eocene and Miocene varieties found in Europe and America are perfectly represented, on comparison of specimens, by the different varieties in our Bird-Rock Bluff beds.

It is, I think, a very curious result of the careful comparison I have made between the fossil species of the Bird-Rock Bluff Mollusca and their nearest allies, that I can with certainty announce one of the commonest of them to be specifically identical with the *Limopsis Belcheri* of Adams and Reeve, of which the few known specimens were brought up alive from a prodigious depth by Admiral Belcher, off the Cape of Good Hope. The identification, I should say, does not rest on an examination of the published figure and description, which would not have been sufficient for the purpose, but, having been fortunate enough to procure a living specimen for the National Museum which I take a pleasure in forming during my residence in Melbourne, I have perfectly satisfied myself of the complete identity of our Miocene Tertiary abundant shell with the hitherto very rare recent one by direct comparison.

The *Limopsis aurita* (Sassi), perfectly identical with specimens which I have used for comparison from the Coralline Crag of Suffolk and many Miocene localities in Germany (which Mr. Jeffreys has lately dredged from 85 fathoms off Unst, in Shetland), is also common, though not so abundant in the Australian beds as the *L. Belcheri*.

The third living species of the *Arcidæ* in these beds is the *Pectunculus laticostatus* (Quoy & Gaimard) of New Zealand, occurring just as abundantly as the others.

The last bivalve I shall mention in this communication is an extremely abundant *Corbula*, which I can safely pronounce identical with the *C. sulcata* now living on the west coast of Africa. Lest it might be supposed that, judging from figures or descriptions, I had mistaken the North-east Australian *Corbula tunicata* or other allied forms for the *C. sulcata*, I should state that this is not so, but that, in working out the palæontology of our Australian deposits, I have thought it my duty to science to take the precaution of procuring every recent species I refer to for comparison before assuming an identity.

The commonest *Dentalium* in these beds I believe to be a mere variety of the Upper Eocene *D. Mississippiensis* (Conrad) from Vicksburg.

Melbourne, May 25, 1865.

XII.—*Observations on Raphides and other Crystals in Plants.* By George Gulliver, F.R.S.

[Continued from vol. xv. p. 458.]

The object of this paper being to show how the order Vitaceæ differs, in the possession of the character of raphis-bearing, from its allies, they will here follow as enumerated by Prof. Lindley.

Droseraceæ.—Dried specimens of *Drosera rotundifolia* and *D. anglica*: no raphides.

Fumariaceæ.—Of these were examined fresh plants of *Fumaria officinalis* and another English species, *Dielytra spectabilis*, and *Corydalis*, sp., in none of which could raphides be detected.

Berberidaceæ.—Leaves and fruit of *Berberis vulgaris, B. Japonica, B. Darwinii, B. dulcis, B. aquifolia*, and leaves and ovaries of *Epimedium alpinum, E. macranthum*: no raphides in any of them; a few sphæraphides in the fruit of *Berberis vulgaris*.

Vitaceæ.—Raphides and other crystals in the Grape-vine have been long known (Edwin Quekett, Lindley's 'Introduction to Botany'); and I have already indicated that the character may pervade the whole order ('Annals,' Dec. 1863 and Jan. 1865). Lately I have repeated my former observations, and extended them to more species of this order and its allies. The Vitaceæ examined are *Cissus discolor, Vitis vinifera, V. odoratissima, V. apiifolia, Ampelopsis hederacea* and two other species, and two species of *Leea*. Every one of these plants afforded raphides and sphæraphides in more or less abundance. The *Leeæ*, though merely old dried fragments of leaves and flowers, exhibited the raphides and sphæraphides in abundance, the raphides often in bundles, and still more frequently swimming separately in the water on the object-plate. All the other Vitaceæ were fresh and healthy plants. In *Cissus*, the sprigs, tendrils, young leaves, and stipules all abound in raphides, some within short oval-shaped cells; there were also other cells, longer, much tougher, and narrower than the former, pointed or nipple-shaped at the ends, and containing raphis-like objects. Whether these be true raphides requires further examination to determine; for they are very fine and fragile, and (unlike the obvious raphides of this plant) difficult to separate from each other and from their cells. They are common, with the regular raphidian cells, in the leaves, and especially plentiful in the thick base of the stipules.

Pittosporaceæ.—Fresh leaves and twigs of *Pittosporum undulatum* and *P. tobira*: some sphæraphides in the leaves and mesophlœum, but no raphides. Dried fragments of leaves and flowers of *Bursaria spinosa, Marianthus candidus, M.* sp., and *Cheiranthera linearis*: a few sphæraphides in each of these plants, but no raphides. Fresh leaves of *Sollya heterophylla*: no raphides, but many sphæraphides. In short, these Pittosporaceæ afford sphæraphides, but are quite devoid of raphides.

Olacaceæ.—Dried leaves of *Olax scandens, O. stricta, Liriosma*, sp., *Heisteria cyanocarpa, Ximenia americana, Icacina senegalensis, Aphodytes*, sp., *Gomphandra axillaris, Pogopetalum aculeatum*, and *Cansjera scandens*: all these Olacaceæ and Icacinaceæ devoid of raphides.

Araliaceæ and *Rhamnaceæ.*—Of these orders the following plants were examined, and none of them afforded any raphides: *Aralia leptophylla, A. nudicaulis, Hedera Helix, Rhamnus Alaternus, Ceanothus azureus*, and *C. divaricatus.* Some of them abound in sphæraphides, as may be well seen in *Aralia* ('Annals,' April 1864) and *Rhamnus.* In the last plant they form a beautiful sphæraphid tissue, of which there is a plate from *Lythrum* in the 'Annals' for September 1863, pl. IV. fig. 13. This tissue occurs in the leaves, liber, and between the medullary rays and alburnum of *Rhamnus.*

On the present occasion negative results of searches for raphides are detailed more particularly than has been usual in these papers, in order that botanists may estimate the observations on Vitaceæ at their true value, and more especially as Mr. W. H. Baxter has kindly afforded me the means of making comparative examinations of all the above-named Leeæ, Pittosporaceæ, and Olacaceæ.

Excepting the little order Cyrillaceæ, of which I have yet seen no member, the first six orders in this paper form the whole of Prof. Lindley's Berberal Alliance, in which the order Vitaceæ occupies the central place lineally. The affinities of this order he thus indicates:—

Araliaceæ.
Berberidaceæ.—VITACEÆ.—Pittosporaceæ.
Rhamnaceæ.

The result of the present observations is remarkable. No plant of the central order examined without finding raphides; while, on the contrary, these were never found at all in any examination of its allies and surrounding orders. Thus Vitaceæ must surely be entitled to the character of a raphis-bearing order. But whether this character will always certainly prove diagnostic, as now seems probable, can only be decided after a complete examination of all the orders in question. So novel is this subject of raphides as natural characters in systematic botany.

Balsaminaceæ, Galiaceæ, Onagraceæ, Phytolaccaceæ, and *Nyctaginaceæ.*—And the same remark applies to these raphis-bearing Exogens, although my observations in the 'Annals' for July

1864, and many since made, have convinced me that, so far as regards the British flora, the raphidian diagnosis is not only quite true, but very natural. Yet, as formerly noticed, this character might more easily escape attention in Galiaceæ than in the other orders.

Finally, the propriety of retaining *Leea* under Vitaceæ has been disputed; and the present observations will tend to support the conclusion of those botanists who, with Adrien de Jussieu and Lindley, persist that this genus ought not to be separated from Vitaceæ.

Edenbridge, July 17, 1865.

[To be continued.]

XIII.—*On the Operculum and its Mantle* (lobus operculigerus, pomatochlamys). By Dr. O. A. L. Mörch.

Adanson* regarded the operculum of univalve shells as answering to the second valve of the bivalves—an opinion maintained by Oken and lately by Dr. Gray† and Prof. Macdonald‡. In this point of view the *lobus operculigerus* (Lovén), or "the opercular mantle," would correspond with one moiety of the mantle of bivalves.

Prof. Lovén regards the bivalve shell as produced by a cloven or bipartite mantle, and the operculum as homologous with the byssus.

Prof. Keferstein§ supports Lovén's opinion, considering the slit in *Emarginula* and *Tenagodus* as a trace of division. The porous slit of *Haliotis, Tenagodus,* &c., corresponds with the notch or channel in canaliferous shells (*Entostomata,* Blv.). There is, however, a more important trace of division in many univalves—for instance, the dentated furrow in *Monoceros, Pseudoliva, Ancillaria,* and some species of *Murex* (*Cerastes*), but chiefly in *Carinaria.* In this last genus the keel is formed by the two sides of the shell, which are pressed against each other in such manner that a piece of paper can be introduced into the middle of the keel as far as the fœtal shell. In *Onustus* (Humphr.) the two sides are cemented together, but the union can be clearly seen. *Akera bullata* shows something similar in

* Hist. Naturelle du Sénégal.

† J. E. Gray "On the Operculum of Gasteropodous Mollusca, and an attempt to prove that it is homologous or identical with the second valve of Conchifera" (Annals and Mag. of Nat. Hist. ser. 2. v. p. 476; and Phil. Trans. 1833).

‡ "On the Homologies of the so-called univalve shell and its Operculum" (Proc. Linn. Soc. v. 1860).

§ Bronn u. Keferstein, Die Klassen u. Ordnungen des Thierreichs.

the line of suture. The shell of the young *Dentalium* is also split throughout its whole length. The best proof of analogy would perhaps be the carapace of *Limnadia* and *Estheria*, among Crustacea, which is bivalve, while that of closely allied genera, as *Nebalia* and *Apus*, is univalve.

Pinna saccata, L., has both valves united in the adult state; but it has never been observed that the two valves have their origin in the division of a single shell: on the contrary, the division is manifest in the larval shell.

Nearly all organs are double in the Acephala: there are thus two ovaria with distinct external orifices, two kidneys (organs of Bojanus) with distinct external orifices, two pairs of labial palpi, two pairs of gills. It seems to me therefore probable that the Acephala also have two shells originating in the same way as the other organs above mentioned. This duplicity of the organs is very indistinct among the univalves, as in *Dentalium* and *Chiton*, and it becomes rarer and rarer among the higher Mollusca.

The larva (*Glochidium*) of *Anodonta* has in each shell a distinct byssus-bundle ("cordons ombilicaux," Quatrefages*), and a distinct intestinal channel with distinct oral orifices†; in other words, it is a true *Diplozoon* in the larval state. This curious fact is perhaps not quite solitary among Mollusca. Thus, according to Koren and Danielssen‡, several eggs (from 1 to 100) are, in *Buccinum undatum*, united to form a single embryo. The difference is chiefly that in the much lower mollusk, *Anodonta*, the amalgamation takes place in a more advanced state of the embryos, so that some organs, the intestinal channel and the byssus, are united into one, and the other organs are kept in their original condition. The animal would then be composed of two "zonites," reminding us of the "egg-producing process" of *Hydra*, regarded by Prof. Huxley as a reduced individual, or an organ homologous with an individual§. An Acephalous mollusk must therefore be considered an individual in the same sense as a plant or flower composed of individuals (leaves) reduced to organs. The question is, Does the opercular lobe with its operculum represent one lobe of the mantle and its shell in the bivalves, or is it something different?

The epipodial line of Huxley ("manteau inférieur," Lacaze-

* Ann. des Sc. Nat. tom. iv. (1835) p. 283, and tom. v. (1836) p. 321, &c.

† Von Siebold, Vergleichende Anatomie, Wirbellose Thiere, p. 294.

‡ Bidrag til Pectinibranchiernes Udviklingshistorie; "On the Development of *Buccinum undatum*" (Athenæum, 1852, p. 1066).

§ Lecture upon Animal Individuality, Royal Institution (Ann. Nat. Hist. ser. 2. vol. ix. p. 505).

Duthiers*) often produces *posteriorly* a shell (*operculum*) analogous to the shell of the true mantle; *laterally* it can be developed into fins, as in *Aplysia* and Gymnosomata (*Pneumodermon*, &c.), analogous to the pallial fins of the Cephalopoda; it can form a fimbriated or undulated edge, as in *Haliotis, Trochidæ, Elysiidæ,* and *Philine*†; it can form a siphon, as in Cephalopoda or in the American *Ampullariæ,* analogous to the mantle-siphon of *Buccinidæ*; perhaps it forms *anteriorly* the tentacula, ommatophores‡, and intertentacular lobes of *Trochidæ,* corresponding to the mantle-edge of *Pectines, Solenes, Galeomma,* &c. The epipodium is attached to the foot; but it is not quite clear that it is a part of it. One author considers the foot homologous with the adductor muscle of the Acephala; but it must be remembered that the foot of the Acephala is homologous with that of the Gasteropoda. Dr. Gray regards the muscles which connect the columella and the operculum as homologous with the adductor muscles of bivalves.

Prof. Lovén considers the operculum homologous with the byssus; but, as this organ is found in several univalves, even in those with an operculum, this opinion cannot be adopted, as was pointed out by Prof. Macdonald. It must also be remembered that it is not known how the byssus of univalves is formed. Swainson (Treatise, p. 186, f. 29) represents *Cyclostoma suspensum*, Gould, and A. Adams (Voyage of Samarang, p. 44, t. 13. f. 3), *Cerithidea obtusa*, Lam., as attached to a branch by a byssus during the æstivation. According to Macdonald, *Planaxis*, and to Gray, *Rissoa parva*, spin a byssus. It is possible, from its resemblance to that of *Mytilus*, that the deep posterior groove in the footsole of *Cerithiopsis tubercularis* (Forb. & Hanl. Brit. Moll.) produces the byssus. The nature of the slimy thread of *Litiopa*, too, is very doubtful; perhaps it only corresponds to the thread of *Limax filans*, Hoy. The "float" of *Ianthina*, which attaches the animal to the surface of the water, is probably homologous with the byssus §, judging from its ventral position ||.

* "Mémoire sur le Système nerveux de l'*Haliotide*" (Ann. des Sc. Nat. Zoolog. 1858, sér. 4. vol. xii. p. 226).

† Mörch, Journal de Conchyliologie, 1863, p. 39.

‡ The double-eyed monstrosities of *Emarginula* and *Patella vulgata*, the latter of which, with a double tentacle, described by Fischer, are not without importance for this comparison (Journal de Conchyliol. tom. v. p. 230, tom. xii. p. 89). Lacaze-Duthiers, "Sur les Monstres doubles de la *Bullæa aperta*" (Compt. Rend. Acad. Sc. tome xli. 1855, pp. 1247–1250).

§ Mörch, Journal de Conchyliologie, 1860, Juillet.

Macdonald, "On the Homologies, &c." (Proc. Linn. Soc. vol. v. Nov. 14, 1860, p. 209).

|| In the young *Cyclas* the byssus has, however, a posterior position.

It has a remarkable analogy to the singular vesicular development of the cement-tissue of the peduncle of *Lepas* (*Dosima*) *fascicularis*, Sol. & Ellis*.

The byssus in the Acephala is generally corneous; but in *Anomia* it forms a calcareous plate (the plug), possibly corresponding with the opercular valve in *Hipponyx* and *Lithedaphus*, which may be considered a calcareous secretion of the ventral face of the foot. The epiphragm of the *Helices* would also be homologous, if this plate be really a secretion of the foot, as M. P. Fischer states; but it is probably secreted by the mantle, like the septa of *Vermeti*, *Runcina decollata*, &c. To this category belong probably the tubes of *Teredo*, *Gastrochæna*, *Clavagella*, &c., and the accessorial valves of *Pholades*. The two pallets in *Teredo*, which have a striking analogy to the opercula of some *Serpulæ* (*Hydroides norvegica*, Gunn.), might perhaps be compared with the posterior supplementary shells of *Talona*.

The shell of *Argonauta*, considered by Mr. Adams to be homologous with the egg-cases of *Murex*, agrees with *Nautilus* in its position and the black colour of the carina; but it seems to be formed by the arms only. Its homology is therefore uncertain. It appears that all parts of the skin in Mollusca can secrete a shell. There are likewise found calcareous spicula or grains in all parts of the body, in the clypeus in Gymnobranchia, the tentacula of *Pleurobranchus*, and even in the intestinal channel. In the *Bullidæ* and some Pellibranchiata there are thick calcareous plates in the stomach.

Note. The ligament is a thickening of the epidermis, which is part of the skin of the animal, but not specially of the shell. This seems evident to me from examining, for instance, a specimen of *Mya truncata* in spirit. The connexion of the two valves by the ligament proves, therefore, not that the valves were originally *one* only, but that the bivalve shell is formed in the same manner as the two lateral mandibles of the *Æolidæ*.

XIV.—*Notes on some Amphibians.*

By John Hogg, M.A., F.R.S., F.L.S. &c.

Dr. J. E. Gray, in his paper "On the Clawed Toads (*Dactylethra*) of Africa," published in the 'Annals and Magazine of Natural History' (vol. xv. p. 334), well observes, that this kind has "large webbed hinder feet, some of the toes of which are armed with very distinct horny black claws—a peculiarity of structure that is quite an exception amongst the Batrachian animals."

* Darwin's 'Cirripeds,' p. 96.

Cuvier, in the second edition of his 'Règne Animal' (1829), bestowed the generic name of *Dactylethra* on the only one then known, which had been discovered in South Africa, and which is now called *D. capensis.*

The Greek appellation of the genus, *δακτυλήθρα*, properly means a "case" or "sheath for the finger," *i. e.* a *thimble*; and it is clearly a very correct one for the sort of *horny case* which covers *three* of the five toes of this curious animal. Dr. Gray describes it as a "black horny claw, which covers the last joint of the three outer toes and the spur of the hind foot."

The same zoologist further describes this Toad as having its skin "scattered with small white lines disposed in a symmetrical manner, which, when examined by a magnifier of rather high power, display linear series of close minute perforations or glandular openings."

These small perforations or pores are probably of use in exuding, under a dry and hot atmosphere, a fluid that is serviceable in moistening the naked skin, which, in several species of Frog, is known to perform the function of breathing. This cutaneous respiration possessed by some of the Amphibians was, I believe, first made known by Dr. Edwards, in Paris, more than a quarter of a century ago; but how far that function may assist, or be employed in lieu of, pulmonary respiration I have not been able to learn.

When I wrote my first paper on the "Classifications of the Amphibia," which was published in the 'Magazine of Natural History' (n. s. vol. iii. p. 265, 1839), I kept the genus *Dactylethra* apart from the genus *Pipa*, and took the *D. capensis* as the type of a distinct family, which I termed *Dactylethridæ*. For so doing, more than twenty-seven years since, several zoologists, whose classifications were not in accordance with mine, censured me; but I am now very happy to find that Dr. Gray has adopted (p. 340) the family "Dactylethridæ" as an established one. Although this distinguished naturalist does not assign the author to this family, yet by consulting Prof. Agassiz's 'Nomenclator Zoologicus,' it will be seen that I was the originator of it.

The entries in that useful work are as follow:—

In the 'Index Universalis' (p. 115), "Dactylethridæ, *Hogg*, Rept. Ad. 1838."

Again, in the 'Addenda' to 'Reptilia' (p. 3), "Dactylethridæ, *Hogg*, Ann. Nat. Hist. i. 1838. *Dactylethra. Pipæ.*"

And should the animal named by Dr. Gray *Silurana* prove a distinct genus, and not the larval or tadpole-state of a species of *Dactylethra*, it will constitute another interesting genus in the family Dactylethridæ.

I will now make a few remarks on the Axolotl of Mexico—named by Cuvier *Axolotus Mexicanus,* and by myself *Siredon pisciformis* (1838).

Dr. Gray, in his very useful 'Catalogue of the Specimens of Amphibia in the British Museum,' part 2, printed in 1850 (wherein he has done my labours justice), places this remarkable Amphibian in his suborder II. *Gradientia,* and family III. *Plethodontidæ;* and he says at p. 49, that it "has only been observed in its larva state." He also there cites this passage from Baird (Journ. A. N. S. Phil. 1849, p. 292):—"It (*Siredon*) so much resembles the larva of *Ambystoma punctata* in both external form and internal structure, that I cannot but believe it to be the *larva* of some gigantic species of this genus. It differs from all known *Perennibranchiates* (the *Manentibranchians,* mihi) in possessing the larval character of the gular or opercular flap, this being unattached to the subjacent integuments, and free to the extremity of the chin. The non-discovery of the *adult* is no argument against its existence."

Also Charles Bonaparte, Prince of Musignano, in the same year (1850), in his Classification of the Amphibia, considered the *Siredon* as the mere *tadpole* of a Salamandra or Batrachian.

Although Dr. Gray, with his usual accuracy, has referred to "*Home,* Phil. Trans. 1824," yet he seems not to have fully examined that memoir, and to have overlooked the following passage which I wrote in 1838 respecting it:—

"Latreille places the Axolotl (*Siredon pisciformis*) amongst the Caducibranchious Amphibia; but it had been *previously discovered* that its *branchiæ* are *persistent*; the details of which may be learnt from a paper by Sir Everard Home, published in the 'Philosophical Transactions' for the year 1824, p. 419. One of the accompanying plates accurately represents the external *gills* as still *remaining* on a female Axolotl when in the state of possessing fully developed *ovaria,* and just before the *ova* are shed; thereby proving her to be a *perfect* animal. Consequently Latreille should have stationed the Axolotl next to the *Proteus* in his second order." This fact has been fully confirmed; and the *permanency* of the external *gills* throughout the life of the animal is now well determined. It is frequent in the lake near the city of Mexico; and the common people considering it a *fish* (as indeed some naturalists are inclined to do), sell it as such; and, as Hernandez says, "salubre et gratum præbet alimentum." There seem to me to be three or four species which are not yet correctly known or distinguished.

M. Duméril has very recently given an account of the *hatching* of the young from the *ova* of the Mexican species (*Siredon pisciformis*) in the menagerie of the Museum of Natural History in Paris. The *ovum* is like that of all the Batrachians. The gills in the tadpole of this species consist of three short appendages, which are cylindric and only slightly ramified.

For a full description of the interesting development of the tadpole from the egg of this Amphibian, see the last April Number (16) of the 'Comptes Rendus,' tome lx. p. 765.

I may, however, note that it appears that the time required for the hatching of the tadpole of the Axolotl is about *one month* —the same as that, in our ordinary springs, for the birth of the common tadpole.

This genus was placed, in my modified Branchial Classification, in 1841, thus:—

Class IV. *AMPHIBIA.*

Subclass II. *Diplopneumena.*

Order III. MANENTIBRANCHIA.

Tribe I. **RAMIBRANCHIA.**

Family II. **Proteidæ.**

Genus SIREDON.

And I do not think it necessary for me to alter its position, even after a period of twenty-four years.

But, before I conclude, I must point out *two errors* in Prof. Agassiz's valuable 'Index Universalis.'

The *first* is in attributing to me the word *Cadnabranchia*, which I have never used. The entry at p. 56 stands thus:—

"Cadnabranchia, *Hogg*, Rept. Ad. 1838" (which he corrects to "*Caducibranchia*)." And he then inserts the following:—

"Caducibranchia, *Bonap.* Rept. 1831" (which he corrects to "V. *cadnabranchia*").

The word *Cadnabranchia* is, I conclude, only a misprint.

And the *second error* occurs at p. 310, as follows:—

"Proteidea, *Hogg*, Rept. Ad. 1841" (which he corrects to "*Proteoidæ*").

Now the term "Proteidea," which is seen at p. 355, Ann. & Mag. Nat. Hist.' (No. 45, July 1841), is not my own, but it is that of Prof. J. Müller: the original is published in Oken's 'Isis' (p. 710) for the year 1831; and a translation from the German, made by myself, is there inserted.

Norton House, Stockton-on-Tees.
July 11, 1865.

XV.—*Remarks on the Histology of two Specimens of* Rhynchopora Geinitziana, *De Verneuil, from near the River Oukhta, Province of Archangel, and belonging to the Collection of the Corps des Mines of St. Petersburg.* By Professor William King.

The specimens which are treated of in the present communication have been recently noticed by Dr. Carpenter* in connexion with a dispute which occurred between us in 1856. They were kindly submitted to our individual examination, at the time, by Mr. Davidson, who, on account of the light they seemed to throw on the histology of the *Rhynchonellidæ*, spared no labour in procuring the loan of them for the purpose stated.

Palæontologists will remember that, in a paper of mine, entitled "Notes on Permian Fossils," which appeared in the 'Annals and Magazine of Natural History' for March and April 1856, I asserted that the species to which the specimens belong is "as distinctly and regularly perforated" as any of the family *Terebratulidæ*; and that, on the contrary, Dr. Carpenter, in a letter published nearly twelve months afterwards, maintained that it has "*only pits upon the inner surface of the shell*"†.

Before proceeding further, I wish it to be understood that I have no desire to enter on a controversy with Dr. Carpenter in your pages: my object is solely to place on record, in a scientific journal like the 'Annals,' the observations which I made on the specimens in question ‡. Dr. Carpenter, I am fully aware, will also publish his observations on the same specimens—a proceeding which I shall be perfectly satisfied with, provided he confine himself to the main point at issue between us§. Should this be the case, it may be reasonably expected that the discussion will stimulate others, who have sufficiently favourable opportunities, to endeavour to determine which of us is right.

One of the specimens has a considerable portion of the umbone of the large valve broken off: the other is nearly perfect.

* See 'Reader' for July 8, p. 45.

† See 'Annals and Magazine of Natural History,' ser. 2. vol. xix. p. 214. Dr. Carpenter, however, had previously admitted, in a paper published in the 'Annals,' vol. xvii. p. 504, that my statement, as regards some German specimens, was correct, "so far as can be judged by the external appearance" of two which he had examined.

‡ My observations would have been published at the time they were made but for certain reasons, which it would be a waste of your valuable space to be occupied with: they will be stated, however, I expect, in an immediate number of the 'Reader.'

§ Dr. Carpenter will have ample opportunity of adding any other matters in the 'Reader,' in which he has already introduced a "personal discussion."

Neither specimen exhibits *any portions of an impression of the inner surface of the valves.*

1. *The specimen with the umbone of the large valve broken off.*— The outer or original surface of this specimen seems to have disappeared, while in some places it is obscured with foreign matter. In the former condition, the remaining test displays numerous black dots*. In a few places the specimen has been a little filed or cut down. The test that remains is, in several places, of *considerable thickness,* which is well exhibited on the fractured portion, where the umbone is broken off. At this part the black dots are seen (as represented in the surface-figure and longitudinal section, figs. 1 and 2) not only on the surfaces *a* and *c*, but also on the intermediate portion *b*. A broken part on the small valve, between the umbone and the anterior margin, also shows the test to be of considerable thickness; and in certain lights some of the black dots appeared as if they formed the terminations of fine hair-like lines passing down through its thickness. In no instance could I convince myself that they were "mere accidental results of infiltration," as maintained by Dr. Carpenter in one of his letters to me: their regularity completely forbids the idea. Black dots are nearly everywhere exhibited on the abraded surface of this valve: the exceptional cases will be noticed hereafter.

Fig. 1.

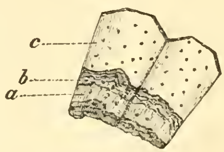
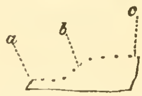


Fig. 2.



The observations stated completely prove, in my opinion, that the black dots are not simply "pits upon the internal surface of the shell;" or they ought not to be seen on the surface of every layer of tissue exposed: the whole of the layers, be it understood, form a series of considerable thickness. On the contrary, seen under the circumstances named, they cannot but represent broken transverse sections of tubular perforations, similar to those characteristic of the *Terebratulidæ,* and passing through the entire thickness of their shell-substance. I am disposed to regard their dark colour as due to the carbonaceous residuum of the membrane with which the perforations were originally occupied. The perforations of fossil *Terebratulidæ* are often filled with a similarly coloured matter: this is remarkably the case with some specimens before me of *Waldheimia ornithocephala,* which in this respect offer so striking an analogy to what is seen in the Permian species under consideration as to

* My observations, made with a Stanhope lens, were most successful when made in subdued sunlight.

render it a matter of surprise how its perforated character can be doubted.

From the surface of the large valve, a little in front, and on the left of the part where the umbone is broken, some shreds have been removed, apparently for microscopic examination. This portion of the specimen appears to be so much altered by mineralization as to render it, in my opinion, of *little or no service in settling the question at issue.* On those parts from which the shreds have been removed the black dots are distinctly visible; and the remaining test on which they are seen is of such a thickness as to completely preclude the idea of their being "only pits upon the internal surface of the shell."

2. *The nearly perfect specimen.*—This specimen is exceedingly valuable, inasmuch as it *decisively exhibits,* on the left side and on the umbone of the large valve, *the original or outer surface of the shell.* All the other parts are either obscured with foreign matter, or they show that portions of the shell-substance have been accidentally worn down or otherwise removed. The black dots are distinctly seen where the abrasion occurs; and in two or three places on the umbonal region of the small valve they are visible on at least three different layers, *a, b, c,* as represented in fig. 3. The parts marked with an asterisk consist of a mere crust of mineral matter, which appears to have replaced the original surface-layer. A portion of the right half of the anterior region of the shell, where the margins of the valves join, also exhibits black dots very distinctly, as represented in fig. 4: the test is evidently of considerable thickness at this part.

Fig. 3.

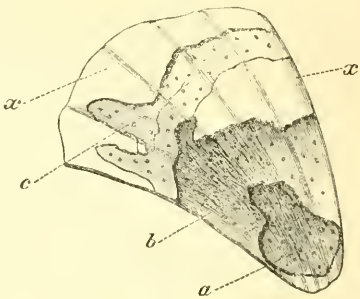
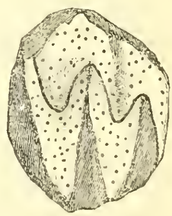


Fig. 4.

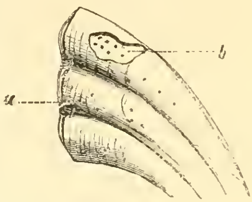


With respect to the umbone of the large valve, it does not, to me, show any black dots, either on the original surface or in the tissue beneath it. Whether this absence is due to the shell-substance of the umbone having undergone a molecular change or metamorphism, or has been produced by any other cause, are points on which I cannot offer any decided opinion*. I am

* To show the effects of fossilization, I may mention that the type

unwilling, however, to admit that the test is here in its original condition, because the surface-layer on the left side of the valve, passing on to its margin, displays a few faint black dots*; while the markings are distinctly visible on the third rib, where a small film-like portion of the original surface has been removed. Figure 5 is a representation of what has just been described,—*a* being the original surface, with a few faintly-marked black dots; and *b*, the abraded part, with others distinctly visible. This absence of what may now be termed tube-apertures on the umbone is paralleled in many specimens I have examined of *Terebratulidæ* belonging to the Carboniferous and Permian systems. I have also observed it in Jurassic specimens. In all these cases, mineralization was probably the obliterating agent. Furthermore the test at the umbonal portion of the small valve of the first-described specimen does not exhibit the black dots so well as the anterior region: their paucity on an old part of the shell is possibly due to senility.

Fig. 5.



On the whole, I cannot but regard these two specimens as completely confirming the view I took of the histology of the German fossils noticed under the head of *Rhynchonella Geinitziana*, in my paper already alluded to. The German specimens, however, exhibit the tubular perforations more decidedly than those from Russia, which is in favour of the latter having undergone a greater amount of metamorphism. I have nothing more to add to my description of the German examples: their perforated structure, which is correctly represented in the plate appended to my paper, is identical with that of a species of Silurian *Retzia*, specimens of which are now before me. In the latter the perforations are indicated by black dots, similar to those in the German specimens.

I therefore repeat, in conclusion, that the species under con-

specimen of the species, belonging to my friend M. de Verneuil, who kindly lent it me for examination, shows no black dots, nor any appearance of perforations; but its test has undoubtedly undergone a remarkable change, which has developed a concentric structure like that of Beekite, and which, in my opinion, has obliterated all indications of perforations. Another specimen, collected at Röpsen, near Gera, which I procured from Mr. Damon of Weymouth, differs remarkably, in the *apparent* absence of perforations, from some, procured at the same place, which I had noticed in the "Notes" already cited as published in the 'Annals.'

* I exclude some accidental *superficial* black specks, which might be confounded with the "black dots;" but the latter rather appear to be *in* the outer layer of tissue than *on* it.

sideration has both valves "as distinctly and regularly perforated as those of any *Terebratulidæ*." Either Dr. Carpenter or I must be labouring under some serious mistake. If the mistake be mine, I shall readily bow to correction; but I may be excused maintaining my view until the appearances on which it is founded are shown to support a contrary conclusion.

Belmont, near Galway, July 14, 1865.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

June 15, 1865.—Major-General Sabine, President, in the Chair.

"A Description of some Fossil Plants, showing Structure, found in the Lower Coal-seams of Lancashire and Yorkshire." By E. W. Binney, F.R.S.

The author stated that, although great attention has been devoted to the collection of the fossil remains of plants with which our coal-fields abound, the specimens are generally in very fragmentary and distorted conditions as they occur imbedded in the rocks in which they are entombed; but when they have been removed, cut into shape, and trimmed, and are seen in cabinets, they are in a far worse condition. This is as to their external forms and characters. When we come to examine their internal structure, and ascertain their true nature, we find still greater difficulties, from the rarity of specimens displaying both the external form and the internal structure of the original plant. It is often very difficult to decide which is the outside, different parts of the stem dividing and exposing varied surfaces which have been described as distinct genera of plants.

The specimens described were collected by the author himself, and taken out of the seams of coal, just as they occurred in the matrix in which they were found imbedded, by his own hands. This has enabled him to speak with certainty as to the condition and locality in which they were met with.

By the ingenuity of the late Mr. Nicol of Edinburgh, we were furnished with a beautiful method of slicing specimens of fossil wood so as to examine their internal structure. The late Mr. Witham, assisted by Mr. Nicol, first applied this successfully, and his work on the internal structure of fossil vegetables was published in 1833. In describing his specimens, he notices one which he designated *Anabathra pulcherrima*. This did not do much more than afford evidence of the internal vascular cylinder arranged in radiating series, somewhat similar to that described by Messrs. Lindley and Hutton as occurring in *Stigmaria ficoides*, in the third volume of the 'Fossil Flora.'

In 1839 M. Adolphe Brongniart published his truly valuable memoir, "Observations sur la structure intérieure du *Sigillaria ele-*

gans comparée à celle des *Lepidodendron* et des *Stigmaria* et à celle des végétaux vivants," in the Archives du Muséum d'Histoire Naturelle. His specimen of *Sigillaria elegans* was in very perfect preservation, and showed its external characters and internal structure in every portion except the pith and a broad part of the plant intervening betwixt the internal and external radiating cylinders. Up to this time nothing had been seen at all to be compared to M. Brongniart's specimen, and no person could have been better selected to describe and illustrate it. His memoir will always be considered one of the most valuable ever contributed on the fossil flora of the Carboniferous period.

In 1849, August Joseph Corda published his 'Beiträge zur Flora der Vorwelt,' a work of great labour and research. Amongst his numerous specimens, he describes and illustrates one of *Diploxylon cycadeoideum*, which, although not to be compared to M. Brongniart's specimen, still affords us valuable information, confirming some of that author's views rather than affording much more original information. All these last three specimens M. Brongniart, in his 'Tableau de végétaux fossiles considérés sous le point de vue de leur classification botanique et de leur distribution géologique' (published in 1847), classes as *Dicotylédones gymnospermes*, under the family of *Sigillarées*—amongst other plants his *Sigillaria elegans*, Mr. Witham's *Anabathra*, and Corda's *Diploxylon*.

In 1862 the author published, in the 'Quarterly Journal of the Geological Society' of that year, an account of specimens which confirmed the views of the three learned authors above named as to *Sigillaria* and *Diploxylon* being allied plants; but showed that their supposed pith or central axis was not composed of cellular tissue, but of different-sized vessels arranged without order, having their sides barred by transverse striæ like the internal vascular cylinders of *Sigillaria* and *Lepidodendron*. These specimens were in very perfect preservation, and showed the external as well as the internal characters of the plants.

All the above specimens were of comparatively small size, with the exception of that described by M. Corda, which, although it showed the external characters in a decorticated state, did not exhibit any outward resemblance to a plant allied to *Sigillaria* with large ribs and deep furrows so commonly met with in our coal-fields, but rather to plants allied to *Sigillaria elegans* and *Lepidodendron*.

In the present communication the author has described some specimens of larger size than those previously alluded to, and endeavoured to show that the *Sigillaria vascularis* with rhomboidal scars gradually passes as it grows older into a ribbed and furrowed *Sigillaria*, and that this singular plant not only possesses two woody cylinders arranged in radiating series, an internal and an external one divided by a zone of cellular tissue, both increasing on their outsides at the same time, but likewise has a central axis composed of hexagonal vessels, arranged without order, having all their sides marked with transverse striæ. Evidence is also adduced to show that *Sigillaria* dichotomizes in its branches something like *Lepidodendron*, and that, like the latter plant, it has a *Lepidostrobus* for its fructification. The outer cylinder in large *Sigillariæ* is composed of thick-walled quadrangular tubes or utricles arranged in radiating series, and exhibiting every appearance of the tree having been as hard-wooded as *Pinites*, but as yet no disks or striæ have been observed on the walls of the tubes. *Stigmaria* is now so generally considered to be the root of *Sigillaria*, that it is scarcely necessary to bring any further proof of this proposition; but specimens are described which prove by similarity of structure that the former is the root of the latter.

The chief specimens described in the memoir are eight in number, and were found in the lower divisions of the Lancashire and Yorkshire coal-measures, imbedded in calcareous nodules occurring in seams of coal.

No. 1, *Diploxylon cycadoideum*, was from the first-named district, and the same locality as the *Trigonocarpon*, described by Dr. J. D. Hooker, F.R.S., and the author, in a memoir on the structure of certain limestone nodules enclosed in seams of bituminous coal, with a description of some *Trigonocarpons* contained therein*; and the other seven (*Sigillaria vascularis*) were from the same seam of coal in the lower coal-measures in which the specimens described in a paper entitled "On some Fossil Plants showing Structure from the Lower Coal-measures of Lancashire" †, were met with, but from a different locality in Yorkshire.

"On the Fossil Mammals of Australia.—Part II. Description of an almost entire Skull of *Thylacoleo carnifex*, Ow." By Professor Owen, F.R.S. &c.

In this Part the author gives additional cranial and dental characters of the extinct marsupial carnivore, *Thylacoleo*, deduced from examination of better-preserved fossils, obtained from freshwater deposits in Darling Downs, Queensland, Australia.

The fore part of the skull, wanting in the first-described specimen from similar deposits in the province of Victoria, is preserved in the present specimen, showing the premaxillary bones, which are relatively larger than in placental felines. Each bone has three teeth, of which the foremost is developed into a tusk, the second and third being very small. There is no canine, or no tooth developed as a laniary in the maxillary bone. In the short extent of the alveolar border of this bone between the great carnassial molar and the maxillo-premaxillary suture, there are two approximate small round sockets, which lodged either one double-rooted tooth or two small single-rooted teeth. But dental development has mainly expended itself upon the perfection of a pair of laniary incisor tusks, in both upper and lower jaws, for piercing, tearing, and holding, and a pair of carnassials in both jaws for flesh-cutting. These, in the present specimen, closely agreed with those described in the former one, but were more worn: they are the largest examples of these

* Philosophical Transactions, 1855, p. 149.

† Quarterly Journal of the Geological Society of London for May 1862.

peculiarly modified shear-blade teeth in the mammalian class. Although the tusks are incisors—not, as in placental carnivora, canines —they possess, through the singular shortness of the facial part of the skull in *Thylacoleo*, the same mechanical advantage, in their proximity to the biting-power of the enormously developed temporal muscles, as in *Felis*. In the lower jaw there is, anterior to the carnassial, either a socket for a small double-rooted premolar, or two approximate sockets for as many single-rooted ones; and, as in the upper jaw, these cavities do not range in the same longitudinal line with the carnassial, but extend obliquely inward and forward, from the inner side of its fore part. There is no other alveolus in the lower jaw between the premolar one and that of the large lower tusk. The small 'tubercular' molar on the inner side of the hind end of the upper carnassial, and the two 'tuberculars' behind the lower carnassial, are indicated by their sockets in the present specimen. The author sums up, from acquired data, the dental formula of *Thylacoleo* as follows:—Incisors $\frac{3-3}{1-1}$, Canines $\frac{?}{?}$, Premolars $\frac{1-1}{1-1}$ or $\frac{2-2}{2-2}$, Carnassials $\frac{1-1}{1-1}$, Tuberculars $\frac{1-1}{2-2}$. Of the incisors, the foremost above are long and large tusks, like the pair below: of the other teeth, the carnassials, of unusually large size, are functioned as flesh-cutters, and the small tuberculars would serve for pounding gristle or tendon, as in *Felis*: the premolars indicated by sockets, and the small upper incisors, represent a remnant of the dental family type under its extreme adaptive modifications in *Thylacoleo*.

In the rest of the skull of the subject of the present Part, many particulars are yielded in addition to those deduced from the fragmentary fossils which indicate the genus. They confirm the deductions of the marsupial nature of the large extinct Australian carnivore, determine the alternative expressed in the author's first communication as to the homologies of the inferior tusks, and show that the genus *Thylacoleo* ranges, not with the series now including *Didelphys*, *Dasyurus*, and *Thylacynus*, but with the Diprotodont group, more eminently characteristic of the Australian continent, and which is at present represented by, or reduced to, the genera *Phascolarctos*, *Phalangista* with its subgenera, *Macropus* with its subgenera, and *Phascolomys*. The carnassial of *Thylacoleo*, in its large proportional size, absence of the tubercular part, and indications of subvertical groovings of the enamel, most closely resembles that tooth of the more ancient marsupial carnivore *Plagiaulax*, and is associated, in the lower jaw, as in that genus, with two small posterior tuberculars, one or two small premolars, and one large incisive tusk, similarly directed obliquely upward and forward. Few facts in mammalian palæontology are more interesting and suggestive than the occurrence in our hemisphere, during secondary geological periods, of Marsupial forms, which find their nearest representatives in existing or tertiary extinct *Marsupialia* of the continent of our Antipodes.

The present Part of the author's series of Papers on Extinct Australian Mammals is illustrated with drawings of the entire skull of the *Thylacoleo carnifex*.

ZOOLOGICAL SOCIETY.

Feb. 28, 1865.—Dr. J. E. Gray, F.R.S., in the Chair.

Description of a new Species of Porpoise in the Museum of Buenos Ayres. By Dr. H. Burmeister, F.M.Z.S.

Phocæna spinipinnis, sp. nov.

The animal has the general figure of the common European species, but differs entirely in the position of the dorsal fin, which is placed further backwards, and has spines on the upper edge.

The whole body is black, without any other colour, and the surface of the skin is transversely striated with fine excavated lines, like the inside of the human hand. The upper lip is somewhat shorter than the under, and the figure of the mouth, on both sides, rather curved behind; the length of the opening is $8\frac{1}{2}$ centim. on each side. From the hinder corner of the mouth the eye is distant 7 centim., and from the eye to the beginning of the pectoral fin is 16 centim. The opening of the nose has the form of a broad transverse ridge, somewhat curved forwards; it is 3 centim. broad, and 16 centim. distant from the top of the upper lip. The figure of the whole body is fusiform, but much more elongated behind than before; it measures from the top of the upper lip to the notch of the tail-fin 162 centim., and the circumference of the thickest part of the body, at the middle, is 102 centim.

Fig. 1.

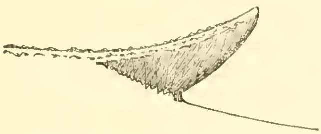
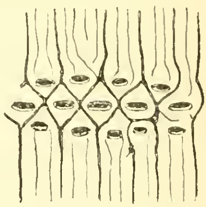


Fig. 2.



The distance from the nasal aperture to the beginning of the dorsal fin is 84 centim.; but the elevation of this fin is so gradual, that it is difficult to say exactly where it begins. The figure of the whole fin is triangular, somewhat curved forwards near the end, and its height 14 centim. (see fig. 1). This curving forwards is a peculiar and very distinguishing character of the species, as is also the clothing of the anterior margin of the fin with small spines. These spines are not different from the skin, but elevations of the skin itself, like small angles, of an elongated-oval form. I have figured part of the middle (where the spines are most elevated) as seen from above (see fig. 2), to show that every spine is surrounded by a ridge of the skin, and that from the sides of the lateral spines other ridges begin. Some small spines begin in the middle of the back, at the distance of 25 centim. in front of the fin, as a single line of moderate spines; but soon another line begins on each side, so that in the beginning of the fin there are already three lines of spines. These three lines are continued over the whole rounded anterior margin of the fin, and are augmented on both sides by other small spines irregularly scattered, so that the whole number of spine-lines in the middle of the fin is five. Towards the end of the fin they become smaller, and on the rounded tip of the fin there are no spines at all.

From the hinder margin of the dorsal fin to the notch of the tail-fin is 54 centim. The tail-fin is 39 centim. broad, and each fluke 20 centim. long on the anterior margin. This margin is somewhat curved backwards, and the hinder margin sinuated.

The underside of the body is somewhat more curved and extended than the upper side, and the tail more descending.

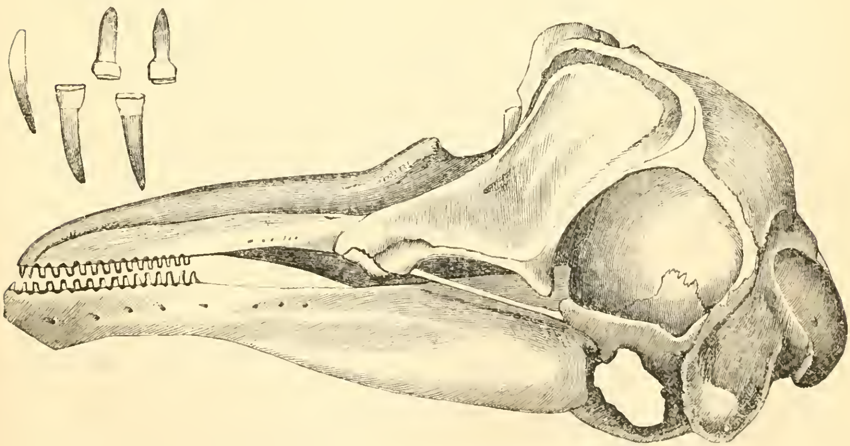
The anus is situated under the beginning of the dorsal fin, 70 centim. distant from the notch of the tail-fin.

The individual seems to be a very young one, because all vestiges of genital organs are wanting in the exterior. The anus has a dozen radial folds, of which the largest, 6 centim. long, runs forwards; all are very deep, and transversely ridged.

The pectoral fin is falcated, 26 centim. long and 10 broad. At its proximal end there are many fine ridges in the skin, and in the middle part are ridges indicating the finger-bones beneath.

The skull proves that the animal is a very young one, and that it has come perhaps only to half its natural size; because all the bones are very weak, not perfectly ossified, and the vomer entirely cartilaginous. It has the general figure of the skull of the European *Phocæna*, differing principally in the form of the hinder part of the intermaxillary bones, which is more abruptly elevated in this new species than in the European (see figs. 4 & 5).

Fig. 3. Fig. 4.

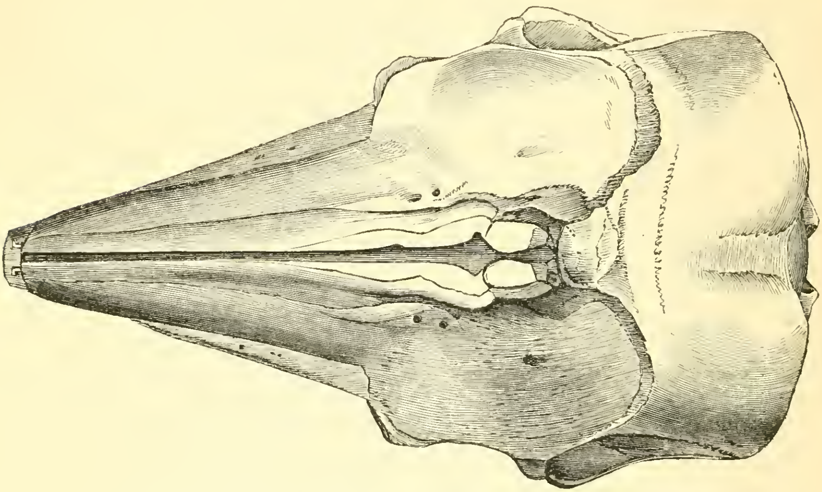


Side view of the skull of *Phocæna spinipinnis*, reduced one-third.

The upper jaw has sixteen small teeth, and the lower jaw seventeen, on each side, there being no vestige of an alveolar ridge behind them in either jaw. The first teeth are smaller and conical, the hinder broader and truncated, as seen in figures 3 & 4. This is another character distinguishing it from the European species; the skull of a young individual of the latter, which I examined, had twenty-four teeth in the upper jaw, and twenty-five in the lower, in both extending more towards the hinder part of the jaw than in the new species.

The specimen of *P. spinipinnis* which is preserved in the public Museum of Buenos Ayres, was captured in the mouth of the River

Fig. 5.



Skull of *Phocæna spinipinnis*, seen from above, reduced one-third.

Plata, and was afterwards exhibited in Buenos Ayres to the public, some years before I came to this country.

Length of the whole skull, 29 centim.

Breadth between the orbits, 17 centim.

Length of the external margin of the upper jaw, 12 centim.; of the lower jaw, 22 centim.

Note.—The tympanic bone is lost; the figure is therefore defective in this part.

On the Osteology of Microglossa Alecto.
By W. K. Parker, F.Z.S.

Having been busy of late with the study of the skull and its development in the Ostrich tribe, I am the more sensitive to the peculiar ornithic excellences of the Parrot family. Indeed, but for their *livery*, it could hardly have been supposed that these opposite creatures belonged to one *house*: they are the most perfectly antithetical of all the feathered tribes.

Judged by the mere power of flight, the Parrots would not be accounted worthy to stand in so high a position; but this is only one, among many, of the talents possessed by birds of noble degree.

Like all those who glory in "high degree," the Parrots have a poor relation or two to abate their pride. The Owl-billed Parrot (*Strigops habroptilus*) of New Zealand is as lowly as "the younger son of a younger brother." If birds were to be classified by the sternum only, then the *Strigops* should be put near the *Apteryx*, and the Tinamou attached to the train of the Peacock.

If birds be ranked according to the degree of their intelligence, then, without controversy, the familiar Crows and Starlings, Finches, and Singing-birds may take the highest room; but if power of flight, mere brute strength, and savage audacity shall be considered most decent and becoming to a bird, then let the Eagles and Falcons sit on the throne of the feathered kingdom. But there are qualities, dear to the morphologist, in which the Parrots have the preeminence, and stand higher, as Birds, than all other birds; and although, all things considered, the Crow is the best type and model with which to compare the whole plumy brotherhood, yet in many things the Parrot is a bird of birds; he is an ultra-type, and sets bounds to the class to which he belongs.

But this bird, with the wise and solemn face of an Elephant, has, like us, its chief and best qualities resident in its head; and if the skull of an Ostrich be compared with that of the most psittacine of the Parrots, the difference will appear almost as great as exists between a *larva* and an *imago*.

The type under consideration is one in which the characters of the Parrot, and indeed the characters of a Bird, as such, are carried to their highest pitch. I have long been familiar with this highest kind of Psittacine skull in the genera *Plyctolophus* and *Calyptorhynchus* (see Cat. Mus. Coll. Surg. vol. i. pp. 277, 278, nos. 1440 & 1445), and have recently discovered it in the Grass-Parakeet (*Melopsittacus undulatus*); but the genus *Microglossa* carries it to the fullest degree.

The teleologist might write a fair volume on the fitnesses displayed in the skull of this bird; but the adaptive conditions are of secondary importance to him who would trace the clue of morphological unity through the mazes of nature's unutterable variety.

The first thing that strikes the eye of the observer is the cleaving of a great transverse cleft through the whole face, in front of the eyes, leaving the enormously developed intermaxillary apparatus, enclosing the vestibular parts of the olfactory organs, on one hand, and the skull, maxillary apparatus, and true olfactory region, on the other. Then we see that not only is the eye bounded beneath by a blending of the lachrymal with the postfrontal, but the latter is anchylosed to the squamosal also; and thus, with the true zygomatic arch below, we have three pairs of facial bridges. But the deep, steep-sided, beautifully arched intermaxillaries, the fair, broad forehead, the well-roofed eyebrows, the perfectly bony orbit, and a mandible such as the eye searches for in vain elsewhere—all these are outstanding characters in the highest type of Parrots, and, above all, in the genus *Microglossa*.

The huge, mobile face is but one bone in the adult, and yet it is composed of a great variety of parts that have become blended into one thick mass, perfectly void of sutures. The nasals, intermaxillaries, prevomers (the vomer is not developed in the Psittacidæ), the nasal septum, the inferior turbinals, and the alæ nasi, all these go to form this large compound bone. There are, therefore, six splint bones; and the axial bones are four for the septum, two (at least) for the inferior turbinals, and two for the alæ nasi, thus making eight more, or fourteen bones in all. The highly complex skull also is completely fused into one bone, and it has in it the separate parts that form the auditory and olfactory sense-capsules. But the original attachment of the pieces of the arrested palato-pterygoid arch is loosened so as to let the ascending (proximal or orbital) process of the palatine lie half an inch below its proper foundation, viz. the pars plana or antorbital. Anteriorly, the palatine is thick and transversely expanded, and its convex elliptical end fits in a glenoid cavity in the end of the prevomer of the same side. Further back, at its proximal plate, it is two-thirds of an inch high, it scarcely becomes less than half an inch; and its emarginate hinder end reaches to behind the "membrana tympani," full a quarter of an inch behind the somewhat slender rod-like pterygoids. The latter bones, although an inch in length, are thus completely overlapped by the palatines. The small, late-appearing mesopterygoids have early coalesced with each other, and they have united also with the front corner of the basicranial edge of the left palatine. The malar bone articulates, like its axis, the palatine, with the prevomer. The epipterygoid process of the pterygoid is obsolete; the metapterygoid process of the quadrate bone is small, conical, and anteriorly placed, as in its autogenous counterpart in the non-venomous Serpents. The hinge-convexity of the quadrate bone is semicircular; the cupped process for the jugal is large and projecting; and a well-developed, outstanding, oval condyle is received by the cup at the end of the pterygoid. The heads of the os quadratum—answering to the crura of our anvil-bone ("incus")—are well developed, but do not stand as in other birds; for that which is related to the sympletic cartilage of the stapes is directly *inside* the outer or prootic head. In birds generally, this incus-head projects far backwards, overlapping the opisthotic, and overshadowing the auditory "fenestræ," to articulate with the exoccipital. The splints of the lower jaw, ten in number, have all become one piece, as unlike as possible to the simple Meckelian rod on which they were modelled. The symphysis is an inch in extent, and the bone is transversely flattened below, so as to be an inch wide at what should be the intermandibular angle; this is, there, a gently concave transverse margin having a rounded edge. The greatest height of the mandible is $1\frac{1}{4}$ inch; the angular process passes further back than the exoccipital. The occipital condyle is an extremely neat hemisphere. The scooped occipital plane forms a very obtuse angle with the basis cranii, which latter region is very small, triangular, and protected by sharp ridges that meet at the fore angle of the coalesced basitemporals, below the small, closely placed Eustachian openings. At first the "rostrum" of the basisphenoid is sharply-carinate, then it becomes thick, rounded, and covered with articular cartilage, under which the palatines and anterior ends of the pterygoids glide. The height of the skull is so great that, although the hemispheres of the brain lie down between the eyes more than in most birds, yet the compressed rostrum of the basisphenoid and the lower edge of the perpendicular ethmoid do, together, make a great keel, larger than the sternal keel of the Love-bird (*Agapornis pullaria*). The anterior pterygoid processes are thrown out of relation to the pterygoids, which grow no spur to answer to them; they are dull forthstanding prickles. The exoccipitals are not nearly so much scooped to make a drum-cavity as in the smaller Parrots; the tympanics, like the columellæ, are lost. The main piece is large in some of the smaller kinds. In front of the great cranio-facial hinge, the nasals and nasal processes of the intermaxillaries are converted into the merest swollen sponge; behind the hinge, on each side, the lachrymals are also swollen; but the frontals dip to form a valley between the orbits. Then there is a pair of frontal, and another pair of parietal, smooth, large, rounded swellings, with a shallow, equally smooth valley between them. The width of the head is nearly two inches at the point where the postorbital process of the frontal melts into the postorbital spur of the alisphenoid (post-frontal proper). Below and behind this point it is more than two inches wide. The junction of the thick quadrate splint (squamosal) with the post-frontal spur is so extensive as almost to cover in the small heart-shaped "temporal fossa." This bridge of bone is half an inch across. The optic foramina are about one-third of an inch apart; the olfactory fissures are at the same distance. There is an elegant, small, shell-like middle turbinal on the front of the self-developed "*pars plana*," or antorbital, and the simple crus of the ethmoid curls upon itself, so as to form an upper turbinal. There are evidently full two coils to the inferior turbinals, which are ossified in a fenestrate manner, as in mammals, and which project far beneath the alæ nasi. These latter are ossified separately in the Parrots, and then, in many instances as in this, acquire an adhesion with the nasals and the inferior turbinals. The outstanding spurs of the antero-inferior septal bone increase the complexity of the nasal labyrinth.

The sternum has its fenestræ nearly filled up. The sternal keel is, as in Parrots and many of their nearest allies, coincident with the upturned, somewhat bifurcate episternal process. This is perfectly normal; for the keel, the episternal process, and the coracoid grooves really belong to the shoulder-girdle; together they form the true episternum or manubrium. This might be called "omo-sternum," in contradistinction to the rib-sternum ("pleuro-sternum"), or that which relates to the *inner* cartilaginous belts, which grow directly from the *centra* of the vertebræ *. The furcular bone is only apparently simple, although in this specimen of *Microglossa* no sutures can be seen. In the Ash-coloured Parrot (*Psittacus erythacus*), however, and in the East-Indian *Palæornis torquatus*, the thick, broad end of each ramus is seen to be a separate piece. This is also to be seen in the Toucan (*Ramphastos Toco*) and in the Kingfisher (*Alcedo ispida*), but is still better developed in all the "Raptores" and Totipalmatæ, in the *Balæniceps* and *Umbretta*, and, in a less degree, in most typical Herons. I have already spoken of this part (P. Z. S. 1864, p. 339 *et seq.*), and may now say that it is a rudiment of the so-called "clavicle" of the Batrachian, Chelonian, and African Ostrich, and is well seen as a distinct bone in the shoulder-girdle of the Salmon tribe and some other allied Fishes. In Birds this rudiment is *proximal*; in Mammals, generally, it is *distal* or sternal; but I have found such a piece at both ends of the clavicle in certain Insectivora, *e. g.* the Mole (*Talpa europæa*), and in the Shrew (*Sorex tetragonurus*). In Lizards the counterpart of this cartilage is the anterior boundary of the coraco-acromial fenestræ. The supposed rudiment of the clavicle in certain small Parrots, *e. g.* the Love-Bird (*Agapornis pullaria*) and the Grass-Parakeet (*Melopsittacus undulatus*), is an ossification of this acromial cartilage. In ***Psephotis multicolor*** neither this nor the furcular bone is present.

March 28, 1865.—John Gould, Esq., F.R.S., in the Chair.

Notice of a New Species of Porpoise (Phocæna tuberculifera) inhabiting the Mouth of the Thames. By Dr. John Edward Gray, F.R.S., F.L.S., etc.

The fact of a new species of Porpoise being found on our own shores, at the mouth of the Thames, must be considered a proof of how little we at present know of the species of Cetacea.

The Zoological Society, who are so anxious to obtain specimens of these animals that their habits may be studied, procured with considerable trouble a fine male Porpoise, which had been caught at Margate. It was carried to the Gardens, and placed in the pond formed for these animals; but, though showing no external injury, it was in so weak a state when it arrived that it sank to the bottom, and was obliged to be taken out and suspended by bands on the surface of the water so that it might not be choked. After a time it recovered so as to be able to swim about by its own exertion, but it only survived the transport a few days.

Messrs. Bartlett and Gerrard, when it was alive, said that it differed so much in general appearance from the Common Porpoise that they were induced to believe that it might be a species of *Lagenorhynchus* or *Grampus*.

* I would remark that, to trace the affinities of the Parrot tribe, we should take such forms as the Common Grey Parrot (*Psittacus erythacus*), *Nestor*, *Psephotis*, &c., in which the Psittacine characters are somewhat enfeebled. I have not found any other "family" so isolated as this.

The general form of the head, and examination of the teeth after death, proved at once that it was a species of *Phocæna*, very nearly allied to, if not identical with, *Phocæna communis*.

Dr. Burmeister's description of a *Phocæna* from the River de la Plata (contained in the Museum at Buenos Ayres), which is peculiar for having some spines on the upper edge of the dorsal fin, naturally made me careful in examining the edge of the fin of this specimen; and to my astonishment I discovered that this species also was provided with a series of compressed tubercles, giving the fin a sharp, hard, serrated appearance.

The tubercles or spines on the dorsal fin having been observed in two specimens from very different localities, I was induced to inquire if this was a character common to the genus, which had been overlooked; but, on examining the stuffed specimen of the Common English Porpoise in the Museum, it is clear that they are not found in the common state of the species. It then occurred to me that it might be a peculiarity of the male sex; but Mr. Flower informs me that the male specimen which lived for some weeks in the Gardens of the Society, and which he lately dissected, certainly had no spines on the edge of the dorsal fin: so that cannot be the case.

Under these circumstances I think I am justified in considering that the possession of these spinous tubercles is a peculiarity of the species, and therefore a specific character. The examination of the skull shows that there are differences in its form which confirm this opinion.

The species of *Phocæna* may be thus defined:—

a. *Back in front of the dorsal fin, and upper edge of the dorsal fin, smooth, without tubercles or spines. Dorsal fin in the middle of the back.*

1. Phocæna communis.

Hab. North Sea and mouths of rivers.

b. *Back in front of the dorsal fin smooth; the upper edge of the dorsal fin with a single series of oblong compressed tubercles, which are more crowded near the upper end of the fin. Dorsal fin in the middle of the back.*

2. Phocæna tuberculifera, sp. nov.

Hab. Mouth of the Thames, Margate.

c. *Back in front of the dorsal fin with a single series, and upper surface of the dorsal fin with three series, of square-based compressed tubercles or spines. Dorsal fin behind the middle of the back.*

3. Phocæna spinipinnis, Burmeister, P. Z. S. 1865, p. 228.

Hab. Rio de la Plata.

The new species may be described as follows:—

The specimen was 52 inches, measured along the side from the end of the nose to the notch in the middle of the tail. The front edge of the dorsal fin is 23 inches from the tip of the nose, measured over the arch of the back; the hinder edge of the dorsal fin, measured in the same manner, is 22 inches from the notch in the tail. The front edge of the base of the pectoral fin is 9 inches from the end of the nose; and the fin itself is 9 inches long, measured along its front margin. The tail is 13 inches wide, measured across the hinder edges; the lobes are rounded, and rather overlap each other at the central notch.

The hinder part of the back, the whole of the dorsal fin, and the upper and lower surfaces of the pectoral and caudal fins are black; the head, the lower lip, the front part of the back, and the sides to the base of the pectoral fins are greyish black; the upper parts of the sides of the body behind the pectoral fins are grey, more or less mottled with a darker shade; the chin, throat, chest, belly, and under parts of the body white. The upper and lower jaws are of the same length. The upper lip covers the edge of the lower one, the covered part being pale-coloured, flattened, and gradually shelving in towards the upper margin. There are two minute pits (which may have been the places from which whiskers arose) in the upper part of the upper lip, situated about where the depression is placed that separates the beak from the head in those genera which have the beak marked.

The dorsal fin is scarcely falcate, with a rather broad, rounded upper margin, which is armed with a single series of distinct compressed tubercles; the tubercles have an oblong base, with a slightly raised conical centre, and the surface is covered with irregular radiating wrinkles. Those on the front part of the edge are largest, and separate from one another; they diminish in size and become crowded near the hinder upper part of the fin, forming a ridge which is hard and serrated to the touch.

The skull is much like that of *Phocæna communis* in size, general form, and in the number, disposition, form, and size of the teeth; but it differs from the skull of that species in the beak of the skull being rather narrower, more tapering in front. The foramen maximum is narrow, much higher than wide, and the condyles larger; while in *P. communis* the foramen maximum is nearly circular, and the condyles smaller and more oblique. The symphysis of the lower jaw is longer, and the sloping lower edge is more oblique and considerably longer than in *P. communis*.

A skeleton is being formed of the bones of this animal; and the skin has been preserved in spirits, which is certainly one of the best ways of preserving the specimens of Cetacea, as it allows the outer surface to be examined at any future time in a state most nearly resembling that of living specimens.

On the Pipe-fishes belonging to the Genus Phyllopteryx.
By Albert Günther, M.A., Ph.D., M.D., F.Z.S.

Many Pipe-fishes are provided with short or thin cutaneous appendages, symmetrically disposed on the different dermal scutes. These appendages are most developed in the species which may be referred to the genus *Phyllopteryx* (Swains.), Kaup. The first of these extraordinary forms was described and indifferently figured by Shaw (Zool. v. pl. 180). He named it *Syngnathus foliatus*, which name must be preferred to that given in the same year by Lacépède (*Syngnathus tæniopterus*, Ann. Mus. iv. pl. 58. f. 3), since the author of a work may be presumed to have named the species at a much earlier period than the writer of a memoir.

The British Museum possesses, among others, a fine example, 13½ inches long, of this *Phyllopteryx foliata* from Tasmania; and there is a beautiful coloured figure in the collection of drawings made by Ferdinand Bauer, Dr. Brown's companion during Capt. Flinders's voyage.

A second species was described by Dr. Gray as *Haliichthys tæniophorus* in 'Proc. Zool. Soc.' 1859, p. 38, and figured pl. vii.; it is from Freycinet's Harbour.

A third species has been lately presented to the British Museum by Mr. George French Angas, who received it from Port Lincoln, South Australia. I name it *Phyllopteryx eques*. Its form is still more extraordinary than that of the preceding species, the spines, crest, and cutaneous appendages being much more developed, and the trunk being dilated into an upper and three lower prominences. The snout is as long as the distance of the front margin of the orbit from the hind part of the nape; it bears a pair of small spines behind the middle of its upper edge, a pair of minute barbels at the chin, and a pair of long appendages in the middle of its lower part. The forehead bears an erect, broad, subquadrangular crest, with a shorter single spine behind; a horizontal spine above each orbit; a cluster of spines with narrow appendages on the occiput. Nape of the neck with a long spine, dilated at the base into a crest, and carrying a long bifid appendage.

The trunk is compressed, somewhat dilated, strongly arched on the back, and with two deep indentations in its lower profile. There are seventeen bony rings between the pectoral fin and the root of the tail. The spines are of three kinds: 1. The band-bearing spines are the strongest, strongly compressed, not flexible, each terminating in a pair of short points. There are one pair of these spines in the middle of the back, and one on each of the three prominences of the abdominal outline; the flaps are long and bifid. 2. Very long, compressed, and somewhat flexible spines, without appendages; these occupy in pairs the uppermost part of the back, and in a single series the median line of the belly. 3. Small, short, conical spines run in single series along the median line of the sides, and along the lateral edges of the belly; a pair of similar spines in front of the lower part of the base of the pectoral fin.

Tail quadrangular, with sharp edges, and with five pairs of band-bearing spines along its upper side; its end is slightly prehensile.

P. 20. D. 37. The dorsal is situated entirely on the tail.

The specimen, being dry, has lost its original colours, which were probably red during life. The iris is crossed by radiating streaks; and several other streaks (of a whitish colour) radiate from the eye over the opercles and the upper part of the head.

There is no doubt that these fish attach themselves with the prehensile end of their tail to stems of seaweed or other objects; and when they are in the vicinity of seaweed of a similar colour, their resemblance to it must be so great that they would easily escape being observed by their enemies.

MISCELLANEOUS.

The Food of the Aye-Aye.

To Dr. J. E. Gray.

Dear Sir,—The specimen of sugar-cane I sent for your examination a few days since exhibits in a clear manner the mode of using its incisor teeth by the Aye-Aye. This animal, as you are aware, came here in August 1862, and during the period of nearly three years has been kept in good health and condition, its food being varied from time to time. It was only recently that I obtained some fresh green sugar-cane, and placed two or three sticks of the same in the cage of the Aye-Aye. I soon found the animal was fond of this kind of food; and it is interesting to observe how well its teeth are adapted for obtaining the juice and sugar from each of the joints of the cane. As will be seen, the long points of the incisors cut deeply into the cane, the fibre being pulled forward, and the moisture chewed out. In the observations made by me, and published in the 'Annals' for July 1863, p. 72, I stated that the animal feeds freely on a mixture of *milk, honey, eggs,* and any *thick glutinous fluid*; and, from what I had observed, I was led to think the creature fed upon the juices of trees; and I am induced to send you this short notice as an additional proof of the correctness of my statements.

I am, dear Sir,

Yours faithfully,

A. D. Bartlett.

On the Histology of the Acalephæ. By Prof. Kölliker.

Professor Kölliker has published in the 'Würzburger naturwissenschaftliche Zeitschrift' some observations made by him upon the histology of the Hydrozoa and Ctenophora in the Firth of Clyde.

In these animals he distinguishes three kinds of connective tissue. One forms the tentacles of the Hydroid Polypes and all the solid tentacles of the Medusæ. It presents the appearance of a series of cells (*muscular cells* of Keferstein) occupying the axis of the tentacle. These cells possess no contractility; at least the tentacles of the *Æginidæ* and *Trachynemidæ*, which present this structure, are rigid.

The contractile tentacles owe their contractility to a muscular layer situated between the cellular axis and the external epithelium. This cellular axis is only a dependence of the internal epithelium which lines the digestive cavity (Hydroids) or the marginal canal (Medusæ). It probably acts as an elastic organ antagonistic to the muscular layer.

The second kind of connective tissue is a substance destitute of cells, which forms the umbrella of all the simple Medusæ, including the gelatinous substance of the natatory bells and covering laminæ of the Siphonophora. Sometimes this substance is entirely homogeneous; sometimes it is traversed by numerous fibres very like the elastic fibres. In an *Æquorea* these fibres are attached to a membrane capable of isolation, placed beneath the epithelium of the convex surface of the umbrella.

The third form is the well-known gelatinous substance with disseminated cells of the umbrella of the higher Medusæ. Professor Kölliker agrees with Professor Virchow in denying the existence of these cells in *Cyanea capillata*.—*Bibl. Univ.* May 1865, *Bull. Scient.* p. 66.

On a New Type in the Group of Ascidians—Chevreulius callensis. By M. Lacaze-Duthiers.

After describing the general characteristics of the Ascidia, the author says:—The specimen which forms the subject of the present memoir exhibits an exceptional and very remarkable arrangement, which masks the true characters of the group. All the individuals of the genus *Chevreulius* are without stolons or buds which might lead to their being approximated to the social Ascidia, and still less to the compound forms. Their form is that of a cylinder, free at one extremity, adherent by the other, and slightly flattened on that side which is in contiguity to the foreign body. The free superior extremity presents the characters of the genus.

The test, which is of a yellowish colour and cartilaginous, is sufficiently resistant to retain its form after desiccation; its thickness is not great, and it resembles a thin lamina of pale horn. When it is contracted, the orifices are not visible; but as it becomes distended, more than half of the flat upper extremity of the cylinder is soon seen to detach itself towards the circumference, and to rise by moving as if round a hinge placed on the side of the cylinder which is flattened.

Beneath the plate which rises thus so as to form a right angle with its former position, and which represents a valve, there appears a white transparent tissue—a membrane stretched from one side to the other of the separated parts, so as to fill up the great fissure produced by this sort of gaping. Upon this membrane two mamillæ soon rise, at the summit of which open the two orifices characteristic of the Ascidia. One of these leads into the branchial chamber, and consequently to the mouth; this is the highest one: the other, less prominent and placed laterally, gives passage to the water which traverses the branchiæ, to the residues of digestion, and to the products of reproduction.

Between these two orifices a small opaque-white nucleus may be distinguished through the tissue, with delicate filaments issuing from it: this is the nervous ganglion.

Thus *Chevreulius* is undoubtedly an Ascidian, but it is a *bivalve* Ascidian, of which the test is divided into two parts moveable upon each other, as in the Acephala; and the Ascidia themselves must be arranged in two series—one for those in which the external envelope is a true little leather bottle with two apertures, the other for those in which the test, divided into two parts by a broad horizontal cleft, becomes bivalve.

Having met with *Chevreulius* for the first time in the waters of Calle, I have named it *C. callensis*. It lives at great depths (60, 80, or 100 fathoms), and belongs to the fauna of the coralligenous zone.

In conclusion, the author remarks upon the interest attaching to the discovery of *Chevreulius*, as an Ascidian with an upper and lower valve, in connexion with the relation existing between the Tunicata and Brachiopoda.—*Comptes Rendus*, June 19, 1865, p. 1264.

On some singular Organs appended to the Feet of certain Crustacea. By MM. Claus and Sars.

Professor Claus (Zeitschr. wiss. Zool. xiii. p. 422) and Professor Sars (Videnskabsselskab. Förhandl. 1863) have independently investigated the Schizopod Crustacea of the family Euphausidæ with regard to the singular organs already alluded to by Dana, Semper, and Kröyer, and regarded by Semper as eyes, and by Kröyer as auditory organs. These are spherical organs, of a reddish colour, situated at the base of several of the thoracic legs and of the first four pairs of abdominal appendages. Both the authors above mentioned have demonstrated the correctness of Semper's view, although, besides these pedal eyes, the animals possess the two large compound eyes common to all Decapoda. Each of the thoracic and abdominal eyes receives a special nerve from the ventral ganglionic chain. The organ itself is a spherical bulb, moved by special muscles; and in it may be distinguished a crystalline lens, a vitreous body, a pigment-layer, and a retina of complex structure. The existence of a crystalline lens distinct from the cornea is very striking, as remarked by M. Sars; for in other Crustacea no true crystalline exists, its function being performed by the thickened and inflated cornea. According to M. Claus, the position of the four pairs of abdominal eyes is very remarkable: the first pair looks forwards, the last pair backwards, and the two intermediate pairs downwards. —*Bibl. Univ.* May 1865, *Bull. Scient.* p. 63.

THE ANNALS

AND

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[THIRD SERIES.]

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XVI.—*On a new Lizard, with Ophidian affinities, from the Lower Chalk* (Saurospondylus dissimilis). By Harry Seeley, F.G.S., of the Woodwardian Museum, Cambridge.

Professor Owen described the *Raphiosaurus subulidens* from the Lower Chalk of Cherry Hinton, and I should perhaps have been inclined to refer the vertebra here described from that locality to the same genus, had not a sight of Mr. Carter's type specimen shaken my faith in its reptilian character. So far as external features go, there is nothing to suggest that it is not the jaw of a fish. Even were it reptilian, it is so disproportionately large in comparison with this vertebra, that the identity of the two would still be doubtful. But Professor Owen appears to know the vertebræ of *Raphiosaurus*; for, in the 'Palæontology' (p. 311, 2nd ed.), it is on such evidence that the species is said to be based.

The Lizards yet known from the Chalk have procœlian vertebræ with that simple structure of the zygapophyses in which the front articulations are turned up and exposed, and the back pair turned down. This structure, characteristic of most vertebræ, would appear to result from the fact that the limbs support that part of the skeleton which is in front of them—a function manifest in the straight or upward tendency of the neck, where each vertebra rests on its zygapophyses, and the downward direction of the tail, where the vertebræ hang without support under the zygapophyses.

The development and origin of these processes and the form of the bones depend on the functions of the muscles, though in a less degree than in the limbs, where bones appear to have owed their very existence to muscular and functional action.

But in *Saurospondylus* the vertebra has ten articular facets, as in Serpents and in the Iguana Lizards, in which the neurapophyses overhang and lock on to the zygapophyses of the vertebra in front. Such a structure indicates a flexible vertebral column, for it allows of dorsal vertebræ being supported by the anterior limbs. In the lumbar region of many mammals, such as the Armadillo, the Raccoon, and even the wild Cat, where there is much upward and downward motion, there is a near approach to a like modification of yoking.

This vertebra, with depressed centrum, obliquely overhanging and transversely oval cup and ball, zygosphene, and zygantrum, indicates the lower dorsal region of a small reptile having its nearest affinities with *Iguana*. It is $\frac{3}{8}$ths of an inch long, not quite so wide in front where widest. It was found in the lower Chalk of Cherry Hinton, near Cambridge.

There is no neural spine, and no hypapophysis.

The inferior surface of the centrum is subtriangular. The length from the base of the cup in front to the base of the ball behind is equal to the width of the zygapophyses in front. From these, two strong curved ridges descend and approximate to the bottom of the sides of the ball. The subtriangular area so enclosed is a little convex transversely and concave in length.

The vertebra is $\frac{3}{16}$ths of an inch high in front, nearly one-half being the height of the centrum, and the remainder that of the neural arch, which is higher behind than in front, and may there have had a slight neural spine. The neural arch on each side is a smooth cupped surface, with a concave border, and contracts behind.

The anterior zygapophyses are horizontal square surfaces, hardly above the border of the cup, from which they are separated in front by a perpendicular concavo-convex surface on each side, about the size of their own articulations.

The zygosphene projects in front of the vertebra, and is just as wide as the cup. Its superior front margin is concave and horizontal. Its flat articular surfaces, which look forward and outward, are very narrow, and entirely between the zygapophyses, above and in front of which they project about half their own length.

The neural arch is very thin in front, thicker behind, where the processes are less perfectly preserved.

The sides of the vertebra are narrow, concave, wedge-shaped surfaces bordered by (1) the basal ridges already mentioned, and (2) the concave ridges at the sides, which from above make the outline of the neural arch, are laterally parallel with its top ridge, and connect the anterior with the posterior zygapophyses. Both ridges meet in front, below the zygapophyses in the tubercle for the rib, which is broken off on both sides.

The body of the centrum and the neurapophyses appear to be cellular. The outline of the posterior end of the vertebra is pentangular, as high as wide. The height of the ball appears to be less than the depth of the cup.

Of the vertebral differences of Serpents and Lizards little is known. This fossil resembles a serpent more than could have been expected, and yet in other modifications comes near to the Lizards. A Cretaceous serpent may have been more Lacertian than any now known, and a lizard of the Chalk may have been more Ophidian.

The chief Lacertian features which I detect are—

(1.) The absence of an hypapophysis, which all serpents appear to have, though in some (as in *Python*) it is very slight.

(2.) The depressed centrum, with transversely oval and overhanging cup and oblique ball, are Lizard characters, though the cup is oblique in *Crotalus, Paleryx depressus,* &c., and the ball is transversely elliptical in some other forms.

(3.) The absence of additional diapophyses besides the costal tubercle is characteristic, though they are not found in all Ophidia.

(4.) The neural arch is not notched between the zygantra, as in Serpents, but is prolonged back a little between and over them, as in *Iguana.* The zygantra are excavated in the middle of the sides of the neural canal, as in *Iguana,* and not at its summit, as in most serpents, though *Naja, Hydrus, Natrix,* &c., are exceptions.

(5.) The zygosphene projects well over the cup, as in *Iguana,* and is not level with it, as in Ophidians.

(6.) *Iguana* has similar basal ridges, and depressions under the costal tubercle, like those in the fossil, only more developed. But neither in lizards nor in serpents does the basal ridge meet the ridge between the zygapophyses, because the costal tubercle is always lower down.

The more marked Ophidian characters are—

(1.) The broad quadrate form, which is nearer to *Palæophis* than to *Iguana,* though the anterior vertebræ of this and most lizards are as short. In *Scincus* there is much the same general form of the vertebra, and a like absence of neural spine and hypapophyses; but the zygosphene can hardly be said to exist, the zygapophyses are never horizontal, and are well raised above the tubercle for the ribs.

(2.) The horizontal zygapophyses, level with the top of the cup, find their parallel in *Eryx* and most Serpents; but in *Iguana,* the nearest to it of the Lizards, they are higher. *Iguana* wants the sharp ridge connecting the zygapophyses; it is characteristic of some serpents, but is also found in *Scincus.*

The balance of evidence from the few data at my command

11*

rather inclines to the conclusion that *Saurospondylus* was an Iguanoid Lizard, hardly separable from the Serpents, than that it indicates a Cretaceous Ophidian. So classed, it is the type of a new family.

XVII.—*Notice of a new Finner Whale from Formosa.* By Dr. J. E. Gray, F.R.S. &c.

Mr. Swinhoe has kindly sent me some bones of a Finner Whale which was cast ashore on the coast of Formosa.

The cervical vertebræ show that it is quite distinct from any Whale the bones of which have previously come under my examination.

It agrees with the smaller Finner, *Balænoptera rostrata* of Europe, in the second and third cervical vertebræ being united, while in all the other true Finners known they are free; and also in the subcircular form of the front part of the neural canal.

I am therefore inclined to refer it provisionally to the genus *Balænoptera* as restricted in my paper (Proc. Zool. Soc. May 24, 1864); but I think it probable that, when we know the entire number of the vertebræ and other details of the skeleton, it will prove to be a distinct form.

The Whale may be named *Balænoptera Swinhoei.*

The second cervical vertebra with large, broad, truncated, lateral processes, with a large, oblong, subcentral perforation; the lateral processes are each two-thirds of the transverse diameter of the articulating surface of the body of the vertebra.

The third cervical united to the second by the anchylosis of the neural arches; the body thin, oblong, transverse, broader than high; the lateral processes slender, truncated at the end, not so long as the transverse diameter of the body, curved towards each other at the end, but not forming a ring.

The rest of the cervical vertebræ free.

The sixth or seventh cervical with a thin body, and a slender, nearly straight upper lateral process, and only a very short tubercle on each side below.

The neural cavity of the second cervical vertebra subcircular, rather less high than broad, and not quite so wide as half the diameter of the front side of the body.

The neural cavity of the third cervical vertebra oblong, transverse, rounded above, as wide as half the transverse diameter of the body, and about one-third broader than high.

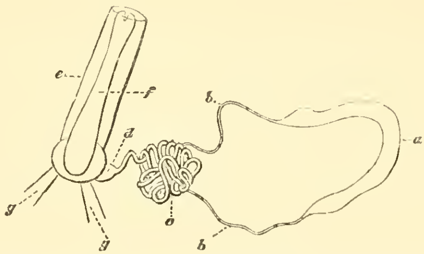
The bones are nearly the same size as the similar bones in the *Physalus antiquorum*, which is between 60 and 70 feet long when alive; they therefore belong to an animal at least three times as large as the *Balænoptera rostrata* of Europe.

XVIII.—*On the Male Generative Organs of* Phalangium. By Dr. A. Krohn*.

From dissections which I have very recently made, it appears that the notions of Treviranus and Tulk as to the male sexual apparatus of *Phalangium* still generally adopted require to be essentially modified. The principal question here is as to the still unexplained signification of a gland-like organ furnished with two efferent ducts, which is situated in the abdomen upon the lower wall of the alimentary tube, occurs only in the male, and appears, as Treviranus asserts, to have some connexion with the other parts of generation.

My investigations have proved that the above-mentioned organ is the testis; so that the pair of glands consisting of ramified lobes or cæca situated in the anterior part of the abdomen, to which Treviranus and Tulk ascribe the function of preparing the seminal fluid, have quite a different destination.

When the abdomen is opened from the ventral surface, the testis falls out, and appears, after the removal of the adherent fatty body, as a sausage-shaped greatly curved organ† of a dull white colour, bridged over by the two retractor muscles of the penis (fig., *a*). From the extremity of each of its horns (which



The male generative apparatus of the second species of *Phalangium* mentioned in the text, without the accessory glands. Its component parts are removed from their natural position in order to show their connexion.

a. The Testis. *b b*. *Vasa efferentia*. *c*. Coil of the *vas deferens*. *d*. Dilated portion of the *vas deferens*. *e*. Sheath of the penis, with the penis (*f*) within it. *g g*. Retractors of the penis.

are directed forwards, and do not reach to the part where the two breathing-orifices or stigmata occur on the outer surface

* Translated by W. S. Dallas, F.L.S., &c., from Wiegmann's Archiv, 1865, pp. 41–48.

† The sigmoid or zigzag form ascribed to this organ by Treviranus and Tulk is probably only a consequence of injury or displacement during dissection.

of the body) there issues one of the above-mentioned narrow canals, which may with perfect justice be characterized as *vasa efferentia* (*b b*). In its forward course each of these canals strikes first of all upon the origin of the tracheal stem of its side, then bends inwards, and runs to the median line of the abdomen, where it meets with the canal of the opposite side, and both pass into the origin of the *vas deferens*. Of the nature of this long duct, which gradually increases in diameter, and is chiefly rolled together into a close coil (*c*), Tulk has already given a satisfactory account. I can completely confirm the statement of this naturalist that the *vas deferens*, after passing through the penis, opens at the extremity of the so-called *glans**, which is armed with a curved spine or hook at its apex, and is moveably articulated upon the shaft of the penis. I may, however, remark that the *vas deferens*, after having become suddenly and greatly dilated (*d*) just before its entrance into the penis, appears so exceedingly narrow during its passage through the latter, that the transverse section of its lumen bounded by a chitinous coat only seems very slightly to exceed the diameter of a single seminal corpuscle†.

The testis possesses a bounding membrane which passes into the outer envelope of the efferent ducts; it is, however, not hollow, but its mass consists throughout of round cells, furnished with a distinct wall, and closely pressed together, which contain a great number of small transparent vesicles. As a nucleus, often surrounded by dark granules or molecules, makes its appearance in these vesicles on the addition of acidulated water, I regard them as the formative cells of the semen, whilst the cells enclosing them seem to represent their mother cells.

* This so-called glans no doubt functions as an excitant organ during copulation.

† The above-mentioned dilated portion of the *vas deferens* is distinguished from the preceding portions of this canal by a very thick chitinized lining membrane and by a very strong muscular coat. From the great narrowness of the duct in its passage through the penis, it might be supposed that the dilated portion may act as an organ of propulsion in the ejaculation of the semen. According to Tulk, the excitant organ (the so-called glans), which, during repose, is always bent back over the end of the shaft of the penis, can be elevated or extended (that is, brought into the same line with the shaft of the penis) by means of two muscles. I must deny the existence of these muscles; but, on the other hand, it is not difficult to detect the presence of a single powerful muscle which is evidently destined to this purpose. This muscle, which has hitherto been overlooked, occupies half the length of the interior of the penis from the base, and is connected with a strong sinew running straight to the excitant organ, to the base of which it is attached. The mode of action of this muscle may be easily ascertained by a simple experiment, namely, by laying bare the sinew, inserting a fine needle into it, and pulling in the direction of the traction of the muscle.

In support of this view I may refer to the data already extant as to the development of the semen in some Arachnida (see Von Siebold, Vergl. Anatomie, p. 544, note 6; and Leydig, "Ueber den feineren Bau der Arthropoden," in Müller's Archiv, 1855, p. 470).

Mature semen is usually found in greater or less abundance in the entire portion of the *vas deferens* before the dilatation. The seminal corpuscles are rounded structures, furnished, I believe, with a disciform nucleus. The oscillating movement which is observed in them when they are not too closely pressed together appears to be referable to the phenomenon of the so-called molecular movement*.

The two accessory glands situated in the anterior portion of the abdomen immediately above the sheath of the penis are connected by connective tissue and tracheal ramifications with the coil of the *vas deferens*, which is placed between them. Their intimate structure is founded on the same plan that has been made known to us in the glands of many insects by the admirable works of H. Meckel, and especially of Leydig. Thus we may distinguish in them a homogeneous external envelope (*tunica propria*), a subjacent, proportionally thick layer of secreting cells, and within this a lining membrane (*intima*). The lumen of the lobules or cæca appears to be a comparatively narrow canal, from the circumference of which, throughout the whole length of the canal, numerous fine tubules pass deeply into the cellular layer. In the male of *P. opilio* (*P. cornutum*) single tubules are seen at intervals, which are distinguished from the rest both by their greater size and by their branching within the cellular layer. The canals of all the sacs, after uniting to form larger branches, finally combine into a main duct extending forward through the midst of the gland, and opening upon the upper wall of the sheath of the penis not far from the sexual aperture. This duct, however, is never free, as the layer of secretion-cells is continued upon it and envelopes it as far as its outlet. The orifices of the two main ducts at the point just mentioned lie close together on each side of the median line. On the lining membrane of the main ducts and their first branches a so-called spiral filament, similar to that of the tracheæ, may be detected. In the male of *P. opilio* it may be pretty clearly distinguished even on the above-mentioned fine tubules which penetrate the cellular layer.

* I have not been able to give a satisfactory description of the appearance of the seminal corpuscles under a high magnifying power. According to Leydig's investigations, they are round, flat structures, with a central band-like elevation. Leydig regards their oscillating movement as quite spontaneous, and therefore assumes that they probably possess a fine capillary appendage (*l. c.* p. 469, pl. 17. fig. 41 *d*).

These two glands also occur in the females; but even when their pregnancy is very far advanced, the size of these glands is less than in the males. In their structure they differ from those of the males only in the circumstance that the spiral filament appears to be entirely wanting in the ramifications, although present in the main ducts. The spot at which the two main ducts discharge themselves corresponds exactly with that of the male. Their orifices are also in the vicinity of the sexual orifice, upon the upper wall of the sheath embracing the laying-tube*.

As to the use of the secretion of these glands nothing can at present be stated with certainty. In the male, the secretion is a clear, tenacious, thickly fluid substance, apparently very similar to the spinning-material of the Araneida.

In conclusion, I must refer to an exceedingly remarkable phenomenon which I have observed in the examination of nearly all males of *P. opilio*†. This is nothing less than a production of eggs from the testis, at the same time that the development of the semen is by no means diminished. The number of ova produced by the testis may sometimes be so great that, as in the ovary, they occupy the entire surface; or it may be very small, and in this case the ova occur only on particular spots of the testis. In the former case the ova, as on the ovary, present the most various states of development, from the smallest, with the vitellus still clear, to those in which the vitellus appears more or less turbid. These ova, however, appear never to attain the full size of those produced on the ovary. I have only observed one case in which, among a number of ova, two or three were remarkable for their preponderant size. These ova agreed perfectly with the nearly mature ovarian ova, not only in their size, but also in the nature of the vitellus, which appeared of a chalky whiteness. In a second species (which, from the form of the penis, appears to be the one investigated by Treviranus and Tulk), the males of which I was able to procure much more frequently, I have rarely detected ova upon the testis, and when present they were always but little developed.

To remove the suspicion that I may perhaps have erred in

* I may remark here, in passing, that the two supposed cæcal tubes extending to the laying-tube, which Tulk has regarded as cement-glands, are really nerves, as has already been indicated by Gegenbaur (Grundzüge der vergl. Anat. p. 276). I have succeeded in tracing them to their origin in the thoracic ganglion. They also occur, although of less size, in the male, in which they accompany the portion of the *vas deferens* issuing from the coil to its immersion in the penis. In both sexes they supply the retractors of the copulatory organs, and also penetrate with a portion of their branches into the interior of the latter, and then become further divided.

† The males of this species are exceedingly rare in comparison to the females.

the interpretation of what I have seen, I may refer to the testimony of a celebrated witness, who detected the same phenomenon long before me. This is Treviranus, who makes the following statement :—" In one of the *Phalangia* that I examined I found an ovary filled with eggs, but, instead of the laying-tube, a male genital organ. Hermaphroditism, which has often been observed in the Lepidoptera, appears, therefore, not unfrequently in the *Phalangia*" (*l. c.* p. 38).

This case, in my opinion, agrees exactly with those observed by me, if we only admit that the organ described as an ovary can have been nothing but the testis. And this will be the less doubtful when we consider that, as already stated, Treviranus certainly saw the testis, but was not in a position to recognize it as such.

As regards the ultimate fate of these eggs, there seems to be no doubt that, after persisting for a longer or shorter time, they disappear. In favour of this we may quote as an analogous example the case of some of our indigneous toads (*Bufo variabilis*, *B. calamita*, and especially *B. cinereus*), the males of which, according to the thorough investigations of Wittich, possess, besides a testis, a more or less rudimentary ovary*. From these investigations it appears clearly that the ova produced by this ovary, after attaining a certain degree of maturity, finally become aborted and disappear†.

XIX.—*Descriptions of new Species of* Crioceridæ. By J. S. Baly.

Crioceris scabrosa, Baly.

C. elongata, subcylindrica, plumbea, subnitida, pube aureo-sericea brevi vestita ; capite rugoso ; antennis dimidio corporis longioribus, obscure rufo-piceis, basi et apice nigris ; thorace sat profunde transversim strigoso, fere glabro, lateribus vix constrictis ; elytris crebre rugoso-punctatis, elevato-reticulatis, reticulis fere lævibus, glabris, disco anteriore dilatatis, et ibi superficiem totam fere amplectentibus ; tarsis obscure cyaneis ; tibiis intermediis ad apicem incrassatis, intus curvatis.

Long. 4 lin.

Hab. Mexico.

Elongate, subcylindrical. Head not constricted behind the eyes ; face subelongate, finely rugose, sparingly clothed on the

* "Beiträge zur morphol. und histol. Entwickelung der Harn- und Geschlechtswerkzeuge der nackten Amphibien," Siebold and Kölliker's Zeitschrift, Bd. iv. p. 159.

† Morphologically it is an interesting fact that the ovary in the abovementioned toads occurs as a perfectly independent organ having no further connexion with the testis, whilst the seminal gland of *Phalangium* (especially in *P. opilio*) has completely the character of an hermaphrodite gland.

labrum, lower parts of epistome, and round the eyes with short, adpressed, aureo-sericeous hairs; front impressed with a deep fovea, on either side of which is a fine but distinct groove, which, commencing at the apex of the epistome, runs obliquely upwards on either side to surround the upper portion of the orbit of the eyes, but at a considerable distance from the eye itself; eyes not mounted on a raised orbit, rotundate, entire; antennæ slightly thickened towards their apex, moderately robust. Thorax cylindrical, slightly flattened above, subquadrate, its surface closely covered with deep, irregular, transverse grooves; just in front of the base, and again behind the apex, are two indistinct transverse depressions. Scutellum smooth, triangular, its apex obtusely truncate. Elytra much broader than the thorax, parallel, acutely rounded or almost angulate at their apex; subcylindrical above, slightly flattened along the back, obsoletely depressed transversely below the basilar space, their apical portion suddenly and obliquely deflexed; closely and somewhat finely rugose, closely clothed with short, adpressed, aureo-sericeous pubescence; whole surface (with the exception of the deflexed apex) covered with large, broad, raised, glabrous reticulations; on the anterior half of the inner disk these elevations become much dilated, and coalesce so as to occupy by far the greater portion of the whole surface. Body beneath clothed with coarser hairs than the upper surface; abdomen smooth, impunctate, each segment impressed on either side its centre with a deep fovea, from the surface of which springs a tuft of pale suberect hairs; hinder thighs extending rather beyond the apex of the abdomen.

Crioceris rugata, Baly.

C. elongata, nigra, nitida, thoracis dorso elytrisque fulvis; antennis subfiliformibus, vix compressis et perfoliatis; thorace subquadrato, lateribus leviter coarctato, dorso rude punctato; elytris infra basin obsolete transversim depressis, profunde punctato-striatis, interstitiis basi planis, apicem versus subelevatis; scutello piceo, glabro.
Long. $3\frac{1}{4}$ lin.

Hab. Japan.

Head deeply constricted behind the eyes; forehead impressed with a deep groove; face triangular, closely covered with adpressed sericeous hairs; eyes deeply notched; antennæ half the length of the body, moderately robust, subfiliform, first, third, and fourth joints equal in length, fifth to the eleventh each half as long again as the fourth, equal, somewhat thickened and compressed, scarcely perfoliate. Thorax subquadrate, subcylindrical, sides moderately constricted in the middle, stained in front with nigro-piceous; upper surface deeply and coarsely punctured. Scutellum triangular, its apex truncate. Elytra much broader than the thorax, parallel, upper surface slightly flattened along the suture, indistinctly depressed transversely below the basilar space, very deeply punctate-striate, interspaces impunctate, plane at the base, indistinctly rugulose on the transverse depression, distinctly thickened towards their apex, being subcostate near the outer margin and suture. Body beneath nearly glabrous, the pleura clothed with adpressed sericeous pubescence; abdomen smooth, impunctate, very sparingly furnished with subdepressed silky hairs. Hinder thighs not thickened, not extending beyond the second abdominal segments.

Very closely allied to *C. impressa*, smaller, much more coarsely punctured; antennæ more slender.

Crioceris ruficollis, Baly.

C. oblonga, nigra, nitida, collo thoraceque rufis, hoc vix elongatulo, subcylindrico, lateribus medio modice coarctato, dorso vage subremote punctato; elytris convexis, nigro-cæruleis, infra basin leviter transversim impressis, distincte sed tenuiter punctatis, interstitiis planis.

Var. A. Capite antice obscure rufo; antennis basi piceis.

Long. $3\frac{1}{4}$ lin.

Hab. Northern China. Collected by Mr. Fortune.

Face triangular, clothed with aureo-sericeous pubescence; antennæ moderately robust, slightly compressed, subperfoliate, more than half the length of the body. Scutellum rufo-piceous. Elytra broadly oblong, much broader than the thorax. Pubescence on the under surface of the body silvery white, that on the legs with a golden tint. Abdominal segments each with a transverse groove, which is clothed with a single row of suberect silvery hairs. Hinder thighs very slightly thickened, their apex not reaching beyond the apex of the third abdominal segment.

Lema quadriplagiata, Baly.

L. oblongo-elongata, fulva, nitida, subtus sparsim fulvo-sericea, ore supra nigro; antennis modice robustis, corporis longitudine brevioribus, articulo tertio secundo duplo longiore; thorace cylindrico, subquadrato, lateribus medio valde constrictis, dorso lævi, pone medium profunde transversim sulcato, disci medio obsolete lineatim punctato; elytris infra basin obsolete transversim impressis, sat fortiter punctato-striatis, striis ad apicem sulcatis, interspatiis postice elevatis, utrinque plagis magnis duabus obscure violaceis.

Var. A. Antennis (basi excepta) fuscis; corpore subtus fusco variegata.

Var. B. Elytris totis metallico-cæruleis.

Long. $2\frac{2}{3}$ lin.

Hab. Pachybouri. Collected by the late M. Mouhot.

This species may be separated from *L. histrio*, Clark, by the following character:—In the present insect the third joint of the antenna is double the length of the second, whilst in *L. histrio* it is only from one-third to one-half longer.

Lema Adamsii, Baly.

L. elongata, subcylindrica, pallide fulvo-flava, nitida; capitis maculis duabus, thoracis maculis quatuor, quadratim dispositis, elytrorum maculis quatuor, duabus pone basin parvis, duabusque ante apicem magnis, pectore, femorum singulorum macula, tibiarum apice, tarsis antennisque nigris, his subfiliformibus, dimidio corporis longioribus, articulis duobus basalibus fulvo-flavis; thorace subquadrato, lateribus sat coarctato, ante basin transversim sulcato, disco lævi fere impunctato; elytris fortiter punctato-striatis, infra basin vix transversim impressis, interspatiis lævibus, antice transversim rugulosis, apice callosis.

Long. 3 lin.

Hab. Chusan. Collected by Mr. A. Adams.

The more robust, shorter, black antennæ, with the second and third joints nearly equal, will distinguish this species from *L. quadriplagiata* and *L. histrio.*

Lema Downesii, Baly.

L. subelongato-parallela, pallide fulva, nitida, antennis (basi excepta) tarsisque fuscis; scutello elytrorumque vitta suturali, ante apicem abbreviata, nigris; thorace elongatulo, basi transversim sulcato, lateribus vix pone medium modice constrictis, antice subgloboso, lævi, lateribus et disci medio fortiter subremote punctato; elytris infra basin haud transversim impressis, profunde punctato-striatis, interspatiis prope apicem elevatis, secundo octavoque apice coëuntibus callosisque.

Long. 2 lin.

Hab. Bombay; Bengal.

Thorax smoother and more swollen than in *L. suturella*; third joint of antenna one-half longer than the second, equal in length to the fourth.

Lema suturella, Baly.

L. oblongo-parallela, fulva, nitida, tibiis tarsisque infuscatis, pectore abdominisque basi nigris; antennis (basi excepta) fuscis; thorace cylindrico, lateribus medio modice constrictis, supra ante basin transversim sulcato, leviter irregulariter punctato; scutello piceo; elytris infra basin vix transversim impressis, fortiter punctato-striatis, interspatiis prope apicem costatis, linea suturali cyanea, ante apicem abbreviata, instructis.

Long. 2 lin.

Hab. Bengal.

Thorax less swollen than in *L. Downesii*, irregularly punctured; a longitudinal space down the middle of the disk, together with the sides in front, more coarsely punctured than the remainder of the surface; third joint of antenna one-half longer than the second, distinctly longer than the fourth.

Lema concinnipennis, Baly.

L. elongata, parallela, subcylindrica, nitido-cærulea; antennis nigris, abdominis apice fulvo; thorace subquadrato, subcylindrico, lateribus medio modice constrictis, disco ante basin transversim sulcato, fortiter punctato, spatio longitudinali centrali lævi, fere impunctato; elytris infra basin transversim impressis, intra callum humerale sulcatis, punctato-striatis, punctis ad apicem minus fortiter impressis, interspatiis planis; antennis corporis dimidio longioribus, modice robustis.

Var. A. Abdomine corpore concolore.

Long. $2\frac{1}{2}$ lin.

Hab. Northern China.

Face subelongate; eyes deeply notched; lower portion of face closely subrugoso-punctate; forehead impressed with a short longitudinal groove, very finely punctured. Legs moderately robust.

Lema Psyche, Baly.

L. oblonga, valde convexa, chalybeo-cærulea, nitida; antennis pedibusque nigris; thorace subtransverso, cylindrico, lateribus medio modice constrictis, disco tenuissime punctato, basi impresso; elytris purpureis, robustis, thorace multo latioribus, infra basin transversim depressis, sat fortiter punctato-striatis, striis integris, interspatiis ad apicem convexiusculis, obsolete costatis; antennis gracilibus, filiformibus, articulis 3° et 4° æqualibus.

Long. 3 lin.

Hab. Northern India.

Face subelongate, vertex coarsely punctured; eyes notched; antennæ two-thirds the length of the body; transverse depression of elytra shallow, obsoletely wrinkled. Legs slender; thighs scarcely thickened.

The broad elytra and robust form of this insect at once distinguish it from its congeners.

Lema bipunctata, Baly.

L. subelongata, piceo-fulva, nitida; antennis (articulo basali prætermisso), scutello, thoracis vitta laterali, abdominis fasciis, tibiarum apice tarsisque nigris; elytris singulatim fovea infra basin, linea suturali alteraque marginali, apice abbreviata, chalybeis.

Long. 2–$2\frac{1}{4}$ lin.

Hab. Port Natal.

Forehead impressed with a deep oblong fovea; antennæ half the length of the body, subfiliform, second and third joints each equal in length to the first, obovate. Thorax scarcely broader than long, subcylindrical, sides moderately constricted just behind their middle, anterior angles acute, upper surface convex, transversely excavated in front of the base, distinctly punctured down the middle of the disk and along the anterior border. Elytra broader than the thorax, not transversely depressed below the basilar space, punctate-striate; interspaces towards the apex furcate.

Lema globicollis, Baly.

L. elongata, parallela, subcylindrica, picea, nitida; ore antennisque nigris; pectore, scutello thoraceque rufis, hoc elongatulo, basi constricto, antice globoso, fortiter punctato, utrinque spatio longitudinali impunctato; oculis nigris, prominulis, intus vix sinuatis; elytris cyaneis, dorso planiusculis, infra basin haud transversim impressis, fortiter punctato-striatis, interspatiis prope apicem elevatis.

Long. $2\frac{1}{4}$ lin.

Hab. India.

Head short; face triangular, concave between the eyes, the latter very prominent, globular, shining black; forehead nearly impunctate; antennæ scarcely equal in length to half the body, robust, gradually increasing in thickness towards their apex, basal joints pitchy. Thorax rather longer than broad, deeply impressed with subremote large punctures; a longitudinal space on either side the disk smooth, impunctate.

Lema Dia, Baly.

L. fulva, nitida; pectoris lateribus pedibusque obscurioribus, femoribus (basi excepta) abdominisque utrinque macula basali nigropiceis; antennis fuscis; thorace fere transverso, lateribus medio valde constrictis, dorso ante basin transversim sulcato, lævi, disci medio longitudinaliter tenuissime punctato; elytris obscure cæruleis, violaceo micantibus, infra basin transversim depressis, tenuiter punctato-striatis, punctis vix ante apicem deletis, interspatiis planis; limbo (basi excepta) fasciaque centrali fulvis.

Long. $3\frac{1}{2}$ lin.

Hab. Ega, Upper Amazons.

Head deeply constricted behind the eyes; face triangular; antennæ two-thirds the length of the body, slender, filiform, basal joint fulvous, second very short, third nearly twice as long as the second, fourth one-third longer than the third, the rest each equal in length to the fourth. Scutellum triangular. Elytra much broader than the thorax, suboval, their apex broadly rounded.

Lema ornata, Baly.

L. oblongo-elongata, subcylindrica, nigra, nitida; capite, scutello thoraceque rufo-piceis, hoc vix transverso, cylindrico, lateribus medio modice constrictis, dorso lævi, ante basin transversim sulcato; pedibus antennisque pallide fulvis, his apice fuscis; elytris infra basin leviter transversim depressis, subfortiter punctato-striatis, interspatiis postice subcostatis, disco antico obsolete transversim crenulatis, flavo-albis, vitta brevi suturali ante medium abbreviata, plaga communi apicali et utrinque vitta lata a callo humerali longe ultra medium extensa, postice paullo ampliata, obscure cæruleis.

Long. 3 lin.

Hab. Guatemala.

Lema præclara, Baly.

L. subcylindrica, testaceo-fulva, nitida; capite (antennarum apice albo excepto), thorace basi et apice, tibiis tarsisque nigris; thorace subtransverso, lateribus medio sat valde constrictis, dorso lævi, ante basin transversim sulcato, disci medio tenuiter lineatim punctato; elytris læte purpureis, infra basin profunde transversim depressis, punctato-striatis, stria nona medio obsoleta, punctis apicem versus minus distinctis, interspatiis planis, ad apicem convexiusculis.

Long. 3 lin.

Hab. Nauta, Upper Amazons.

Lema Pithys, Baly.

L. elongata, subcylindrica, rufo-fulva, nitida, subtus aureo-sericea; antennis gracilibus, filiformibus, fusco-fulvis, apice pallidis; thorace transverso, pone medium strangulato; elytris nigris, infra basin et intra humeros impressis, disco exteriore pone medium foveolatis, punctato-striatis, striis postice sulcatis, stria nona medio late interrupta, callosa, interspatiis antice planis, crebre sed tenuissime crenulatis, postice costatis.

Long. $3\frac{1}{2}$–4 lin.

Hab. S. Paulo, Upper Amazons.

Antennæ nearly equal to the body in length, second and third joints equal, each more than twice the length of the second, fourth equal to the two preceding united, fifth and following joints nearly equal, each somewhat shorter than the fourth. Thorax broader than long, deeply constricted behind the middle, smooth, impunctate. Scutellum triangular, its apex truncate. Elytra longitudinally sulcate within the humeral callus, transversely excavated near the suture below the basilar space, interspaces strongly costate behind the middle of the elytra; ninth stria from the suture broadly interrupted, the interrupted portion costiform; on the inner side of this costa, near its apex, is a broad shallow fovea which extends across several of the adjacent striæ.

Lema Idalia, Baly.

L. elongata, subcylindrica, rufo-fulva, nitida, subtus aureo-sericea; antennis elongatis, filiformibus, fulvo-flavis; thorace vix transverso, lateribus medio sat coarctato, pone medium transversim sulcato, lævi impunctato; elytris læte violaceis, nitidissimis, infra basin et intra humeros impressis, tenuiter punctato-striatis, stria nona medio late interrupta, interspatiis planis, lævibus, postice obsolete convexiusculis.

Long. $3\frac{1}{2}$ lin.

Hab. Upper Amazons.

Antennæ rather shorter than in *L. Pithys*; otherwise in form and structure very similar. Thorax less transverse, less deeply strangulated.

Lema pulchra, Baly.

L. subcylindrica, testaceo-fulva, nitida, subtus aureo-sericea, antennis, genibus, tibiis tarsisque nigris; elytris infra basin transversim depressis, punctato-striatis, striis ad apicem subsulcatis, interspatiis postice convexis, stria nona medio late interrupta; læte violaceis, apice pallide fulvis.

Long. 3 lin.

Hab. Nauta, Upper Amazons.

Face elongate-trigonate; epistome and labrum clothed with coarse yellow hairs; eyes obliquely notched; antennæ slender, filiform, nearly as long as the body. Thorax cylindrical, subquadrate, sides moderately constricted in the middle; upper surface smooth, impunctate, impressed before the middle by a broad transverse sulcation. Hinder thighs slightly thickened, extending nearly to the apex of the abdomen.

Lema Latona, Baly.

L. rufo-fulva, nitida; antennis pedibusque (femoribus basi et infra exceptis) nigris; thorace lævi, transverso, lateribus medio constrictis, dorso ante basin transversim sulcato; elytris infra basin leviter transversim depressis, punctato-striatis, striis ad apicem distinctis, interspatiis ad latera et ante apicem costatis; læte violaceis, vitta lata laterali pone medium valde angustata rufo-fulva.

Long. $3\frac{1}{4}$ lin.

Hab. S. Paulo, Upper Amazons.

Head deeply constricted behind the eyes; face triangular, front impressed with an oblong fovea; antennæ moderately slender, filiform, slightly tapering towards their apex.

XX.—*Description of a new Species of* Cetonia *in the Collection of the British Museum.* By Arthur G. Butler, F.Z.S., Assistant Zoological Department, British Museum.

Schizorhina Nortoni.

Clypeus black, elongate, emarginate; thorax shining black, with black margins; elytra shining black, sulcated, the striæ broad and clothed with short white hair, apices of elytra coarsely pilose.

Clypeus large, black, smooth, elongate, cylindric, emarginate in front, densely punctured, with black, opake, elevated lateral margins. Eyes lateral, pitchy. Antennæ black.

Thorax smooth, very finely punctured, densely near the margins, shining black, with black edges; anterior portion narrower than the posterior, and somewhat depressed at the sides so as to form an obtuse keel; hinder portion a little narrower than the elytra, with trisinuate hind margin.

Scutellum very large, smooth, nearly triangular, black.

Elytra smooth and shining, nearly covering the abdomen, a little narrower at the apex than at the base, with four longitudinal smoothly hollowed striæ on each elytron, not reaching the base, and filled with very short white setæ, the two outer striæ meeting at the apex, and filled at their apical terminations with very long golden-yellow hairs, which extend beyond the abdomen.

Body shining black beneath; head, thorax, and sides of abdomen clothed with coarse golden-yellow hairs; sternum produced, compressed, subtriangular.

Legs black; femora compressed, those of fore and middle legs densely punctured and sparsely clothed with short yellow setæ; femur of hind leg sparsely punctured, the sides not clothed with hair; tibia of fore leg short, compressed, strongly punctured, outer edge trispinose, inner edge with a marginal line of minute yellow hairs, and terminated by a long spine; tibia of middle leg cylindrical, finely and sparsely punctured, a few yellow setæ extending half along its inner side, apex quadrispinose; posterior tibia elongate cylindrical, outer edge coarsely punctured and bluntly unispinose in the middle, the remainder smooth; inner edge clothed with long, straight, yellow hairs; apex quadrispinose: tarsi five-jointed.

Length 16 lines.

Habitat. Sydney.

Closely allied to *S. Philipsii*, Schreib. (Trans. Linn. Soc. vol. vi. p. 193, t. 20. fig. 4, Gory, Monog. Ceton. p. 158, pl. 27. fig. 2), from which it differs in being altogether longer and much larger, and more quadrate; the clypeus being longer, narrower, and destitute of setæ; the thorax much more finely and sparsely punctured, more depressed at the sides in front, much more deeply trisinuate behind, shiny black, and destitute of setæ; the scutellum almost imperceptibly punctured; the elytra more roof-shaped, the striæ more irregular, narrower above than below, filled with shorter and white hair, apical portion filled with long golden-yellow setæ, protruding beyond the abdomen.

The underside is not so densely clothed, and the femora are not so densely punctured and are much more destitute of hair; the tibiæ much more finely punctured, the middle leg with no median spine, and the hind leg with little beyond an excrescence.

This interesting species was presented to the National Collection by Mr. H. Norton, and is one of the most beautiful insects in the genus.

XXI.—*Investigations on new or rare* Crustacea *of the French Coasts.* By M. Hesse*.

§ Notopterophorus.

M. Hesse has obtained individuals of all ages of the curious Crustacean described by him (Ann. Sci. Nat. 5e sér. tome i.) under the name of *Notopterophorus papilio*, and now gives an account of the life-history of the species.

The *male* is one-third of the size of the female (2 mill. in length), and has the head large and the body short and stout; and the thoracic region, which is of uniform width, does not present an enlargement for the reception of the ova at its base.

The abdominal portion, which is cylindrical, is also shorter and more robust than in the female, and the dorsal membranous expansions are but small at the base, whilst the lobes which accompany them are very long, and gradually diminish to a point. In number and position these expansions are exactly similar to those of the female. The colour is a slightly yellowish white, through which the large intestinal tube, of a yellow colour, with red and black points, may be perceived. The eye is black. The males occur in much smaller numbers than the females, in the interior of *Phallusia canina*.

In their early states the *Notopterophori* resemble *Cyclops*. The body is cylindrical, and formed of four thoracic segments (including the cephalic shield), all of which present posteriorly two triangular acuminate processes; of these the points, directed obliquely, project outwards and on the back, and they are evidently destined to become the membranous expansions of the

* Abstract, by W. S. Dallas, F.L.S. &c., from Annales des Sciences Naturelles, 5e sér. tom. iii. (1865) pp. 221–242.

adults. The abdomen, antennæ, and feet exactly resemble those of the adults.

At its first escaping from the egg the body of the young animal is perfectly cylindrical. The antennæ are broad, flat, and rounded at the end; their joints are not distinctly marked. The first legs are very strong, and composed of four joints, terminated by a stout claw; then follows a pair, thinner, of footjaws, terminated by bristles or spines, and beneath these is the rostrum, formed of two pairs of jaws; beneath these is another pair of short, slender feet, placed laterally, followed by another larger pair, curved upwards, and furnished with a comb of strong spines or rigid hairs. The thoracic feet are already biramose.

Notopterophorus Bombyx, Hesse.

This Crustacean, found in the interior of *Phallusia intestinalis,* is doubtfully described as a new species by the author. The *male,* as in the preceding species, is one-third of the size of the female. Its head is much larger; the thorax is broad and short, and diminishes gradually in diameter to the abdomen; it is very retractile, the segments forming it have their margins everted so as to favour their invagination, and the lower extremity of the last segment, being capable of vertical elevation, forms a sort of broad, flat surface, which probably serves as a point of support for propulsion.

The membranous dorsal expansions appear to be much less extensive than in *N. papilio,* and that which is implanted upon the nape presents at its base an occipital protuberance. The colour is entirely yellowish white.

The female is elongated, especially in the abdominal region; the head is also very long, and the ridge which forms the base of the occipital membranous expansion is much thicker than in the other species; the membranous expansions are also smaller and thicker. The antennæ and feet are more slender, and the last thoracic segment, which contains the eggs, is remarkable for a peculiar structure which, when seen in profile, presents some analogy with that of *Doropygus.* The female is very little smaller than that of *N. papilio*; its colour is pale yellow, with a rusty red streak in the middle. The eye is red. The eggs are very dark green, with a transparent limb.

In this species the membranous expansions were more lacerated than in the other. The Crustaceans are seen constantly extending and contracting themselves as if endeavouring to remove something, or to force a passage through resisting objects; their movements of propulsion are aided by the strong claws and spines with which the feet are armed, and the hooks which terminate the abdominal appendages enable them to move back-

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wards. M. Hesse thinks that the membranous expansions may also assist in locomotion; they are moved in the manner of the wings of a butterfly. They are probably employed as a point of support and traction, by being applied hermetically, and by projecting, upon surfaces to which the animals wish to adhere, the lobes by which they are accompanied. There is also a very frequent and active movement of the mandibles, which might lead to the supposition that these parasites are rather masticators than suckers.

The young animal, at the second or third transformation, has a nearly uniformly cylindrical body, diminishing gradually, however, towards the posterior extremity, by which it acquires the appearance of a *Cyclops*. There is as yet no dorsal appendage; but the last thoracic segment has commenced the modification which fits it for the reception of the ova. The other appendages, although imperfectly formed, resemble those of the adult. The body is hyaline, with the eye alone red.

Genus Pleurocrypta, gen. nov.

M. Hesse, in September 1864, discovered under the arch of the branchial cavity of *Galatea squamosa* a parasitic Crustacean belonging to the group of the Isopoda, which he regards as forming the type of a new genus intermediate between *Gyges* and *Phryxus*. He gives the following characters of this parasite, for which he proposes the name of

Pleurocrypta Galateæ.

"*Male.* Body elongate-ovate, divided into seven nearly equal thoracic segments, of which the first is amalgamated with the head, which is deeply inserted into it; and the last is attached to the abdomen, which is triangular and of a single piece. Feet terminated by a strong hooked and denticulated claw.

"*Female.* Body ovate, symmetrical, provided above with very long incubatory laminæ, which entirely cover the thoracic portion; abdomen divided into six [five ?] segments, furnished with simple acuminate branchiæ of unequal size; feet terminated by an oblique, ampulliform joint, having a prehensile orifice.

"Length of the male 0·001, of the female 0·007 m."

The head of the male is amalgamated with the first thoracic segment, forming a sort of buckler, rounded in front and hemispherical above; the six following thoracic segments are of nearly equal width, but the sixth is a little narrower and soldered to the abdomen. The latter is of an elongate triangular form, rounded at the extremity, and presents no trace of segments, unless it be that the lateral margins are slightly undulated. On each side of the body, in each segment except the first, the white branching reproductive organs are seen shining through the skin.

On the lower surface of the body the foremost organs are two pairs of short antennæ placed obliquely on the sides of the head, and scarcely passing its margin. The superior antenna is shorter than the other, and of three joints; the inferior antenna has four. The antennæ of each side spring from a common flat basilar piece.

The buccal apparatus is of a somewhat conical form, with the apex, bearing the buccal orifice, directed forward. The organs of the mouth consist of two pairs of hard corneous denticulated jaws, forming a sort of curved nippers, of four other small foot-jaws, each consisting of three joints and terminated by a crooked claw, and of two flat pointed laminæ forming a lower lip. The thoracic legs consist of five joints, of which the femoral and the apical are the largest; the latter is terminated by a powerful, curved, and denticulated claw, which, by folding down upon a protuberance of the lower surface of the inflated apical joint, becomes a prehensile organ. The body is of a buff colour, with the abdomen reddish brown. The intestinal canal is brick-red, with a fine white line upon it, indicating the course of the interganglionic cord. The surface is covered with short, rigid, and scattered hairs.

The *female* is much larger than the male, measuring 7 mill. in length by 3 mill. in breadth; its form is a regular oval. The head is hemispherical, and embraced by the first pair of incubatory plates, of which there are in all four pairs, increasing in dimensions as they descend towards the abdomen. The last two plates are longer than the others, and their posterior margin is turned down almost perpendicularly upon the base of the abdomen so as to close the incubatory chamber. At their base these plates present small niche-like cavities for the reception of the feet.

The epimeric pieces are alternately large and small, so as to facilitate the movements of the thorax; from the fifth onward, they become more and more pointed to the extremity of the abdomen. Each of the five segments of the abdomen is provided on each side with a branchial lamina, which is very delicate and contractile; these laminæ, like the segments to which they are attached, diminish in size posteriorly.

The ventral surface is nearly flat, or very slightly concave. The buccal apparatus is placed close to the membranous anterior margin of the head; the orifice is pierced in the middle of a large lip, and from it issue two pointed denticulated jaws, forming a pair of pincers. A little above this orifice are situated the antennæ, which, as in the male, are four in number; the superior antennæ are shortest, and composed of three joints; the inferior have a large basal joint, and are terminated by a cylindrical filament of five joints. The eyes are situated on small rounded protuberances close to the base of the inferior antennæ.

The body is divided into twelve segments, seven thoracic and five abdominal; and, from the arrangement of the former, the animal is enabled to roll itself up into a ball like the woodlice. Each thoracic segment is furnished with a pair of feet, which are articulated laterally to the epimeric pieces at the base of the incubatory laminæ; each foot is formed of five nearly equal joints, and curved in such a manner that its extremity is directed towards the ventral surface. The apical joint, which is larger than the others, is inflated above and flat beneath, and on the first two pairs of feet forms a sort of elastic pad; the apical joints of the other feet are hollow internally and narrowed at the apex, where there is a small contractile aperture with a raised margin. The anterior half-circumference of this aperture appears to be of a more solid substance, and, furnished with denticulations, may render the organ more efficient in fixation.

The head, abdomen, and whole lower surface of the female are bright yellow, with the two small lateral protuberances of the head reddish brown; the incubatory plates are light vinous grey, and the branchial laminæ transparent and bright blue. Beneath, the segments and epimeric pieces are bounded by white lines.

The young, on escaping from the egg, are minute and very active, swimming rapidly by jerks. The head is hemispherical, rounded in front, and as wide as the first thoracic segment in which it is immersed; this is followed by seven other segments, all of the same size, except the last, which has a small rounded process in the middle. The eyes, situated on the sides of the head, are large and hemispherical; the abdomen is formed of a single piece, as in the male.

The mouth, which is proboscidiform and retractile, is placed at the lower extremity of an oval protuberance, which projects in the middle of the first thoracic segment. The superior antennæ are short, stout, and formed of three joints, the last of which is slender and cylindrical, and truncated at the extremity, and the second bears some strong pointed setæ. The inferior antennæ are much elongated, and composed of five nearly cylindrical joints, which diminish in thickness from the second to the apex.

The legs, as in the adult, are seven on each side, and all formed of five joints, of which the last is the most developed.

The first pair, as in the male, is terminated by a powerful claw; the last joint of the others is hollow, and terminated by a round orifice.

The abdomen has on each side a broad, lamellar, bifurcate false leg, and these appendages are preceded by others which are also lamellar, pointed and denticulated on the margins; these are organs of propulsion, and subsequently form the branchiæ. In some individuals the extremity of the abdomen bears, close to the anus, two small, flat, rounded, margined laminæ. The body of the young animal is of a pale violet-grey colour, as are also the eggs; and it is to the latter, seen through the transparent incubatory laminæ, that the suprathoracic pouch of the female owes its peculiar tint.

The females of these Crustaceans reside in tumours produced by them on the inner surface of the arch of the branchial cavity in *Galatea squamosa*; and the males are found adhering to the abdomen of the females, frequently to the branchial laminæ. In many cases two males are attached to one female.

XXII.—*Contributions to an Insect Fauna of the Amazons Valley.* COLEOPTERA: LONGICORNES. By H. W. BATES, Esq.

[Continued from p. 113.]

6. *Hypselomus paganus*, Pascoe.

H. sordide fuscus, nigro obscure irroratus; thorace dorso tuberoso, lateribus tuberculo acuto; elytris humeris subconicis, antice curvato angulatis, cristis centrobasalibus prominulis, obtusis. Long. 7–8 lin. ♂ ♀.

Head dingy brown. Antennæ blackish brown, bases of the joints (from the fourth) pallid. Thorax with prominent dorsal ridge and, on each side, two well-marked tubercles, sides each with a small acute tubercle; colour dingy tawny brown, speckled with dusky. Elytra with projecting shoulders, the projection somewhat conical, but anterior slope curved or angulated, the apex formed by a thick black tubercle; centro-basal ridges pronounced, but not crested with tubercles; surface dingy tawny brown, speckled or irregularly marked with dusky. Body beneath dingy brown; abdomen black in the middle. Legs blackish, speckled with tawny; base of claw-joint reddish: posterior tibiæ in the male dilated at apex. Supplementary antennal joint of male wanting.

Ega and S. Paulo, Upper Amazons.

7. *Hypselomus seniculus*, n. sp.

H. parvus, fuscus griseo vestitus, summa fronte acute bituberculata;

elytris grosse punctatis, humeris modice productis, obtuse truncatis, truncaturæ angulo postico acuto; maris articulo 12^{mo} antennarum longiusculo, curvato. Long. $4\frac{1}{2}$ lin. ♂.

Head clothed with thick tawny-grey pubescence, vertex spotted with brown; inner side of each antenniferous tubercle (♂) produced into an acute tooth. Antennæ towards the base grey, spotted with dark brown; apices of third to eleventh joints dusky, bases of joints from the fourth testaceous. Thorax convex, unarmed, grey, coarsely punctured (especially on the sides) and spotted with dark brown. Elytra moderately broad at the shoulders, the latter not conically produced, but obtusely truncated, with the posterior end of the truncature acute; surface thinly clothed with grey pile, and coarsely punctured, simply convex. Body beneath and legs clothed with tawny-grey pile, spotted with blackish, base of claw-joint testaceous; apical half of posterior tibiæ strongly dilated (♂).

Ega.

8. *Hypselomus crassipes*, n. sp.

H. robustus, brunneus; thorace lateribus pallidis; elytris utrinque macula oblonga transversa cretacea; pedibus crassis, nigris, tibiis posticis maris trigonis. Long. $8\frac{1}{2}$ lin. ♂.

Head coarsely wrinkled, black; antenniferous tubercles produced on the inner side into a stout spine (♂). Antennæ scarcely so long as the body, bases of joints, from the fourth, pale testaceous; twelfth joint (♂) short and twisted. Thorax convex in the middle, without distinct tubercles, a short obtuse tubercle on each side; above dark brown, sides dingy tawny white, traversed by an indistinct dusky stripe. Elytra broad and but slightly convex; shoulders conically produced, base on each side obtusely elevated and very coarsely granulate-punctate, sides under the humeral projections also coarsely punctured, rest of the surface faintly punctured; dark brown, base dingy tawny white; each elytron beyond the middle ornamented with a distinct oblong, transverse, chalky spot. Body beneath dingy tawny; abdomen black in the middle. Legs very stout, black; tibiæ compressed; hind tibiæ (♂) dilated from the base, and obliquely truncated at the apex; claw-joint red.

Tapajos. Apparently allied to *H. fasciatus* of Thomson; but no mention is made by this author of any peculiar formation in the legs.

9. *Hypselomus simplex*, n. sp.

H. subelongatus, brunneo-fulvus, unicolor; elytris modice attenuatis, humeris conicis; antennis gracilibus, articulis basi griseis. Long. $6\frac{1}{2}$–9 lin. ♂ ♀.

Rather more elongate than the allied species; but the elytra rather convex, and the third antennal joint strongly bent. Head dusky. Antennæ slender, a little longer than the body in the female, much longer in the male; basal joint strongly clavate; dark brown, bases of the joints, from the fourth, grey. Thorax bituberculate on each side the central ridge, dingy tawny brown. Elytra elongated, gradually and slightly tapering from base to apex; shoulders conical, base on each obtusely raised, finely punctured, colour uniform brownish tawny. Body beneath tawny brown; abdomen black down the middle. Legs simple, posterior tibiæ scarcely dilated in the male; black, thinly clothed with tawny pile; claw-joints black.

Ega.

10. *Hypselomus lignicolor*, n. sp.

H. subcylindricus, brunneus; thorace et pectore vittis lateralibus obliquis, elytris sutura vittisque lateralibus abbreviatis curvatis, nigris pallide marginatis; elytris compressis, sparsim punctatis, humeris paulo productis haud tuberculatis. Long. $5\frac{1}{4}$ lin. ♀.

Head tawny, spotted with dark brown. Antennæ as long as the body (♀), moderately stout, brown, unicolorous. Thorax unarmed and free from tubercles, surface smooth, brown; sides each with two oblique, blackish vittæ, the upper one margined with dull ochreous; there is also a short dusky central line near the middle of the hind margin. Scutellum blackish in the middle. Elytra nearly cylindrical, sides compressed, shoulders produced each into a slightly elevated ridge not surmounted by a tubercle; surface sparingly and finely punctured, brown, suture and several curved streaks on each side blackish, the lateral streaks margined on the upper sides with pallid brown. Body beneath brown; breast with oblique stripes, dull ochreous and blackish; basal half of abdomen dusky. Legs simple, tawny brown.

Ega. This species is much more elongate and narrow than the typical forms of the genus; it consorts, however, much better with the *Hypselomi* than with *Hesycha* or *Oncideres* (which comprehend elongated forms), having antennæ approximated on the forehead instead of widely separated at their bases. It seems to be nearly allied to *Hypselomus egens*, Erichson (Consp. Col. Peru. p. 148).

11. *Hypselomus obscurellus*, n. sp.

H. subelongatus, nigricans, griseo variegatus; antennis articulo basali apice subgloboso; thorace postice constricto; elytris elongato-trigonis, humeris conico-elevatis, obtusis. Long. $5\frac{1}{2}$ lin. ♂.

Head dusky, eyes ample; forehead narrow, coarsely punctured; antenniferous tubercles unarmed. Antennæ black, base of joints grey, basal joint very abruptly clavate near the apex, subglobose, third joint very slightly curved. Thorax cylindrical, constricted behind the middle, surface very uneven, coarsely wrinkled transversely, dark brown. Elytra moderately elongated, wide at the base, and narrowed thence towards the apex; shoulders conically produced, but apex of cone obtuse and not tuberculated; surface very roughly punctured near the base, more finely so towards the middle, colour dark brown or blackish, thinly variegated with greyish pile. Body beneath tawny brown; abdomen in the middle glossy blackish, and sides spotted with black. Legs blackish, varied with tawny; hind tibiæ dilated near the apex (♂).

Obydos, Lower Amazons. Similar in size and general figure to *H. Syrinx** (*Hesycha syrinx*, Dj. Cat. and French collections), but differing in the shape of the basal joint of antennæ and in the constricted thorax.

Genus Jamesia, Jekel.

Jekel, Journal of Entomology, i. p. 259.

This genus is distinguished from *Hypselomus* by the basal joint of the antennæ being very gradually thickened from the base to the apex, not abruptly clavate, and by the third joint being quite straight instead of crooked. The claw-joints of the tarsi are quite as long as the three remaining joints taken together. The species have the same heavy figure and dull colours; but the elytra are much more elongated, and less trigonal. The genus is distinguished also by the large volume and subquadrate form of the eyes.

There seems to be scarcely sufficient difference to warrant the separation of *Jamesia* from *Clytemnestra* (Thoms.)†, the larger volume of the eyes being the only apparent definite character.

* *Hypselomus Syrinx*. Subelongatus, brunneus vel nigricans, elytris utrinque vitta obscura obliqua pallidiore. Caput angustum, fronte impunctata; tuberis antenniferis intus dente armatis. Antennæ corpore paulo longiores, articulis basi pallidioribus, articulo basali paulo incrassato. Thorax basi latus, antice angustatus, linea dorsali elevata. Elytra elongata, postice paulo attenuata, subtiliter punctata, brunnea, linea curvata mediana obscure fulva; humeris prominulis, in carinam lævem curvatam desinentibus. Corpus subtus fuscum. Pedes fusci, unicolores; tibiis compressis. Long. $4\frac{1}{2}$–$5\frac{1}{2}$ lin. ♂ ♀. *Hab.* Rio Jaineiro.

† Since the early part of the genus *Hypselomus* in this memoir was in print, I have found that Perty and Serville happen to have described the types of two distinct genera under the respective names of *Hypsioma* and *Hypselomus*. The latter genus is equivalent to *Clytemnestra* of Thomson, which therefore becomes a synonym. M. Thomson, in his later work, 'Systema Cerambycidarum,' has adopted this change of nomenclature. The following rectification of synonymy is therefore necessary:—

Gen. 1. *Hypselomus*, Perty, Delect. An. Art. Bras.
=*Clytemnestra*, Thomson, Class. des Cérambycides.
=*Jamesia*, Jekel, Thomson, Systema Cerambycid. (section).

Gen. 2. *Hypsioma*, Serville, Ann. Soc. Ent. Fr. iv.
=*Hypselomus*, Thoms. (Class. des Céramb.) Bates (*ut supra*) and authors, *nec* Perty.

1. *Jamesia globifera*, Fab.

Lamia globifera, Fabricius, Syst. Eleuth. ii. 284. 15.
Hypselomus variolosus, Pascoe, Trans. Ent. Soc. n. s. v. pt. 1 (1859).

J. subelongata, sordide griseo-brunnea; thorace transverse ruguloso et acute tuberculato; elytris prope basin tuberculis globosis nigris politis et postice maculis nigris leviter impressis variegatis; capite lateribus parallelis, oculis magnis, subquadratis; antennis brunneis, maris corpore multo longioribus; pedibus simplicibus. Long. 10 lin.

Not uncommon on dead trees throughout the Amazons region; also found at Cayenne.

2. *Jamesia pupillata*, Pascoe.

Hypselomus pupillatus, Pascoe, Trans. Ent. Soc. n. s. v. pt. 1.
Jamesia bipunctata, Jekel, Journ. of Entom. i. 260.

J. subelongata, parum convexa, olivaceo-brunnea, nigro punctata; elytris medio utrinque ocellatis; maris capite infra dilatato, cornibus frontalibus magnis acutis porrectis; antennis quam corpus duplo longioribus. Long. 11 lin. ♂ ♀.

Differs from *J. globifera* chiefly by the more depressed form of the elytra, and the absence of basal elevation with globular tubercles. It may readily be recognized also by the eye-like spot on the disk of each elytron, consisting of a rounded, black, slightly impressed spot, surmounted by a white speck. The antennæ are much more elongated, and the projecting angles of the antenniferous tubercles in well-developed males are very large and acute, and are directed horizontally. The base of the elytron has a few minute granulations with punctures, and the rest of the surface is sprinkled with rounded, dark-brown, slightly impressed spots, as in *J. globifera*.

Ega; not uncommon.

Genus Hesycha (Dj. Cat.), Thomson.

Thomson, Archiv. Entom. i. 187 (1857).
Fairmaire, Ann. Soc. Ent. Fr. (1859), p. 523.

This genus was first characterized, in few words, by M. Thomson in 1857; but the description subsequently published by M. Fairmaire defined more accurately its points of distinction. It agrees with *Hypselomus* in having the first joint of the antennæ abruptly clavate, and the third joint curved; the curvature, however, is much less pronounced than in *Hypselomus*, and is sometimes very slight. Its other distinguishing characters are (1) the elongate, parallelogrammical, and depressed form of body, (2) the more elongated claw-joint of the tarsi, and (3) the wide separation of the antennæ at their origin.

1. *Hesycha Nyphonoïdes*, Pascoe.

Hesycha Nyphonoïdes, Pascoe, Trans. Ent. Soc. n. s. v. pt. 1.

H. parallelogrammica, depressa, obscure fusca cinereo-fulva variegata; elytris medio fascia undulata, obscura, cinereo-fulva. Long. 6½–8 lin. ♂ ♀.

Head dull brown; forehead broad, sparingly punctured; antenniferous tubercles in the male produced on their inner side into a stout pointed tooth. Antennæ in the male nearly twice the length of the body, with the apical joint greatly elongated; in the female about the length of the body, apical joint shorter than the preceding; colour dull brown or blackish. Thorax uneven above, sides with a short pointed tubercle; dull brown, speckled with black. Elytra slightly narrowed from base to apex, shoulders slightly prominent and surmounted by an obtuse shining tubercle; surface even, thickly but finely punctured, dull brown, covered with dingy tawny confluent spots, and crossed beyond the middle by a zigzag fascia of a little paler hue. Body beneath and legs blackish or dull brown.

Common on branches of dead trees at Ega. There are two closely allied species in collections from the interior of French Guiana*.

* *Hesycha jaspidea*, n. sp. *H. Nyphonoidei* simillima, robustior, maris elytris postice magis angustatis et fronte valde cornuta. Obscure fusca; thoracis lateribus utrinque tuberis duobus obtusis armatis. Elytra humeris prominentibus, basi rugoso-punctata et inæqualia fusco-nigra, maculis sordide fulvis sparsis quarum tribus majoribus medianis in fasciam abbreviatam conjunctis. Corpus subtus fulvo tomentosum. Antennæ valde elongatæ, articulis basi griseis. Long. 8 lin. ♂. *Hab.* In Cayenna interiore (Dom. Bar).

Hesycha liturata, n. sp. Minor, brunnea, elytris litura tenui obliqua albicante. Caput fuscum, fronte punctata, tuberculis antenniferis utroque sexu intus acutis. Antennæ brunneæ, maris corpore paulo longiores. Thorax quadratus, lateribus tuberculo distincto subacuto, supra brunneus vittis tribus nigris, lateribus cinerascentibus. Elytra postice paulo angustata, apice oblique breviter truncata, humeris vix productis, obtusis; dorso punctata, brunneo et fulvo variegata, infra humeros (cum prothoracis et pectoris lateribus) nigricantia, apud medium litura tenui valde obliqua albicante. Corpus subtus et pedes brunneo tomentosa. Long. 5–6 lin. ♂ ♀. *Hab.* In Cayenna (Dom. Bar).

The following species belongs also to this genus, from its linear subdepressed form and the somewhat wide separation of the antennæ at their bases:—

Hesycha xylina, n. sp. Elongata, sordide brunnea; elytris rugoso-punctatis, fusco et griseo strigatis, humeris subuncinatis. Caput fuscum, fronte grosse sparsim punctata, tuberculis antenniferis intus dente valido curvato armatis (♂). Antennæ valde elongatæ, brunneæ, apice pallidæ, articulis (à tertio) basi testaceis, articulo 12mo acuto, curvato. Thorax supra inæqualis, inermis, brunneus. Elytra valde elongata,

2. *Hesycha maculosa*, n. sp.

H. elongata, convexiuscula, fusca, maculis numerosissimis partim confluentibus fulvis; vertice nigro trilineato; thorace nigro maculato. Long. $8\frac{1}{2}$ lin. ♂ ♀.

Head dusky, front channeled down the middle, punctured; eyes rather elongated, margined on the inner side narrowly with tawny; vertex tawny, marked in the middle with three parallel black lines; antenniferous tubercles produced into a short acute tooth on the inner side, longer in the male than in the female. Antennæ longer by one half than the body in the male, and the terminal joint very slender and much longer than the preceding; in the female a little longer than the body, with the terminal joint shorter than the preceding; basal joint abruptly clavate, third joint scarcely perceptibly curved; colour blackish. Thorax quadrate, surface uneven, with several impressed curved lines and raised interspaces, sides behind the middle with an acute tubercle; colour tawny, marked with two short black lines in front in the middle and a spot behind them, and four spots on each side of the disk. Scutellum black. Elytra elongate and rather convex, slightly tapering; shoulders prominent, and surmounted by a glossy black tubercle; surface quite even and moderately punctured, dark brown, covered uniformly with a multitude of tawny specks, mostly confluent. Body beneath tawny. Legs blackish.

Ega.

3. *Hesycha cretacea*, n. sp.

H. oblongo-elongata, subdepressa; elytris maculis numerosis fulvis maculaque magna laterali cretaceo-alba. Long. 8 lin. ♀.

Head grey, margins of eyes with tawny lines, front punctured; eyes elongated; antenniferous tubercles acute on their inner side, vertex with three short black streaks. Antennæ a little longer than the body, dark brown; basal joint clavate, third joint very slightly curved. Thorax quadrate, sides each with two large obtuse tubercles, surface with transverse furrows, tawny mixed with grey, and spotted with black. Scutellum black, margined with grey. Elytra oblong, a little dilated beyond the middle, slightly convex, shoulders moderately prominent; with irregular clusters of punctures arranged in lines, black, covered with pinkish-tawny spots, partly confluent, and

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parum convexa; humeris productis, antice curvatis, postice tuberculo nigro armatis, quasi uncinatis; supra grosse punctata, punctis partim confluentibus, sordide brunnea, strigis pallidis et fuscis variegata. Corpus subtus brunneum. Pedes fusci. Long. $4\frac{1}{2}$ lin. ♂. *Hab.* Rio Janeiro, à D. Squires capta.

having in the middle on each side a large chalky-white spot. Body beneath dull chalky white; breasts with pinkish streaks, and abdomen spotted with black. Legs black, thinly clothed with grey pile.

Ega; rare. This handsome species, like the preceding (*H. maculosa*), approaches *Oncideres* in many of its characters, especially the elongate eyes, subconvex form of body, and scarcely curved third antennal joint; but it lacks the massive head, cylindrical form of body, and short transverse thorax of *Oncideres*, and therefore must be classed with *Hesycha*.

Genus Trachysomus, Serville.

Serville, Ann. Soc. Ent. Fr. iv. (1835).
(Char. emend.) Buquet, Ann. Soc. Ent. Fr. 1852, p. 345.

This remarkable group is distinguished from the allied genera chiefly by the elytra being disfigured by tubercular excrescences, and by the antennæ being composed of short joints reaching only three-fourths the length of the body. The head is moderately narrow, the eyes oblong (not narrow and elongated as in *Oncideres*), the basal joint of the antennæ very abruptly clavate, the third joint very slightly curved, the thorax subcylindrical, and the claw-joint of the tarsi shorter than the remaining joints taken together. The species are found closely clinging to thin woody stems of plants, and strongly resemble portions of the stems distorted by glandular prominences or galls.

Trachysomus Santarensis, n. sp.

T. Trachysomo fragifero (Kirbii) valde similis, differt colore ochraceo- vel rufo-fulvo; thorace supra ochraceo; elytris juxta scutellum utrinque spinis quatuor acutis, fasciculis singulis pilorum subapicalibus nigris linea curvata nigra communi connexis. Long. $7\frac{1}{2}$ lin.

This is so closely similar in form of body and tubercular excrescences to the South-Brazilian *T. fragifer*, that it can scarcely be considered more than a local form of the same stock. It is a little broader and more robust, the thorax is less uneven on the disk, and is there of a bright yellowish-tawny colour. The two tubercles on each elytron, near the scutellum, are longer and more acute. The elytra are of a nearly uniform reddish or orange-brown hue; the subapical fascicle of hairs is a little further removed from the apex and margin of the elytra; it is connected with the corresponding fascicle posteriorly by a curved black line, and a large portion of the disk behind each basal excrescence is quite smooth.

Dry woods near Santarem.

Genus Oncideres, Serville.

Serville, Ann. Soc. Ent. Fr. (1835) iv.

The chief characters of this, the typical genus of the group, are furnished by the elongate-oblong or cylindrical form of body; the broad head and convex occiput, with consequent wide separation of the antennæ at their bases; the elongated eyes; the clavate shape of the basal antennal joint, and straight form of the third joint; the short transverse thorax; and, lastly, the great length of the claw-joint of the tarsi, which exceeds that of the three remaining joints taken together.

The species are all found on the branches of trees, which they amputate from the living tree by gnawing deeply into the bark and wood, making a ring-like incision, until the bough breaks off by its own weight. I have often seen boughs thus severed from green and living Cajú trees, and hence discovered that the best means of finding the insects was by examining the amputated portions lying on the ground in woods or the thinner parts of the forest. The object of the severance is apparently to create a supply of dead wood in which to deposit their eggs and rear the larvæ.

1. *Oncideres Callidryas*, n. sp.

O. minus convexus; thorace griseo-tomentoso; elytris basi minute granulatis, medio confertim punctatis, nigris, guttis numerosissimis carneo-griseis. Long. $10\frac{1}{2}$ lin. ♂ ♀.

Head much narrower than the middle part of the thorax, clothed with pinkish-tawny pile; forehead plane, punctured; antenniferous tubercles (♂) on each side armed with longish acute teeth directed forwards; eyes oblong. Antennæ about the same length as the body in the female, twice the length in the male, black. Thorax with transverse depressions, sides each armed with a strong conical tubercle, clothed with hoary-grey pile. Scutellum and basal margin of elytra hoary grey. Elytra less cylindrical and convex than in the more typical species; shoulders prominent and surmounted by a retrocurved tubercle, base and shoulders thickly and finely granulated, middle part simply but thickly punctured, punctures becoming finer posteriorly, and disappearing before the apex; colour black, sprinkled throughout with small grey or pinkish-grey spots, some very minute, others larger; near the middle of each side the spots are whiter, and tend to aggregation. Body beneath hoary white. Legs black, thinly clothed with grey pile.

Pará, banks of the Tapajos, and Ega; one pair taken *in copulâ* on a branch of a felled tree at Pará. The elytra are much more thickly spotted in the Ega examples than in those from Pará and the Lower Amazons.

2. *Oncideres Satyrus*, n. sp.

O. cylindricus, fulvo-brunneus; elytris guttis albis paucis sparsis, basi tuberculis nigris; antennis validis; thorace basi valde constricto. Long. 10–12 lin. ♂ ♀.

Head in the ♂ much narrower than the thorax, in the ♀ as wide as the widest part of the thorax, with broad plane front, colour tawny brown, a black stripe below each eye. Antennæ about the length of the body in the female, a little longer in the male, with the apical joint twice the length of the preceding; they are robust in both sexes, but the four basal joints are thicker in the ♂ than in the ♀; colour black. Thorax with transverse depressions; a conical tubercle on each side, and much constricted behind the tubercle; brownish tawny, with a fine, black, central, transverse line. Elytra cylindrical, brownish tawny, sprinkled with a small number of minute white spots; base and shoulders with a few polished rounded tubercles; rest of surface impunctate, smooth. Body beneath and legs thickly clothed with tawny pile; sides of breast chalky white.

Pará. Closely allied to *O. vomicosus*, Germar (Ins. Nov. 482), but differing greatly in the maculation of the elytra, the spots being small, few in number, and all distinct from each other.

3. *Oncideres fulvus*, n. sp.

O. oblongo-subcylindricus; thorace postice haud constricto, guttis nigris quinque discoidalibus in linea transversa dispositis, tuberculo parvo laterali; elytris modice elongatis, valde convexis, lævibus, guttis parvis albis sparsis, prope basin tuberculis utrinque circa duodecim nigris. Long. 11 lin. ♀.

Closely resembles *O. Satyrus*; but the body is proportionately shorter and broader in the female than in the corresponding sex of that species; the thorax is shorter, and shows no constriction near the base; the elytra are uniformly convex and impunctate, and there are very few tubercles near the base, only two conspicuous ones on each side of the scutellum, and a small number under each shoulder. The colour is entirely ochreous tawny, with the exception of five small spots placed in a transverse row across the thorax, the black elytral tubercles and a small number of widely separated, but tolerably uniformly distributed, white specks over the elytra. The antennæ are somewhat darker, and and there is a very distinct oblong chalky spot on each side of the breast.

Tapajos.

4. *Oncideres Diana*, Olivier.

Lamia Diana, Oliv. Ent. 67. p. 107. f. 168.

O. subcylindricus, griseus; elytris quarta parte basali dense ac minute tuberculata, parte apicali lineis tenuissimis furcatis nigris, medio guttis sparsis nigris; thorace linea transversa nigra: fœminæ capite lato fulvescente; maris capite angusto, fusco, inermi. Long. 8–11 lin. ♂ ♀.

This species is distinguished by the basal portion of the elytra being thickly covered with small glossy-black tubercles, of which one at the hinder part of the humeral prominence is much larger than the rest. The tuberculated area ceases abruptly behind, and the disk of the elytra has only a very few scattered and slightly elevated black specks, which towards the apex subside into simple spots, not raised at all from the smooth surface. The general colour is pale ashy grey (white beneath); the apical part of the elytra has a few fine black lines in the form of a double or treble fork joined at the base. The male differs greatly in width of head from the female, but the antennæ scarcely differ in proportionate length or stoutness; they are, however, more nearly approximated at their bases by one-half in the male than in the female, which gives to a male insect an appearance quite foreign to the genus. The male specimen before me has a finely reticulated black patch across each elytron at the tips of the forked lines, of which there is only a trace in one of the female examples.

Pará, and at Santarem on the Tapajos.

5. *Oncideres crassicornis*, n. sp.

O. subcylindricus, postice utroque sexu attenuatus, fulvo-brunneus; elytris basi tuberculis diversis sparsis instructis, postice punctis impressis rufescenti-brunneis in lineis furcatis ordinatis; maris antennis basi valde incrassatis, capite bicornuto. Long. 9–10 lin. ♂ ♀.

Head not much wider in the female than in the male, brownish tawny, with the usual black stripe below each eye; antenniferous tubercles in the male dentiform on each side. Antennæ dark brown, simple in the female, one-half longer than the body in the male, with the basal and third joints much thickened, especially the latter. Thorax impressed transversely, and furnished on each side with a tubercle; colour brownish tawny. Elytra narrowed to the tip in both sexes, tawny brown, inclining towards ashy near the middle; the basal part raised in the middle, and studded with a moderate number of scattered tubercles, differing greatly in size, and all glossy black; from the middle to the apex there is a number of shallow punctures covered each with a reddish-brown spot and arranged in forked lines. Body beneath and legs clothed with tawny-brown tomentum.

Ega, and banks of the Tapajos.

6. *Oncideres dignus*, n. sp.

O. cylindricus, fuscus; thorace tuberculis quinque in linea transversa ordinatis; elytris prope basin tuberculis magnis globosis utrinque sex nigris, postice guttis numerosis albis. Long. 10 lin. ♂.

Head (♂) moderately narrow; forehead very narrow, being encroached upon by the voluminous eyes, which are oblong and reach very nearly to the extremity of the muzzle; antenniferous tubercles unarmed; colour dark brown. Antennæ nearly twice the length of the body, black, basal joint gradually thickened from base to apex, rest of the antennæ tapering to the tip. Thorax longer and narrower than in the typical species of *Oncideres*; lateral tubercles small, obtuse, and black; in a line with them is a row of five similar glossy-black tubercles lying across the middle of the thorax; colour dark brown. Elytra cylindrical, clear dark brown, impunctate; middle of base with six very prominent glossy-black tubercles, arranged in two rows; besides these, there are ten or twelve smaller tubercles on each side, three of which are on the shoulder: the rest of the elytra smooth, and ornamented with a number of small clear white spots, distributed regularly and widely apart over the surface. Body beneath and legs dark brown.

This handsome species was very rare, at Ega, Upper Amazons.

7. *Oncideres pulchellus*, n. sp.

O. minor, cylindricus, griseo-brunneus; elytris cinereo maculatis, dimidio basali tuberculis rotundatis, dimidio apicali maculis impressis, nigro-nitidis. Long. $6\frac{1}{2}$ lin. ♀.

Head and thorax of same breadth; head ashy brown, with a streak down each side of the front tawny; buccal organs and circuit of the mouth red. Antennæ a little longer than the body, dark brown. Thorax ashy brown, with three shining-black tubercles in a triangle on the disk, and two smaller ones on each side, the outermost of which is in the position of the ordinary lateral tubercle. Elytra cylindrical, obtuse behind, ashy brown, varied with a small number of equal-sized and equidistant pale ashy spots, and with a number of scattered shining round spots, those over the basal half covering large rounded tubercles of small elevation, and those towards the apex shallow impressions; the tubercles are not crowded near the base or shoulders, but are widely dispersed. Body beneath and legs light brown; sides of breast with an ashy patch.

Ega; rare.

8. *Oncideres Cephalotes*, n. sp.

O. magnus, robustus, convexus, postice attenuatus, cinereo-brunneus; elytris prope basin dense, pone basin sparsim tuberculatis, tuberculis ovatis, obliquis et postice elevatis; thoracis tuberculis lateralibus elongatis, fronte magna, latissima, nuda, punctulata. Long. 15 lin., lat. capitis $4\frac{1}{2}$ lin. ♀.

Head brown; front naked, coriaceous, punctured, black; eyes moderate, reaching little more than halfway down the forehead; vertex very convex. Antennæ rather shorter than the body (♀), tapering to the apex, basal joint curved; colour brown. Thorax twice as broad as long, a little narrowed behind the lateral tubercles, which are long and spiniform; surface dull ashy brown, with a central transverse black line. Elytra massive, narrowed to the apex, convex, especially in the middle of the basal part on each side; shoulders prominent and oblique, with a conspicuous tubercle at their hinder angles; colour ashy brown, paler near the middle, and covered with small, oblong, raised, scale-like tubercles, which are very crowded and strongly elevated at their posterior ends near the base, much scattered and very slightly elevated near the middle, and arranged in rows, simply as spots, near the apex. Body beneath ashy white; legs ashy brown.

Ega*.

Genus Eudesmus, Serville.

Serville, Ann. Soc. Ent. Fr. iv. (1835) p. 82.

This well-marked genus resembles *Oncideres* in its cylindrical form of body. Its distinguishing character is derived from the bulbous ovate shape of the third antennal joint in the male.

* The following new species have lately been received from entomological travellers in South America:—

Oncideres limpidus. Cylindricus, fusco-nitidus; elytris fulvo-ochraceo irroratis. Caput (♂) modice angustatum, fronte punctata, ochracea, vitta infraoculari nigra; tuberculis antenniferis intus prominulis, acutis. Antennæ corpore longiores, nigræ nitidæ; articulo basali distincte clavato, articulis tertio et quarto infra dense ciliatis. Thorax postice angustatus, tuberculis lateralibus modice productis, nigris; supra ochraceo-brunneus, linea nigra transversa, ante medium fascia rufo-fulva. Elytra cylindrica, fusco-nitida maculis numerosissimis discretis tomentosis ochraceo-fulvis; juxta basin tuberculis globosis paucis; deinde leviter granulata, humeris confertim tuberculatis. Corpus subtus fulvo-tomentosum. Pedes nigricantes, femoribus fulvo tomentosis. Long. 10 lin. ♂. *Hab.* in Bahia Brasiliæ, a Dom. Reed lecto.

Oncideres Bouchardii. Cylindricus, cano-griseus; elytris nigro punctatis et maculis majoribus rotundatis fulvis sparsis. Caput latum, griseum, maris paulo angustius, tuberculis antenniferis intus vix prominulis. Antennæ griseæ; articulo basali gradatim incrassato, nigro, maris valde rugoso. Thorax griseus, linea transversa nigra. Elytra convexa, vage punctata, cano-grisea, maculis rotundatis carneo-fulvis conspersa, punctis nigris; prope basin tuberculis numerosis globosis. Corpus subtus pedesque cano tomentosa. Long. 10–11 lin. ♂ ♀. *Hab.* in Sta. Martha Novæ Granatæ, a Dom. Bouchard copiose missus.

The females of some of the species resemble *Oncideres* very closely; and almost the only feature by which their generic position may be recognized is the peculiar dark patch, streaked with paler colours, which exists on the apical part of the elytra of all the species. The head is broad, very little broader in the females than in the males; but the forehead is not so plane or so much elongated as in *Oncideres*. The basal joint of the antennæ forms a smooth ovate club; the thorax is relatively a little longer than in *Oncideres*; the elytra are free from ridges and tubercles, and are obtusely rounded at the apex; the claw-joint of the tarsi is moderately elongated, and is about equal in length to the remaining three.

1. *Eudesmus rubefactus*, n. sp.

E. cylindricus, convexus, rufescens; thorace nigro-lineato; elytris dimidio basali grisescente, apice utrinque macula magna ovata saturatiore strigis nigris et griseis ornata. Long. $7\frac{1}{2}$–9 lin. ♂ ♀.

Head reddish tawny, vertex streaked with black; front plane, coarsely punctured, dingy grey; eyes oblong, one-half the length of the front; antenniferous tubercles in the male acute on their inner sides. Antennæ about the length of the body, reddish tawny; apices of joints, from the fourth, blackish. Thorax cylindrical, of same width as the head, very uneven, especially on the sides, where the inequalities rise to broad, obtuse tubercles; colour pinkish red, centre with two black lines continuous with those on the vertex, sides each with two or three much-broken and oblique lines. Scutellum and basal margin of elytra reddish, spotted with black. Elytra cylindrical, convex, abruptly declivous near the apex; surface uneven, with faintly raised lines, thickly punctured, especially towards the base, basal half occupied by a large, triangular, common, dingy-grey patch; on this follows a belt of pale greyish red, which broadens greatly on the lateral margins; the apical portion of each elytron is occupied by a dark, neatly limited, oval patch, streaked longitudinally with black, tawny red, and grey. Body beneath and legs reddish brown; breast ashy in the middle.

Ega, clinging to dead boughs of trees; rare.

2. *Eudesmus caudalis*, n. sp.

E. cylindricus, depressiusculus, cinereo-brunneus; thorace postice fusco notato; elytris dimidio basali griseo-fusco, apice utrinque macula magna ovata nigricante fulvo strigata, medio cinereo fasciata. Long. $5\frac{1}{2}$–6 lin. ♂ ♀.

Very closely allied to *E. rubefactus*, and scarcely differing in the disposition of the colours and markings of the elytra. The latter, however, are much more depressed; and the insect is of a dull ashy-brown hue, and much narrower and smaller. The forehead is uneven, punctured, and of a dull slaty hue; the third antennal joint in the male is much less swollen than in *E. rubefactus,* and therefore more elongate, and fusiform rather than ovate in shape. The thorax is uneven and obtusely tuberculated on the sides, but is destitute of longitudinal lines, except two very short ones near the base. The elytra are of the same grey leaden hue over their basal halves, and have a pale belt beyond the middle; but the latter does not expand on the margin. The dark apical streaked spot has an ashy transverse streak across the middle.

Also found at Ega.

3. *Eudesmus posticalis,* Guérin.

Eudesmus posticalis, Guérin-Méneville, Icon. Règne Animal, p. 248.

E. cylindricus, subdepressus, brunneus; thorace dorso valde inæquali immaculato, tuberculis lateralibus parvis; elytris medio fascia obliqua grisea, deinde brunneis griseo et griseo-brunneo strigatis, ante apicem signatura nigra griseo marginata; antennis brunneis, articulis (duobus basalibus exceptis) basi testaceis; maris articulo tertio valde inflato, ovato. Long. $6\frac{1}{2}$ lin. ♂.

"D'un gris-brunâtre couvert d'un duvet très-court et très-fin d'une couleur cendrée, surtout en dessous, sur les côtés du corselet et au milieu des élytres, où ce cendré blanchâtre forme une bande crochue en arrière, terminée en pointe près de la suture et précédant une tache arrondie d'un brun plus foncé, en arrière de laquelle on voit une petite tache allongée blanche et deux ou trois petites lignes noirâtres. Antennes d'un gris brun, avec la base du troisième article et des suivants d'un jaune roussâtre pâle, une petite pointe avancée à la saillie du front sur laquelle s'insèrent les antennes. Pattes courtes et fortes, d'un gris brun dessus, cendrées en dessous. Long. 14, lat. 5 mill.—Brésil intérieur." (Guérin-Méneville, *l. c.*)

My example was found at Ega.

4. *Eudesmus sexvittatus,* n. sp.

E. elongatus, depressus, fulvo-brunneus; thorace supra vittis sex nigris; elytris ultra medium dilatatis, plaga laterali infra humeros, linea basali strigisque ante apicem fuscis, vitta curvata laterali cinerea; fronte abbreviata, oculis magnis subconvexis. Long. $6\frac{1}{2}$ lin. ♀.

Head slightly convex on the forehead, with short muzzle; eyes very large, broad, and somewhat convex, reaching very nearly to the edge of the epistome; vertex bright tawny, and marked with a semicircular figure of a blackish-brown hue. Antennæ rather longer than the body (♀) and stout, ochreous brown, base of joints (from the fourth) pallid. Thorax convex, but depressed near the hind margin; lateral tubercle small, conical; colour above bright tawny, with six blackish-brown vittæ; sides ashy, with a broader and paler dusky stripe. Scutellum pale tawny ochreous. Elytra dilated a little behind the middle, depressed, and thickly punctured (except towards the apex), rusty tawny, with a few short ashy streaks and a number of dark-brown strigæ a little behind the middle, the innermost of which runs near the suture to the apex: the basal half of the suture is broadly margined with dusky, and there is a short blackish stripe on each side near the scutellum, and a broad patch of similar hue beneath each shoulder, on the upper edge of which is an ashy streak, which continues in a curved line to the lateral margin, and then to the apex. Body beneath ashy; sides of breast and abdomen dark brown. Legs reddish; femora and tibiæ each with a blackish ring round the middle.

I met with the female only of this remarkable species, which differs so much from the other *Eudesmi* in the shortness of the muzzle. If the male, when discovered, should be found not to possess the swollen third antennal joint, the species will have to be removed from this genus. It was found at Ega.

[To be continued.]

XXIII.—*A Description of some Fossil Corals from the South Australian Tertiaries.* By P. Martin Duncan, M.B. Lond., Sec. Geol. Soc.

[Plate VIII.]

The corals about to be described were derived from the same Tertiary beds which yielded the species noticed in the 'Annals' for Sept. 1864*. A new genus is represented by three well-marked species; the well-known genus *Sphenotrochus*† has two species in the collection; and the genus *Antillia*‡, which attains so great a development in the Nivaje shale of San Domingo, is represented by a very interesting new species.

List of Species.

1. *Sphenotrochus australis*, Woods & Duncan, sp. nov.
2. —— *emarciatus*, sp. nov.

* The Rev. J. Woods, who collected those formerly described, classes the various beds of Muddy Creek, Geelong, and the Murray beds as the "Hamilton" Tertiaries. I have to thank him for the specimens now determined and for others which require some further study before their publication.

† Edwards and Haime, Hist. Nat. des Coralliaires, vol. ii. p. 65.

‡ P. Martin Duncan, Quart. Journ. Geol. Soc. Feb. 1864, p. 28.

3. *Conosmilia elegans,* gen. et sp. nov.
4. —— *anomala,* gen. et sp. nov.
5. —— *striata,* gen. et sp. nov.
6. *Antillia lens,* sp. nov.

1. *Sphenotrochus australis**, n. sp. Pl. VIII. fig. 1 *a, b, c, d.*

The coral is very compressed, especially inferiorly, where on either side of the centre of the base a process passes downwards, giving a "fish-tail" appearance. At the calice the compression is less; but the great axis is at least twice the length of the smaller. The coral is longer than its breadth. The costæ are broad, somewhat wavy, and are separated by well-marked lines: those of the inferior appendages arise from the extremities of the processes, and pass upwards and inwards; and the lateral costæ, wavy below, become straight above. All are plain. The wall is much thicker at the ends of the long axis than elsewhere (in sections). The calice is not shallow, is elliptical, and presents, deeply seated, a long lamellar columella, which is joined to the primary and secondary septa by processes. The septa are well developed and plain; they are not exsert, but pass straight downwards and inwards towards the columella; they do not correspond with the costæ, but with the intervals between the costæ, and they number thirty-two. There are three cycles, with the orders of a fourth, in two systems.

Height $\frac{1}{2}$ inch, breadth $\frac{1}{4}$ inch; small diameter, halfway, $\frac{1}{10}$ inch.

Hamilton, Victoria, South Australia. Coll. Geol. Soc.

2. *Sphenotrochus emarciatus,* n. sp. Pl. VIII. fig. 2 *a, b, c, d.*

The coral is generally much compressed, especially inferiorly, where two lateral processes give a notched or emarciate appearance to the base. Superiorly the relation of the long to the short axis is at least 2 to 1. The coral is short and broad; the base is nearly as wide as the calice is long. The costæ are large and plain, and are separated by well-marked lines: the costæ of the appendices are the largest; they pass upwards to the calice, and all are more or less wavy, the central widening out near the calicular margin. The calice is shallow and elliptical. The columella is not long, and, from being joined to the primary and secondary septa by processes which are rounded above, is confused in its appearance. The septa are in six systems of three cycles; they are wider at the wall than elsewhere, are granular, and those of the third cycle are much smaller than

* Mr. Woods gave the name; but I have not had the opportunity of seeing his MS.

the others. All the septa correspond to the depressions between the costæ.

Height $\frac{1}{4}$ inch, breadth $\frac{2}{10}$ inch.

Hamilton, Victoria, South Australia. Coll. Geol. Soc.

Conosmilia, nov. gen.

Coral simple, pedicellate, conical. Columella formed of one or more twisted laminæ, which extend from the base upwards. Endotheca scantily developed. Septa apparently with simple margins, and variable in regard to the number of the primary.

3. *Conosmilia elegans*, n. sp. Pl. VIII. fig. 3 *a, b, c*.

The pedicel is large. The costæ, equal, sharp, and prominent at the base, become broad, flat, and granular above, where they are separated by very faint lines. The columella is formed by one twisted lamella, and occupies much space. The septa are in eight systems of three cycles. There are eight primary septa which reach the columella; the secondary are smaller and reach midway; and the tertiary are very small. The septa are nearly plain, are as thick at the columella as at the calicular margin, and appear to arise between the costæ. The calice is nearly circular.

Height $\frac{3}{10}$ inch; breadth of calice $\frac{1}{10}$ inch.

Geelong, Victoria, South Australia. Coll. Geol. Soc.

4. *Conosmilia anomala*, n. sp. Pl. VIII. fig. 4 *a–c*.

The coral is tall in relation to its small pedicellate base. The costæ are not prominent, but are traced by the faint lines which separate them, and by the fine herring-bone pattern which marks each of them. The columella is large, strong, and consists of two twisted riband-shaped laminæ. The septa are in eight systems of three cycles; the laminæ are sparely granular, and the primary are attached to the columella by processes. The secondary are smaller than the primary, and their inner edge is wavy; the tertiary septa are small. The septa arise between the costæ. The endotheca is sparely developed. The wall is very thin. The calice is slightly elliptical.

Height $\frac{6}{10}$ inch, greatest breadth $\frac{2}{10}$ inch.

Hamilton, Victoria, South Australia. Coll. Geol. Soc.

5. *Conosmilia striata*, n. sp. Pl. VIII. fig. 5 *a–c*.

The coral has a very narrow base, and does not expand gradually. The costæ are very broad, have marked lines between them, are very flat, and have wavy transverse markings like those of a pellicular epitheca. Septa in six systems of three cycles; the primary, which are granular, reach the columella, which appears to be formed by one twisted process. The septa arise between the costæ. The calice is more or less elliptical.

Height $\frac{6}{10}$ inch, greatest breadth $\frac{2}{10}$ inch.

Geelong, Victoria, South Australia. Coll. Geol. Soc.

6. *Antillia lens*, n. sp. Pl. VIII. fig. 6 *a–c*.

Coral in the shape of a cyclolite *Fungia*. The base is circular in outline, nearly flat, the concavity being very slight. The epitheca is pellicular and faint. The costæ are seen as radiating flat elevations, those corresponding with the smallest septa being the smallest. The margin of the base presents slightly exsert, equal processes, which are the septa. The upper surface of the coral is convex and nearly hemispherical, the depression for a small essential columella, formed by processes from the base and septal ends, being slight. The septa are in six systems of four cycles; the primary and secondary septa are equal, and the tertiary are nearly as large; those of the fourth and fifth orders are somewhat less: all are very convex superiorly, and less so and nearly straight externally. The laminæ are thin, and are very strongly marked by sharp ridges, which, radiating from the basal part of each septum, are more or less parallel, and give at the free margin a laterally dentate appearance. The appearance is less in the smaller septa. There is often a paliform process on the larger septa near the columella; and the terminations of the ridges give the dentate character to the free margin of the septa. The endotheca is scanty, stout, and inclined.

Breadth $\frac{3}{10}$ inch, height $\frac{2}{10}$ inch.

Hamilton, Victoria, South Australia. Coll. Geol. Soc.

Remarks on the new Genus and Species.

There is much that is very interesting in these Australian forms; they are so novel to those who are acquainted with the coral-fauna of the past in Europe and America, and moreover they present structural peculiarities which remove some broad lines of demarcation between some of the principal families in our classification.

The new genus *Conosmilia* possesses the twisted riband-shaped columella of the subfamily Caryophyllaceæ, the endotheca and septal margin of the Trochosmiliaceæ, and the irregular septal arrangement which was so common in the corals of the Oolitic age, and which, from its octomeral type, reflected the *rugosa* of palæozoic times.

A simple conical coral with a twisted "sérialaire" columella, an endotheca, and an octomeral arrangement of its septal systems, is as abnormal as the *Echidna hystrix*, as far as European classifications are concerned. The new genus must be placed in the neighbourhood of *Axosmilia*; and it connects the families of the Turbinolides and the Astræides.

The connexion between the septal and costal arrangements in the species of the genus is very remarkable. The bases of the septa and of the costæ are not continuous, but the septa appear to correspond with the line of depression between the costæ. This is common in species of other genera in Australia, but is very rare indeed in any specimens from any other part of the world. It was noticed in the 'Annals' of September 1864 in *Flabellum Victoriæ*, nobis, and the arrangement is seen in the two species of *Sphenotrochus* described in this communication. It gives a sort of Australian stamp to the corals. The costæ are much broader than the septa; and it will be observed that in *Sphenotrochus emarciatus* the line of depression between the costæ is continuous with the line which separates the two laminæ of which the septa are composed. The costæ to the left and right of the depressed line give each a root to the septum. The species of the new genus are readily distinguished.

The *Sphenotrochi* are at first sight not unlike well-known European older Pliocene and recent forms; but the emarciate base and appendages, with the direction of the plain costæ, and the septal arrangements, distinguish the Australian species, and prevent their being confounded with the genus *Platytrochus*.

The cyclolitoid *Antillia* is a most interesting species. The genus superseded *Montlivaltia* during the Miocene (it is a *Montlivaltia* with a well-formed columella); and it would appear that all the various forms of the elder genus are represented in the more modern. The tall cylindro-turbinate, the shorter, the forms with oval, elliptical, or circular calices, those with large bases and short or tall sides, and those with many or but few septa, amongst the *Montlivaltiæ*, are represented in the Miocene of San Domingo, Guadeloupe, Jamaica, and Sinde by *Antilliæ* of corresponding shape. In the Hamilton Tertiaries the interesting cyclolitoid *Montlivaltiæ* of the Oolites have a representative in the *Antillia lens*.

EXPLANATION OF PLATE VIII.

Fig. 1. *Sphenotrochus australis*: *a*, lower half, natural size; *b*, part of calice and columella, magnified 4 diams.; *c*, transverse section, magn. 4 diams.; *d*, costæ, magn. 2 diams.

Fig. 2. *Sphenotrochus emarciatus*: *a*, nat. size; *b*, side view, magn. 4 diams.; *c*, calice, magn. 6 diams.; *d*, continuation of septa and intercostal lines, magn. 6 diams.

Fig. 3. *Conosmilia elegans*: *a*, nat. size; *b*, side view, magn. 3 diams.; *c*, calice, magn. 6 diams.

Fig. 4. *Conosmilia anomala*: *a*, nat. size; *b*, columella, magn. 4 diams.; *c*, costæ, magnified 4 diams.; *d*, transverse section, magn. 4 diams. (one system is closed below by endotheca); *e*, septum with endotheca, magn. 4 diams.

Fig. 5. *Conosmilia striata*: *a*, nat. size; *b*, costæ, magn. 6 diams.; *c*, transverse section, magn. 6 diams.

Fig. 6. *Antillia lens*: *a*, nat. size, view from above and side; *b*, base, nat. size; *c*, side view (part of), magn. 4 diams.; *d*, base (part of), magn. 4 diams.; *e*, septum, magn. 4 diams.

XXIV.—*Notes on the Australian Species of* Arripis. By Frederick M'Coy, Professor of Natural Science in the University of Melbourne, and Director of the National Museum at Melbourne.

I find that nearly all the scales of the Victorian fishes of the genus *Arripis* have a more or less distinct fan-like structure of the base, from the supposed absence of which the genus was originally named.

Having dissected a great number, I am sure there must be some mistake (probably a clerical error) in Dr. Günther's statement that the pyloric appendages are from seventeen to fifty in number, as I find them always about one hundred and sixty.

The Australian species to be found in books are *Centropristes Georgianus* (Cuv.), *C. salar* (Richardson), *C. Tasmanicus* (Homb.), *C. truttaceus* (Cuv.), *Perca trutta* (Cuv.), and probably *Perca marginata* (Cuv.). I have perfectly satisfied myself, from a laborious examination of a great number of fresh specimens, at different seasons and of all ages, that the whole of these six supposed species should be reduced to one, and that the more important characters relied upon by Cuvier, Richardson, and Günther are the peculiarities only of different ages of the fish.

The adult form is the *Centropristes* (*Arripis*) *Georgianus* (Cuv.) and the *C. Tasmanicus* (Homb.). It reaches nearly 2 feet in length; and, although abundant in the market, it is eaten with great hesitation, owing to the many cases (sometimes fatal) reported of poisonous effects produced on certain persons eating it, although others at the same table suffered comparatively little. It is the fish improperly called "Salmon" by the colonists. It is of a nearly uniform pale olive-colour. Probably from having counted the fin-rays of so large a number of specimens, I am able to announce an extraordinary variation in this character: thus the pectorals vary from 14 to 16, the soft anals from 9 to 11, soft dorsals from 16 to 19.

The young, up to about 10 or 11 inches in length, are commonly supposed by the colonists to be a different fish, which they call "Salmon-trout" in the markets; and they are the

Centropristes or *Arripis salar* of Richardson and Günther's works. They have the belly silvery, back olive, sides rich green with vertical darker bands, and four or five longitudinal rows of round yellow spots, like lacquered brass, on the sides. This style of colouring, so different from that of the adult, is most strongly marked in the young of three or four inches in length; and I have traced in the most gradual and satisfactory way its gradual confusion and obliteration as the size approaches 1 foot, beyond which only traces can be seen of any difference from the nearly uniform dull colouring of the adult. The superior size of the eye, the difference of proportional distance between the orbits, and the shape of the forehead, relied upon by authors amongst the characters separating the *C. Georgianus* from the others, are more and more exaggerated as the size and age of the individuals are less and less.

In small, very young individuals the posterior edge of the præoperculum is not denticulated; and this is the great character relied on by Cuvier and Günther for the specific distinction of the *C. truttaceus* in their works (the fin-rays of the adult varying to the amount I have shown above); but I have clearly demonstrated the gradual appearance and development of the serration with increase of size; so that this is certainly (as might even be seen by observing the relative lengths of the radiating ridges forming the denticles going to the posterior and inferior edges of the præoperculum respectively in an old fish) only a character of immaturity.

Living specimens of the young fish three or four inches long have the caudal fin bright yellow, with a broad posterior margin of rich black; both these colours fade quickly, and totally disappear in spirit or on a dried skin. Now as this particular colouring, noted by Cuvier on a drawing from life of a fish of which he had never seen a specimen, was the foundation of the species *Perca marginata* in his 'Histoire Naturelle des Poissons,' and all the other characters are those found likewise in the young of *Arripis Georgianus*, I have no doubt, from my observation of these fugitive colours in the living fish, that *Perca marginata* should be added to the synonyms of the one Australian species of *Arripis* found here—the *A. Georgianus*. I mean to publish figures from the life, shortly, in the 'Decades of the Prodromus of the Zoology and Palæontology of Victoria,' which I am preparing as part of the "Memoirs of the Melbourne Museum," the establishment of which occupies all my leisure so pleasantly.

Melbourne, June 24, 1865.

XXV.—*On undescribed Fossil Entomostraca from the Brick-earth of the Nar.* By George Stewardson Brady.

[Plate IX.]

For the opportunity of describing the following species of Ostracoda I am indebted to the kindness of Professor T. Rupert Jones, from whom I received the specimens. An account of the deposit in which they occurred was given in the 'Geological Magazine,' vol. ii. p. 8, to which the reader is referred. The carapaces were very few in number, and belonged to the four species here described.

Order OSTRACODA.

Fam. Cypridæ.

Genus Cytheridea, Bosquet.

Cytheridea punctillata, n. sp. Pl. IX. figs. 9–11.

Valves oblong, subtriangular, convex. Dorsal margin gently arched, highest at its anterior third; ventral margin straight. Anterior border broad and well rounded; posterior narrower, and sloping steeply to its lower extremity, which forms a rounded angle. Seen *from above*, the carapace is oval in outline, and shows scarcely any appearance of pitting. *End view* suborbicular. *Surface* marked with fine and thickly set puncta. Length $\frac{1}{40}$th of an inch.

This is nearly allied to *Cytheridea pinguis*, Jones, and to *Bairdia punctatella*, Bosquet, but is not strictly referable to either of these species. It differs from the former in surface-ornament, as well as in the absence of angulation of the dorsal border; from the latter, as well as from *B. Hebertiana*, in its more triangular shape and finer surface-ornament.

Genus Cythere, Müller.

Cythere carinata, n. sp.* Pl. IX. figs. 1–4.

Carapace obliquely subtetragonal, convex; margins flexuous. Dorsal margin arched, gibbous in the middle; ventral margin convex, produced anteriorly into a broad, strongly developed keel. Anterior extremity narrow, bordered partially by the ventral keel; posterior extremity broad, somewhat truncate. *Dorsal outline* broadly oval. *End view* ovate, tumid. *Surface*

* This species was noted by Prof. T. R. Jones in the 'Geological Magazine,' vol. ii. p. 306, under the name *Normania carinata*. I have, however, thought it advisable to abandon the MS. genus *Normania*, which was meant to include the "peach-stone" forms, but which I found incapable of accurate definition or separation.

covered with conspicuous concentrically arranged pits, which are well developed towards the margins, but nearly obsolete at the centre of the valves. Length $\frac{1}{45}$th of an inch.

This species is either identical with, or very closely related to, a recent form which is common in deep water on many parts of the British coast, but which appears hitherto to have escaped description.

Cythere arborescens, n. sp. Pl. IX. figs. 5–8.

Carapace broadly oval, well rounded in front, about once and a half as long as broad. The left valve is much larger than the right, overlapping it considerably on the dorsal and posterior margins. The dorsal margin is strongly arched, and slopes somewhat steeply behind towards the ventral margin, the two being produced at their junction into an obtusely angular prominence. Ventral margin nearly straight, somewhat incurved at its anterior third, and sloping gently upwards behind. The *dorsal outline* is oblong oval, compressed. *End view* ovate. *Surface* of the shell finely punctate, marked at the extremities and along the ventral margin with an elevated reticulated pattern, the ramifications of which are gradually lost on the surface of the valves. Length $\frac{1}{35}$th of an inch.

The recent species *Cythere convexa* differs from the present only in the general outline of the valves, which in *C. arborescens* are more decidedly quadrangular, and in the ornamentation of the surface. But though there is much diversity in the sculpturing of *C. convexa*, I have never met with any specimens, either recent or fossil, which show the least trace of the beautiful arborescent ribbing characteristic of the present species. The surface is also more finely punctate than in *C. convexa*; but I should not, on this account alone, have thought it justifiable to propose for it a distinct specific name.

Cythere aspera, n. sp. Pl. IX. figs. 12–19.

Valves oblong, quadrilateral, compressed. Extremities nearly equal, the anterior obliquely rounded, bordered by an elevated nodulated ridge, which terminates in a conspicuous tubercle over the anterior hinge, and is fringed with short blunt spines. Posterior border produced into a broad flattened lamina, which bears at the ventral angle three or four strong squamous spines. Dorsal margin nearly straight; ventral sinuated and squamous behind. *Seen from above*, the carapace is compressed, oblongo-ovate, tuberculated, spinous behind. *End view* quadrilateral. *Surface* of the valves marked by three conspicuous longitudinal ridges, the ventral ridge sharply defined, the others nodulated and less distinct. The valves are covered, between the ridges, with rounded tubercles. In young specimens the longitudinal ridges are sharper, the surface-tubercles are sharp and spinous, and the elevated anterior border is absent or indistinct. The young state of this species is represented in figs. 12–15. Length (of the adult) $\frac{1}{33}$rd of an inch.

The above description applies to well-marked specimens; and much latitude must be allowed as to the amount of spinous and tubercular development, especially with reference to the squamous spines and lamina of the posterior extremity.

EXPLANATION OF PLATE IX.

Fig. 1. *Cythere carinata* (Brady), left valve, × 50.
Fig. 2. The same, seen from above, × 50.
Fig. 3. The same, seen from below, × 50.
Fig. 4. The same, end view, × 50.
Fig. 5. *Cythere arborescens* (Brady), perfect carapace, × 40.
Fig. 6. The same, seen from above, × 40.
Fig. 7. The same, seen from below, × 40.
Fig. 8. The same, end view, × 40.
Fig. 9. *Cytheridea punctillata* (Brady), left valve. × 40.
Fig. 10. The same, seen from above, × 40.
Fig. 11. The same, end view, × 40.
Fig. 12. *Cythere aspera* (Brady), right valve (young), × 40.
Fig. 13. The same, seen from above, × 40.
Fig. 14. The same, seen from below, × 40.
Fig. 15. The same, end view, × 40.
Fig. 16. The same, adult right valve, × 40.
Fig. 17. The same, seen from above, × 40.
Fig. 18. The same, seen from below, × 40.
Fig. 19. The same, end view, × 40.

XXVI. *Classification of Polyps.* (*Extract condensed from a Synopsis of the Polypi of the North Pacific Exploring Expedition under Captains* Ringgold *and* Rodgers, *U.S.N.*) By A. E. Verrill*.

The report upon the collection made by Dr. William Stimpson, naturalist to the expedition, having been much delayed, the following tabular view of the classification adopted is here presented, with the hope that, if imperfect like every other, it may nevertheless afford some aid in illustrating the natural affinities of these humble forms.

Although, in a communication read before a zoological club at Cambridge, January 1862, I attempted to demonstrate the

* From the 'Proceedings of the Essex Institute,' U. S., for 1865.

existence of the three natural orders among Polyps, I refrained from presenting this view in a paper published last year, in order that I might make further investigations upon the subject before finally publishing it.

Class *CNIDARIA* or *POLYPI.*

Order I. MADREPORARIA.

Polyps simple or compound, with embryonic or rudimentary basal or abactinal region, which has no special function, unless for vegetative attachment while young. Actinal area well developed, form broadly expanded, having a tendency in the higher groups to become narrowed towards the mouth. Tentacles simple, conical. Dermal tissues and, usually, the radiating lamellæ depositing solid coral; the radiating plates, being between the lamellæ, are therefore ambulacral, and appear to originate from the surfaces of the lamellæ and the connective tissues extending across the ambulacral chambers and filling them from below. Interambulacral spaces distinct.

Suborder I. Stauracea (*Madreporaria rugosa*)*.

Coral simple, or compound by budding; chiefly *epidermal* and *endothecal*; *septa* apparently in multiples of four, sometimes wanting. Type embryonic, like a young *Astrea* or *Fungia*.

Families: Stauridæ, Cyathophyllidæ, Cyathaxonidæ, Cystiphyllidæ.

Suborder II. Fungacea.

Polyps either simple or compound by marginal or disk-budding, rarely by fissiparity. Tentacles numerous, in multiples of six, imperfectly developed, scattered on the actinal surface, usually short and lobe-like. Upper part of polyps scarcely exsert. Coral broad and low, growth mostly centrifugal, tissue

* This group is placed here with considerable hesitation, and principally on account of the close resemblance in structure to the young of the succeeding and higher groups when they first begin to form a coral, which then consists of a ring of epitheca or epidermal deposit, with a few, imperfect, rugose septa radiating from the centre. If the number four be a constant feature of the arrangement of their septa, it is possible that they may be entitled to rank as a separate order of Polyps. To this opinion Prof. J. D. Dana inclines. Prof. Agassiz unites the group with Hydroid Acalephs, on account of their resemblance in some features to the Tabulata. It seems to me, however, that the absence of transverse plates in Cyathaxonidæ and Cystiphyllidæ, and the perfection of the vertical septa in Stauridæ, Cyathaxonidæ, and some of the Cyathophyllidæ, together with their general structure, show them to be more closely allied to the Fungacea and Astreacea, of which they may be considered embryonic types, while at the same time the group is a synthetic one, having analogies with nearly all the higher groups of Polyps and also, in some respects, with Hydroids.

chiefly septal; walls imperfectly developed, often perforate, subordinate, usually forming the basal attachment.

Families: Cyclolitidæ, Lophoseridæ, Fungidæ, Merulinidæ.

Suborder III. Astreacea.

Polyps mostly compound, either by fissiparity or various modes of budding. Tentacles usually well developed, long, subcylindrical, limited in number, in multiples of six, encircling the disk. Coral mural, septal, and endothecal; growth vertical and centrifugal, producing turbinated forms which are often elongated.

Families: Lithophyllidæ, Mæandrinidæ, Eusmiliidæ, Caryophyllidæ, Stylinidæ, Astreinæ, Oculinidæ, Stylophoridæ.

Suborder IV. Madreporacea (*Madreporaria perforata*).

Tentacles in definite numbers, twelve or more, well developed, encircling the narrowed disk, therefore nearer the mouth; polyps with the upper portion much exsert, flexile; growth chiefly vertical; coral mural and septal, porous. Polyps compound by budding, sometimes simple.

Families: Eupsammidæ, Gemmiporidæ, Poritidæ, Madreporidæ.

Order II. ACTINARIA.

Polyps with well developed, often highly specialized, basal or abactinal region. Walls well developed; tentacles longer, more concentrated around the mouth, which is also usually, if not always, furnished with special tentacular lobes or folds. Ambulacral spaces always open, destitute of connecting tissues and solid deposits.

Suborder I. Zoanthacea.

Polyps encrusting, adherent, budding from mural expansions; tentacles simple, short, at edge of disk.

Families: Zoanthidæ, Bergidæ.

Suborder II. Antipathacea.

Polyps connected by a cœnenchyma, secreting a solid sclerobase or coral-axis. Tentacles few, six to twenty-four, simple, conical.

Families: Antipathidæ, Gerardidæ.

Suborder III. Actinacea.

Polyps free, capable of locomotion, with a highly specialized muscular base or abactinal area. Tentacles well organized, either simple or branched, varying from ten to many hundreds, often with accessory organs arising from the same spheromeres, such as inner tentacles, verrucæ, complicated or simple branchial lobes, cinclidæ, eye-spherules, suckers, &c. Mouth with special lobes or folds. Most of the species are simple, a few are compound by fissiparity, many abnormally bud from the wall near the base, a few secrete from the base a horn-like deposit similar to the axis of *Antipathes*.

Families: Actinidæ, Thalassianthidæ, Minyidæ, Ilyanthidæ, Cerianthidæ.

Order III. ALCYONARIA.

Polyps with well developed actinal, mural, and abactinal regions, compound by budding. Tentacles eight, pinnately lobed, long, encircling a narrow disk. No interambulacral spaces. Ambulacral ones open and wide.

Suborder I. Alcyonacea.

Polyps turbinate at base, budding in various ways, encrusting, adherent to foreign bodies by the cœnenchyma.

Families: Alcyonidæ, Xenidæ, Cornularidæ, Tubiporidæ.

Suborder II. Gorgonacea.

Polyps cylindrical, short, connected by a cœnenchyma, secreting a central supporting axis.

Families: Gorgonidæ, Plexauridæ, Primnoidæ, Gorgonellidæ, Isidæ, Corallidæ, Briaridæ.

Suborder III. Pennatulacea.

Polyps forming free moving colonies, the composite basal portion with locomotive functions and special cavities, with or without a solid free axis.

Families: *Pennatulidæ, Pavonaridæ, Veretillidæ, Renillidæ.*

Among the most interesting species in this collection the following may be mentioned:—

Stephanoseris lamellosa, Verrill.

Coral low, subcylindrical, with a broad base, which completely covers small univalve shells, with the exception of the opening; wall rudimentary; septa in four cycles, the primaries much the largest, with subentire rounded tops; columella well developed, papillose; costæ prominent, unequal.

Loo-Choo Islands. Dr. Wm. Stimpson.

Heterocyathus alternata, Verrill.

A low species with very unequal septa and costæ, the primary septa very prominent. Encrusts and covers small univalve shells.

Gaspar Straits. Capt. John Rodgers.

Balanophylia capensis, Verrill.

A species about half an inch high, broadly attached, slightly turbinated, with an epitheca rising within a line of the margin. Calicle deep, broadly oval. Septa in four cycles, the principal ones much exsert, vertical, narrowed at top, those of the fourth cycle joining the columella in pairs. Colour of the living Polyp bright orange.

Cape of Good Hope. Dr. Wm. Stimpson.

Eupsammia Stimpsonii, Verrill.

Coral free, elongated, turbinated, blunt at base. Calicle oval, deep; columella well developed; septa broad, the principal ones with entire inner edges, rounded. Length an inch or more; breadth of cell ·3 in.

Interesting as a living representative of a genus hitherto known only in the fossil state.

North China Sea. Dr. Wm. Stimpson.

Metridium fimbriatum, Verrill.

A species closely allied to *M. marginatum* of this coast, but apparently more elongated, with longer and more slender tentacles, which are almost hair-like. Disk within the tentacles narrow. "Colour pale orange, translucent; body punctate with dark brown; mouth deep orange."

San Francisco, California. Dr. Wm. Stimpson.

Phellia collaris, Verrill.

Edwardsia collaris, Stimpson, Proc. Philad. Acad. Nat. Science, May and June 1855.

A species remarkable for its great size compared with previously known species from Europe.

Hong-Kong, China. Dr. Wm. Stimpson.

Phellia clavata, Verrill.

Edwardsia clavata, Stimpson, *l. c.* 1855.

A species even larger than the last.

Near Ousima, Japan. Dr. Wm. Stimpson.

AMMONACTIS, nov. gen.

Column elongated, subcylindrical, with well developed basal disk, covered, as in *Phellia,* with a persistent epidermis extending to near the summit, naked above; but differs in having a lobe-like tubercle below each tentacle, distinct from the margin. Tentacles long and numerous.

Ammonactis rubricollum, Verrill.

Edwardsia rubricollum, Stimpson, *l. c.* 1855.

Hong-Kong, China. Dr. Wm. Stimpson.

Halocampa brevicornis, Verrill.

Edwardsia brevicornis, Stimpson, *l. c.* 1855.

Hong-Kong, China. Dr. Wm. Stimpson.

Halocampa capensis, Verrill.

Body elongated; tentacles twenty, blunt; ambulacra subpapillose. Six tentacles have their inner bases dark brown; body pale reddish, with dots and patches of flake white; inner side of tentacles flake white.

Cape of Good Hope, 12 fathoms, sand. Dr. Wm. Stimpson.

Cerianthus orientalis, Verrill.

A large species, similar to *C. americana*, nobis. Body elongated, in a tube of mud. Tentacles long and slender. Colour of body deep reddish brown; outer tentacles translucent, yellowish and white, pale brown on their inner sides, greenish at base; inner ones purplish brown, or sometimes grass-green.

At low-water mark, Hong-Kong, China. Dr. Wm. Stimpson.

Nephthya thyrsoidea, Verrill.

Polyps forming thyrsiform bunches of closely clustered branchlets, 3 inches high and 2 inches broad. Colour wine-yellow or light brown, with a dark purplish tinge below the tentacles; tentacles nearly white; spicula forming elevated transverse lines of silvery white on the stalks.

Cape of Good Hope, 20 fathoms, rocks. Dr. Wm. Stimpson.

Telesto ramiculosa, Verrill.

Cornularia aurantiaca, Stimpson, *l. c.* 1855, non *T. aurantiaca*, Lamx.

Hong-Hong, 10 fathoms, shelly bottom. Dr. Wm. Stimpson.

Parisis laxa, Verrill.

Coral forming openly reticulate fronds; papillæ numerous, rounded, on all sides of the branches; cœnenchyma minutely villous in alcohol. Calcareous joints shorter, and internodes longer, than in *P. fruticosa*, nobis.

Hong-Kong. Dr. Wm. Stimpson.

Acanthogorgia coccinea, Verrill.

Nepthya coccinea, Stimpson, *l. c.* 1855.

Hong-Kong, 10 fathoms, on shells. Dr. Wm. Stimpson.

Veretillum Stimpsonii, Verrill.

A large species, 6 or 8 inches long, the upper portion enlarged, more than half the entire length. Polyps much exsert, upwards of an inch long; tentacles very long. Axis thick, short, fusiform, a third of an inch long. Base white, somewhat striated; body light cream-colour; polyps transparent, bluish white at the bases of the tentacles.

Hong-Kong, 6–10 fathoms, mud. Dr. Wm. Stimpson.

Veretillum baculatum, Verrill.

Club-shaped, the base about a third of the length. Polyps scattered, not numerous. Axis small, fusiform, about half an inch long in a specimen 3 inches long.

Sea of Ochotsk, off Siberia. L. M. Squires.

Kophobelemnon clavatum, Verrill.

Veretillum clavatum, Stimpson, *l. c.* 1855.

Polyps more numerous and crowded than in *K. Burgeri*, Herkl., which it resembles; body more claviform, naked dorsal space very narrow.

Hong-Kong, 6 fathoms, mud. Dr. Wm. Stimpson.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

June 15, 1865.—Major-General Sabine, President, in the Chair.

"On the Anatomy and Physiology of the Nematoids, parasitic and free; with observations on their Zoological Position and Affinities to the Echinoderms." By Henry Charlton Bastian, M.A., M.B. (Lond.), F.L.S.

After commenting upon the many conflicting statements which have been made concerning the anatomy of these animals, and more especially with regard to the presence or absence of a nervous system, and of real organs of circulation, the author alludes to the increased interest which has lately been thrown over this order by the discovery of so many new species of the non-parasitic forms, marine, land, and freshwater.

He has entered fully into the description of the tegumentary organs, and has recognized a distinct cellulo-granular layer intervening between the great longitudinal muscles and the external chitinous portion of the integument. This layer is one of great importance in the economy of these animals; the author looks upon it as the deep formative portion of the integument, from which the chitinous lamellæ are successively excreted. It is bounded internally by a fibrous membrane, which serves as an aponeurosis for the attachment of the four great longitudinal muscles; and the well-known lateral and median lines which have so long been a puzzle to anatomists are, he says, in reality nothing more than intermuscular developments of this layer. In some species each of the lateral lines contains an axial vessel, though in very many others nothing of this kind is to be met with. A periodical ecdysis of the chitinous portion of the integument takes place in all Nematoids during the period of their growth.

The author agrees with Dr. Schneider as to the nature of the transverse fibres attached to the median lines. They are contractile prolongations from the longitudinal muscles, and may be considered extrinsic muscles for the propulsion of the intestinal contents, since the intestine itself has no muscular tissue in its walls.

Schneider's description of the nervous system in *Ascaris megalocephala* has been confirmed, and a similar arrangement has been recognized by the author in several other Nematoids. It exists as a nervous ring encircling the commencement of the œsophagus, in connexion with many large ganglion-cells. The principal peripheral branches are given off from the anterior part of the ring, and proceed to the region of the mouth and cephalic papillæ. Although well developed ocelli exist in many of the free marine species, no nerve-filaments have yet been detected in connexion with them.

The organs of digestion are mostly simple, the principal variations being met with in the presence or absence of a pharyngeal cavity, and in the structure of the œsophagus. In some species its parietes are distinctly muscular, whilst in others, as in the *Trichocephali* and *Trichosomata*, they are as distinctly cellular. Those possessing a pharyngeal cavity sometimes have well-marked tooth-like processes developed from its walls; but the author believes that the chitinous plates which are sometimes met with in posterior swellings of the œsophagus are not "gastric teeth," as they have been hitherto described, but rather valvular plates for ensuring greater perfection in the suctorial process by which these animals pass their food along this portion of the alimentary canal.

The water-vascular system may be seen in many Nematoids in its most elementary condition, as a small tubular gland, with an excretory orifice in the mid-ventral region of the anterior part of the body. In other Nematoids no trace of such a system exists; whilst its most developed condition yet recognized in these animals may be seen in *Ascaris osculata* and *A. spiculigera*, where an intimate plexus of vessels, still in connexion with an anterior ventral pore, is met with in a peculiar development from the left lateral band. Intermediate conditions between these extreme forms may be traced in other species; and from the obviously glandular nature of the tubular or pyriform organ met with so commonly in the free, and also in many of the parasitic species, he thinks considerable light is thrown upon the function of the "water-vascular" system. He says, "Here we have undoubtedly to deal with an excretory glandular apparatus. No one could for a moment regard these structures as at all analogous to vessels destined alternately to receive and discharge an external fluid medium. I believe that in the *Trematoda* and *Tæniada* also, where similar though often more developed systems exist, their function is in like manner one of a purely eliminatory kind; and I therefore cannot but look upon the name of 'water-vascular' apparatus as a singularly inappropriate appellation for this system of vessels."

Other very peculiar transverse vessels exist in the deep integumental layer of *Ascaris megalocephala* and *A. lumbricoides*, mostly running in pairs from median line to median line, and, strangely enough, being about twice as numerous on the right as on the left side of the body.

The author believes that in the Nematoids but little provision exists for the oxidating portion of the process of respiration, and thinks that this deficiency may be compensated by a greatly increased activity of glandular *eliminating* organs. Considering the conditions under whose influence so many of the parasitic forms pass their existence, we can easily imagine that the presence of any organs for effecting an oxidation of their tissues would not only be useless, but actually baneful. Glandular organs exist in the greatest abundance in all Nematoids, and many of these are excretory organs. In those species in which no modification of the ventral excretory apparatus is met with, the author has found a very large number of channels running through the chitinous portion of the integument, so as to bring its deep cellular layer into communication with the exterior. These pores are, he believes, complementary respiratory organs, and their development is always in an inverse proportion to that of the other excretory organs. Thus amongst the free Nematoids he has found them most numerous in *Dorylaimus stagnalis* and *Leptosomatum figuratum*—species in which the ventral excretory apparatus is entirely absent. The same arrangement is met with in the *Trichocephali* and *Trichosomata*, in which these integumental channels attain their maximum development. The gradually widening longitudinal band long known to exist in the *Trichocephali* is due to the presence of thousands of these channels in connexion with a glandular development of the deep integumental layer beneath.

Many interesting facts are brought forward concerning the "tenacity of life" of some of the free Nematoids, and their power of recovery after prolonged periods of desiccation. This has been long known as one of the characteristics of *Tylenchus tritici**, but the author has found it common only to the species of four land and freshwater genera—*Tylenchus, Plectus, Aphelenchus,* and *Cephalobus*. The remainder of the free Nematoids are remarkably frail, and incapable of recovering even after the shortest periods of desiccation.

* *Vibrio tritici* of older writers.

In the last section, on "The zoological position and affinities of the Nematoids," the author enters fully into what he believes to be the points of resemblance between these animals and the Echinoderms. The strongest evidence is, he thinks, to be found in the fact of the very close resemblance between the nervous systems of these animals, differing notably as they do at the same time from what we find in the *Scolecida* or *Annelida*. Then the integumental pores which he has now discovered in so many Nematoids can, he thinks, be paralleled only by the ambulacral and other pores met with in the Echinoderms. Great similarities in the distribution of these pores may also be observed in the two groups. The Nematoids present no trace of segmentation or lateral appendages to their bodies, but traces of a radiate structure do exist. Their various parts and organs exhibit a quadrate mixed with a ternate type of development. He looks upon the order *Nematoidea* as an aberrant division of the class *Echinodermata*, which at the same time tends to connect this class in the most interesting manner with the *Scolecida*—since, although in the points above mentioned they display their affinities to the Echinoderms, still, as regards the structure and different modifications of the ventral excretory apparatus, they agree more closely with the *Trematoda* or flukes.

"Researches on the Structure, Physiology, and Development of *Antedon* (*Comatula*, Lamk.) *rosaceus*." By Dr. W. B. Carpenter, F.R.S.

The author, after adverting to the special interest attaching to the study of this typical form, as the only one readily accessible for the elucidation of the life-history of the Crinoidea, states it to be his object to give as complete an account as his prolonged study of it enables him to offer, of its minute structure, living actions, and developmental history, taking up the last at the point to which it has been brought in the memoir of Prof. Wyville Thomson.

He prefaces his memoir with an historical summary of the progress of our knowledge of the distinctive peculiarities of this genus, and of its relation to the Crinoidea; and he shows that the first recognition of this relationship was most distinctly made by Llhuyd, at the beginning of the last century, though that recognition has been passed without notice by most subsequent writers, and is altogether ignored by MM. de Koninck and le Hon in their recent history.

The author then proceeds to describe the external characters of *Antedon rosaceus*; and shows, from its habits as observed in a vivarium, that although possessed of locomotive power, it makes so little use of this under ordinary circumstances, that its life in the adult condition, no less than in its earlier stage, is essentially that of a pedunculate Crinoid.

He then gives a minute description of the several pieces of the skeleton—the accounts of these previously given by J. S. Miller and Prof. Joh. Müller not being in sufficient detail to serve as standards of comparison to which the parts of fossil Crinoids may be referred. And he directs special attention to the curiously inflected rosette-like plate, previously unnoticed, which occupies the central space left within the annulus formed by the adhesion of the first radials. This plate is in special relation to the organ termed by Joh. Müller the "heart," but certainly having no proper claim to that designation, being a quinquepartite cavity in the central axis, from the walls of which there pass out not vessels but solid cords of sarcode, into the rays and arms, and also into the dorsal cirri. The inflexions of the rosette-like plate serve for the support and protection of the large cords passing into the rays, each of which has a double origin, and a connexion with the adjacent radiating cords that reminds the anatomist of the "circle of Willis."

The skeleton of the adult differs so widely in the forms and relations of its parts from that of the early Pentacrinoid larva described by Prof. Wyville Thomson, that the derivation of the former from the latter can only be understood by observation of all the intermediate stages. When the calcareous skeleton of the calyx first shows itself, it consists only of five *oral* plates arranged conformably upon five *basal* plates, as thus:—

$$\begin{array}{ccccc} O & O & O & O & O \\ B & B & B & B & B \end{array}$$

At a stage a little more advanced (which has been described by Prof. Allman, Trans. Roy. Soc. Ed. vol. xxiii. p. 241), the rudiments of the *first radials* are found interposed between the orals and basals, alternating in position with both, as in the margin; and between two of these first radials there appears a single small unsymmetrical plate, which afterwards proves to be the *anal*. The first radials undergo a rapid increase in size, and soon become surmounted by *second* and *third* radials, which project between the orals; whilst the orals and basals, undergoing no such increase, are relatively very much smaller; the *anal* plate is still found on the line of the first radials. But from this time the radials form the principal part of the calyx, which opens out widely in conformity with the increase of space required for the digestive apparatus, the intestinal canal being now developed around what was originally a simple stomach with one orifice. The highest joint of the stem also undergoes a remarkable increase in size, and begins to acquire the form of a basin with an inflected rim, constituting what is known in the adult as the *centro-dorsal* piece. When the calyx opens out, the five *oral* plates, which originally formed a circlet around the mouth, retain that position, and detach themselves entirely from the divergent radials, nothing but the soft perisomatic membrane filling up the space between them. These *oral* plates never increase in size, and towards the end of the Pentacrinoid stage

$$\begin{array}{ccccc} O & O & O & O & O \\ a & a & a & a & a \\ B & B & B & B & B \end{array}$$

$$\begin{array}{ccccc} A^3 & A^3 & A^3 & A^3 & A^3 \\ A^2 & A^2 & A^2 & A^2 & A^2 \\ O & O & O & O & O \\ A^1 & A^1\,\mathrm{an}\,A^1 & & A^1 & A^1 \\ B & \overline{B} & B & B & B \end{array}$$

they begin to undergo absorption. I can still trace their basal portions in young specimens of the free *Antedon*; but as the creature advances towards maturity they are altogether lost sight of. When the intestinal canal has been sufficiently developed to open on the surface of the oral disk, the *anal* plate is lifted out of the position it originally occupied, and is at last found on the anal funnel, far removed from the radials. This, like the oral plates, begins to undergo absorption towards the end of the crinoidal stage, and completely disappears in the early part of the life of the free Antedon. The *radial* plates increase not only in size but also in thickness; and channels which are left on their internal surface by vacuities in the calcareous network, are converted into canals by a further inward growth of this, which completely covers them in. It is through these canals that the cords of sarcode pass to the arms. The *basal* plates, like the oral, remain stationary in point of size, and present no change in appearance or position until after they have been completely concealed externally by the centro-dorsal piece (the highest joint of the stem), which rapidly augments, both in absolute and in proportional size, when the development of the dorsal cirri is taking place from its convex surface. By the end of the Pentacrinoid stage, this plate has extended itself so far over the base of the calyx as completely to conceal the basals; and as the free *Antedon* advances towards maturity, it gradually extends itself over the first radials, which then become adherent to it and to each other. The basals then undergo a most curious metamorphosis, consisting in absorption in one part and extension in another, by which they finally become converted into five peculiarly shaped pieces, the ultimate union of which forms the single rosette-like plate which has been already stated to lie within the annulus formed by the first radials of the adult *Antedon*. Hence the calyx finally comes to be thus composed:—

$$\begin{array}{cccccccccc}
 & R^3 & & R^3 & & R^3 & & R^3 & & R^3 \\
 & R^2 & & R^2 & & R^2 & & R^2 & & R^2
\end{array}$$

$$\underbrace{b\ \ R^1\ \ b\ \ R^1\ \ b\ \ R^1\ \ b\ \ R^1\ \ b\ \ R^1}_{\text{Centro-dorsal.}}$$

As the *orals* and the *anal* have entirely disappeared, no part of the primordial calyx of the Pentacrinoid larva is traceable in it, until we separate the adherent pieces which form its base, and search out the minute and delicate rosette-like plate which is formed by the metamorphosis of the *basals*.

The structure, physiology, and development of the digestive, circulatory, and respiratory apparatus, and of the nervous and muscular systems, will form the subject of a future memoir.

ZOOLOGICAL SOCIETY.

March 28, 1865.—John Gould, Esq., F.R.S., in the Chair.

Notice of an apparently Undescribed Species of American Porcupine. By Dr. J. E. Gray, F.R.S., F.L.S., etc.

There has been in the British Museum since 1853 a small specimen of a short-tailed American Porcupine, which was sent from Columbia. I suspected that the animal might be young; and I have been waiting, expecting that we might receive another specimen from the same source, which would enable me to give a more complete account of the animal; but as no additional materials have come to hand, I shall now proceed to give a short notice of it, in the hope of drawing the attention of collectors to the animal.

Erethizon (Echinoprocta) rufescens.

Pale brown, varied with black; head white, speckled with black and pale brown; tail and feet black; chin, throat, and beneath pale brown. A short white streak on the centre of the nose, and a few white spines, forming a slight crest, on the nape; a whitish mark on the side of the cheek. The bristly spines of the head thin, white, with a small black subterminal band and yellow tip; the spines of the back elongate, white, with a black subterminal ring and elongated rufous tips; those of the front part of the back and sides very slender, bristle-like, gradually becoming thickened, stronger, and shorter, until on the hinder part of the back, above the tail, they are well developed, short, thick. Spines with black ends and very small brown tips. The end of the nose, chin, and underside of the body covered with uniform pale brown slender bristles. The tail and feet covered with short black bristles. Whiskers black, slender, flexible.

Hab. Columbia.

There are a few spines on the top of the head, with one white to the tip, making a kind of occipital crest; but I am not sure that this may not be an individual peculiarity.

The soles of the hind feet are bald to the heel. Cutting-teeth yellow, slender, rounder in front. Unfortunately I have not been able to see the skull.

If this is a true *Erethizon*, the genus may be divided into two sections:—

1. *Erethizon.* The back covered with elongated bristles and short spines. *E. dorsatus* and *E. epixanthus.*

2. *Echinoprocta.* The back covered with one kind of elongated slender spines, which become shorter, thicker, and more rigid over the rump. *E. rufescens.*

Notice of a Species of Tupaia from Borneo, in the Collection of the British Museum. By Dr. John Edward Gray, F.R.S., F.L.S., etc.

There has been in the British Museum for some years a specimen of a *Tupaia* in spirits, which was received from Borneo, and also a stuffed specimen without a habitat, evidently of the same species.

These specimens have the general coloration of *Tupaia tana*, and have evidently been regarded as varieties of that species; but they are most distinct. The head and skull are short and broad, of about the same form and proportion as those of *Tupaia ferruginea*; the fur and tail is of the same bright shining bay as *T. tana*, but it is entirely destitute of the three black streaks between the shoulders, which are so well marked in that species.

The skull shows that the stuffed specimen is that of an adult animal not so large as *T. tana*, and more nearly resembling in size *T. ferruginea*. It may be known at once from the latter species by the dark red-brown colour of the tail, with its very red underside. I propose to call it

Tupaia splendidula.

Fur dark red-brown, blackish-washed. Tail dark red-brown; pale red beneath; the shoulder-streak yellow. The head conical, about twice as long as wide behind.

Hab. Borneo.

The head is large compared with the size of the body; the ears rounded, with several ridges on the conch, and a well-developed convex tragus, not unlike the human ear. The palm and soles are bald to the wrist and heel.

I thought at first that this species might be the *Tupaia speciosa* of Wagner; but that animal is stated to have a head as long and as tapering as *T. tana*, and, indeed, seems to be only a slight variety of that species.

Notice of a New Genus and Species of the Family Trionychidæ from Western Africa. By Dr. J. E. Gray, F.R.S., F.L.S., etc.

The British Museum has just received two specimens of a *Trionyx* with covered legs from Western Africa (collected by the late Dr. B. Baikie, probably on the Niger), which is evidently different in structure from any we have before received from that country, and which I am inclined to believe is an entirely new form.

It differs from the other African *Trionyches* with covered feet in only having two pairs of callosities on the sternum; while *Heptathyra* has seven, and *Cyclanosteus* has nine such hardnesses on the sternal bones. These callosities differ in disposition and mode of development, as well as in manner, in the three genera. The skull is in form like that of the genus *Cyclanosteus*; that is to say, the face is moderate, with eyes about halfway between the front of the zygomatic arch and cavity of the temporal muscle and the end of the nose; but it differs from the skull of the latter genus in the forehead and crown being wider and flatter.

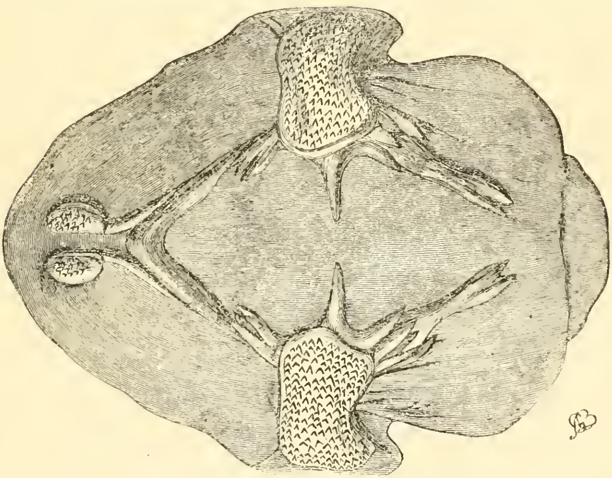
The genus (which I should refer to the tribe *Cyclanosteina*) may be defined thus:—

TETRATHYRA.

The face of the skull short, convex, arched in front; orbits lateral, shelving, about midway between the end of the nose and the front of the zygomatic arch; forehead flat, rhombic, broad. The dorsal shield with flexible margins, without any marginal bones; front of dorsal shield warty above and without any odd nuchal bone. Sternum flat, with broad rounded lobes covering the feet, and two pairs of sternal callosities; the front pair small, rounded, on the front ends of each of the front pair of sternal bones; the lateral pairs are large, oblong, broadly notched out behind, and very rugose.

This genus differs from *Cyclanosteus* in the want of any odd bone in front of the dorsal shield, as well as in the number and disposition of the sternal callosities.

The upper surface of the front of the disk is closely covered with roundish warts. The sternal callosities are not developed in the young specimen, the larger lateral pair being first indicated as the animal increases in size. The dorsal disk of the young specimen is marked with close grains, or warty, in rather arched longitudinal ridges.



Lower surface of *Tetrathyra Baikii*.

There are some young specimens in spirits from West Africa in the Museum, which belong to this species; they differ from the young of *C. senegalensis* in being marbled, while that species is marked with distinct small subcircular black spots.

This second genus of *Cyclanosteina* may explain the reason why we have two skulls from West Africa the one with the front and the other with the whole upper edge of the lower jaw dilated, as figured in the 'Proceedings of the Zoological Society' for 1864, fig. 18, p. 95, and fig. 21, p. 96.

TETRATHYRA BAIKII, sp. nov.

Head olive, white-spotted. Back olive, marbled with black above;

the lower surface pale, irregularly black-marbled or spotted. The front pair of callosities small, oblong.

Younger specimen, the head and dorsal shield pale brown, marbled with large black (often inosculating) streaks; lower part of head and sternum black, with large, irregular-sized, pale spots, some of which are symmetrical.

Hab. West Africa, River Niger?

The largest specimen, which is not full-grown, is 11 inches long; the dorsal shield 7 inches long and 5 inches wide.

April 11, 1865.—Prof. T. H. Huxley, F.R.S., V.P., in the Chair.

Description of a New Species of Indian Porcupine. By P. L. Sclater, M.A., Ph.D., F.R.S.

About three years ago I received a communication from our excellent Corresponding Member, Colonel Sir William Thomas Denison, K.C.B., Governor of Madras, inquiring of me whether anything was known in Europe of a second Indian Porcupine, distinguished from the common species by having some of its quills of a deep orange-colour. Upon my replying that this Porcupine appeared to be unrepresented in our collections of animals either living or dead in this country, and would moreover probably prove new to science, Sir William promised to do his best to obtain living specimens of it for the Society's Menagerie. The first examples of this animal obtained by Sir William for transmission to this country died, I believe, before they were shipped. But in the latter part of last year Sir William was successful in obtaining four other living specimens, which reached this country in safety on the 22nd of December last. Three of these Porcupines are still living in the Society's Menagerie. The fourth died a few days after its arrival, and was found one morning already partially devoured by its carnivorous companions. Enough, however, remained of it to make a tolerably good skin, which, together with the skull, I now exhibit. Upon these materials I propose to attempt to give characters to this hitherto undescribed species.

Before doing so, however, I should mention that this species, although it has never yet been described, and, as far as I can ascertain, has never reached Europe before, alive or dead, has been already provided with a name, which I do not propose to alter. Mr. Francis Day, Fellow of this Society, late of H. M. Madras Medical Service, in his work on the native Indian state of Cochin, called 'The Land of the Permauls,' published at Madras in 1863, has spoken of this animal as "The Orange Porcupine, *Hystrix malabaricus*," and given some details respecting it*. Mr. Day has also kindly supplied me with some further notes respecting it, which I shall give presently.

I commence, however, by characterizing the species, which belongs to the typical *Hystrices*, and is very closely allied to *H. leucura*, as

Hystrix malabarica, sp. nov.

H. *cristæ setis purpurascenti-nigris, unicoloribus; rostro pilis*

* Land of the Permauls, pp. 446, 447.

minutis obsito: colore corporis antici purpurascenti-rubro, spinis ad basin aurantiacis, inde ad apicem purpurascenti-nigris: spinis dorsi elongatis, aliis aurantiaco-rubro et nigro, aliis, sicut in specie vulgari, albo et nigro annulatis: dorsi postici linea mediali distincta, e spinis aliis albis, aliis aurantiacis composita: cauda longa, spinis aliis albis, aliis aurantiaco-rubris.

Long. tota a rostro ad basin caudæ 28·0 poll., caudæ 8·0.

Hab. India Meridionalis, prov. Cochin.

Obs. Affinis *H. leucuræ*, sed spinarum colore, rostro minus setoso, et cauda longiore distinguenda.

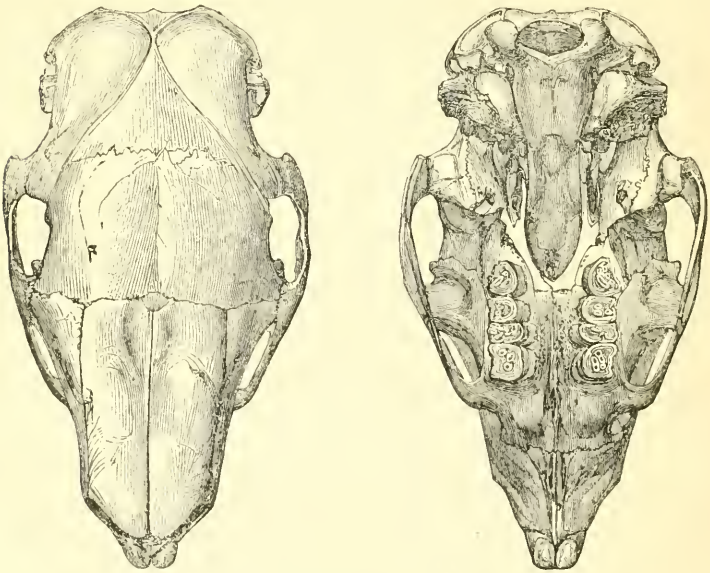
Although the general external appearance of this Porcupine is remarkably different from that of *H. leucura*, so that the living animal strikes one at the first glance as being undoubtedly distinct, I have been somewhat disappointed, on comparing the two skins together, to find how difficult it is to detect any very decided differences in their structure. The muzzle in the present specimen of *H. malabarica* (which is the only individual I have been able to examine) seems to be decidedly less clothed with hair than in *H. leucura*. This is one of the few points in which *H. leucura* differs externally from *H. cristata*, and in this respect the present specimen seems more like *H. cristata*. The whole of the short spines and hairs of the anterior portion of the body in *H. malabarica* are dark reddish orange at their bases, growing into purplish brown at their tips; and the same is the case with those of the flanks and legs. The elongated spines of the middle of the back are some of them black, annulated with white, just as in *H. leucura*; others, more especially towards the sides, where these latter rather predominate, have the white replaced by a bright orange-red. The medial line of the rump is well defined, as in *H. leucura*; but the white spines are mixed with others wholly orange. This is likewise the case with the spines round the base of the strong spines which terminate the tail: some of these are wholly white, and some wholly orange. The strong spines which surround the tail, and extend beyond its extremity, are mostly wholly white, with some wholly orange intermixed. In the centre of these are about twelve of the singular hollow truncated quills mounted on pedicels, just as in *H. leucura* and *H. cristata**. About one-fourth part of these abnormal quills are orange; the others are white.

As the cranial characters of the species of *Hystrix* are generally very well marked, and indeed the only test by which the species can be certainly distinguished, I was in hopes of finding in the cranium of *Hystrix malabarica* some more certain evidence of its real distinctness from *H. leucura*. I have therefore carefully compared the skull of the new species with a fine series of six skulls of *H. leucura* in the British Museum†, in doing which I have received the valuable as-

* I am not aware whether any explanation has ever been given of the use of these curious quills. My impression is that they serve to act as a rattle, which is thus formed, as in the Rattle-Snakes (*Crotalus*), by a cutaneous development at the end of the tail.

† *H. cristata* and *H. leucurus* of the 'Catalogue of the Bones of Mammalia in the British Museum' (1862), p. 191.

sistance of my friend Dr. Peters, who happened to be present on the occasion. The skull of *Hystrix malabarica*, which is that of a very old animal with the molar teeth worn very low and the cranial sutures nearly obliterated, agrees in the shape of the nasal and intermaxillary bones with *H. leucura*. As in the latter species, so in *H. malabarica* the nasal bones have their sides nearly parallel with the hinder margin, terminating nearly in a line with the anterior edge of the orbit, and the nasal processes of the intermaxillaries are broad and truncated. At first I was inclined to think there was some difference in the patterns of the molar teeth of the two species, those of *H. malabarica* being surrounded by a complete cingulum of enamel, and the internal areas being completely isolated, which is not the case in *H. leucura*. But this, I suspect, is only due to the age of the specimen. It would therefore be desirable to have further specimens of the skull of *H. malabarica* for comparison upon this point; but in other respects there seem to exist differences in the skulls of the two species which are amply sufficient to confirm their specific separation.



Skull of *Hystrix malabarica*.

1. In *H. leucura* the total length of the molar series is greater than the distance between the molars and the tympanic bone; in *H. malabarica* it is rather less.

2. In *H. malabarica* the entopterygoid is more remote from the tympanic bone, and is of a different form.

3. The facial surface of the lachrymal is very small in *H. malabarica*—much smaller than in *H. leucura*.

4. The rostral part of the cranium is more elongated and more

compressed in *H. malabarica*, and the foramina incisiva are longer and narrower.

These and other minor peculiarities will, I think, sufficiently serve to separate *H. malabarica* from its nearest ally, although it is of course desirable that further specimens should be obtained for comparison.

With regard to the habits of *H. malabarica*, Mr. Day has kindly furnished me with the following particulars:—

"During my residence at Cochin I was informed by the natives that a species of orange-coloured Porcupine was found in the neighbouring hills, the flesh of which was more highly esteemed for food than that of the common variety. It was said to be a smaller species, and that the two never lived in the same locality. Small families of them, I subsequently ascertained, are found in various places along the ghawts of Cochin and Travancore.

"At Trichooe, about forty miles north-east of Cochin, there was a colony of these animals. They had formed their burrows in the laterite rock, in a spot from which it was impossible to reach them by digging. As I was anxious to obtain one of them, the burrows were stopped and a pitfall dug before two, which were the most frequented; brushwood was then heaped before the other apertures and set on fire, but the prisoners did not venture out until they had been smoked three days and nights.

"The native sportsmen declare that the aroma from these burrows is quite sufficient to distinguish the different species.

"In 1862 I placed a pair, about a third grown, in a cage, and kept them there nearly two months: although they permitted the dogs and cats to steal their food, they never became tame or even friendly with those who fed them.

"They were omnivorous; and, though quiet all day, as soon as it became dusk they commenced to gnaw their cage, and continued to do so until daybreak; subsequently, when the bars were encased with tin, they passed the night scratching.

"In captivity they lose much of their orange-colour; and its vividness greatly decreases when they are ill.

"The natives consider wounds caused by their quills to be venomous, and the effects frequently fatal."

It may be useful to add to this paper a list of the known species of *Hystrix*, and their localities, arranged according to Mr. Waterhouse's excellent system*.

a. Species nucha cristata.

1. H. CRISTATA, Linn. et auct. (*Acanthion Cuvieri*, Gray); Waterhouse, *l. c.* p. 448: ex Europa merid. et Africa bor. et occ.

2. H. AFRICÆ AUSTRALIS, Peters, Reise n. Moss. i. p. 170: ex Africa austr. orient.

3. H. LEUCURA, Sykes (*H. hirsutirostris*, Brandt; Waterhouse, *l. c.* p. 454; *H. cristata* et *H. leucurus*, Gray): ex Asia occidentali usque ad Indiam extremam.

4. H. MALABARICA: ex India merid.

* Nat. Hist. Mamm. vol. ii. p. 446 *et seq.*

b. Species nucha non cristata.

5. H. Hodgsoni, Gray ; Waterhouse, *l. c.* p. 461 : ex India superiore.

6. H. javanica (F. Cuv.) ; Waterhouse, *l. c.* p. 465 : ex Java.

The Society's collection contains at the present time fine living specimens of four of these, namely, *H. Africæ australis, H. leucura, H. malabarica,* and *H. javanica.*

Notes on the Whales of the Cape ; by E. L. Layard, Esq., of Cape-Town, Corr. Memb. With Descriptions of Two New Species ; by Dr. J. E. Gray.

Mr. E. Layard, the Keeper of the South African Museum at Cape-Town, has most kindly sent me descriptions and drawings, made by Mr. Trimen, of the skulls of the Cetacea contained in that museum. Amongst these is the drawing of a Porpoise or Grampus taken in Kalk Bay (Simon's Bay). Unfortunately the skull of this animal was placed in the skin during Mr. Layard's absence from the Cape ; so that it cannot be got at for description ; but, from what he saw of the dentition, he believes it is like a Grampus—very like the figure of the skull of *G. Cuvierii* in the 'Catalogue of Cetacea in the Collection of the British Museum,' t. 5. f. 1. He says that there is a separate skull, greatly resembling that figure, in the South African Museum.

The Grampus (?) prepared with the skull in the skin, mentioned above, is represented as having a rounded head, without any appearance of a beak. "It is entirely deep brown black ; the skin smooth, with a few wrinkles behind the chin and on the front edge of the pectoral fin.

"The entire length, from the nose to the end of the tail, 8 feet ; from the nose to the front base of the dorsal fin, along the curve, 3 feet 9 inches ; of the dorsal, 10 inches ; of the back, from the hinder edge of the dorsal fin to the end of the tail, 3 feet 10 inches ; width of the tail, 1 foot 11 inches.

"Length from the front of the mouth to the base of the pectoral, 1 foot $5\frac{1}{2}$ inches ; of the upper edge of the pectoral, 1 foot 5 inches."

In the South African Museum are two smaller skulls from the coast of the Cape,—one apparently of a *Steno,* with $\frac{37}{38}$ teeth ; and the other of a *Delphinus,* probably the common one of Table Bay, which has $\frac{24}{25}$ teeth.

These are probably new species, to be described.

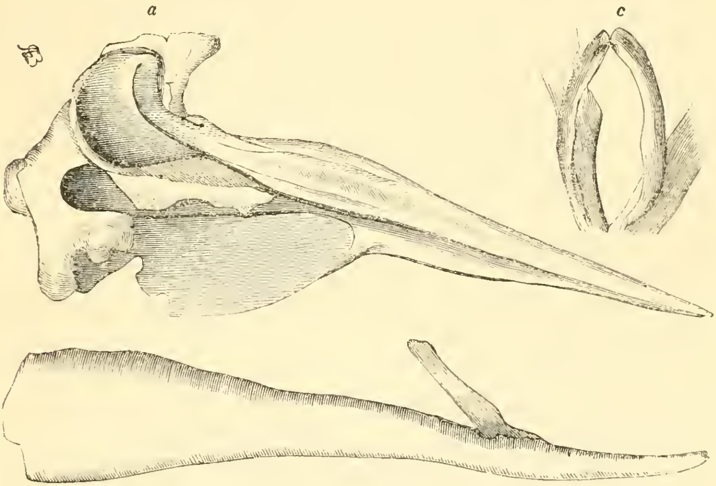
Mr. Layard observes, "These Cetaceans are constantly in the Bay ; but I cannot get the fishermen, who catch plenty of the *Delphinus,* to bring them to the museum. I have offered the market value, besides all the flesh and the blubber ; but they are so prized as food by the men that they are cut up instantly and sold by auction."

"Two, if not more, species of Whales come into our bays to calve. I have never been fortunate enough to see them entire ; but, from the remains, I think them to be the "Right Whale" (*Balæna*) and

Humpback (*Megaptera*). By the way, do you know the meaning of *Pæskop*? The Dutch are the dirtiest-minded people I ever met with: they have heaps of such names for their animals and plants."

"I have seen off the coast several species of Whale (one near Agulhas, with an enormous elongated back-fin; which could it be?) They are in sight for an hour at least."

"I send you a drawing, by our friend Mr. Trimen, of the skull of a Cetacean which I have taken to be a *Ziphius*, probably a very old *Ziphius sechellensis*; but the figure in your 'Catalogue of the Cetacea in the British Museum,' t. 3. f. 2, does not convey any idea how the curious flattened teeth arch over the upper jaw, as shown in Mr. Trimen's drawing. I stood by him all the time, so can answer for the correctness of the sketch; and I took the measurements myself." The drawing shows that it is the skull of an animal more



a, b. Skull and lower jaw of *Ziphius Layardii.* *c.* Teeth of lower jaw, from front.

allied to *Ziphius micropterus* than to *Z. seychellensis.* It differs from *Z. seychellensis* in the lower jaw being elongate, slender, gradually tapering in front, like the lower jaw of *Z. micropterus.* It differs from the latter species in the tooth on the side of the jaw being elongated, strap-shaped, with a small process* in the front side of the truncated apex, and especially in these teeth being arched inwards, forming a high arch "over the upper jaw," the crown of the lateral teeth being short and triangular in *Z. micropterus.* It is evidently quite distinct in the form of the rostrum of the skull and the shape of the teeth from the *Ziphius micropterus* of the coast of Europe. I therefore propose to call it *Ziphius Layardii.*

The entire length of the skull, from condyle to tip of the rostrum,

* The process is not so distinctly shown as it ought to be in the woodcut.

3 feet 7 inches; of the rostrum, from tip to the notch, 2 feet 6 inches; the width at the widest part of the brain-case 1 foot 6 inches; the length in a straight line, from the tip of the rostrum to the crest over the blower, 2 feet 11 inches; the height of the skull, from the hinder part of the palate to the crest over the blower, 1 foot 2 inches.

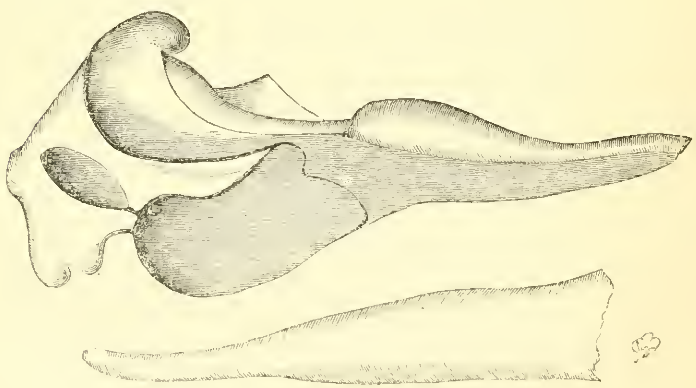
The entire length of the lower jaw 3 feet; the length from the condyle to the hinder edge of the base of the tooth, 1 foot $11\frac{1}{2}$ inches; the length of the exposed part of the tooth along the anterior edge, $9\frac{1}{2}$ inches; the width below the teeth of the side of the lower jaw, measured from the inner part of their base, 3 inches.

There is a partial hollow, as if it were the cavity of an old tooth that had fallen out, on the margin of the inner jaw, behind the base of the elongated arched tooth.

"In your letter you sent me a sketch of the skull of *Ziphius indicus* with two teeth in the front of the lower jaw, and a short stumpy head, totally unlike the skull of *Ziphius* figured in the 'Catalogue of Cetacea.'"

"There is a skull in the South African Museum which I have got down as a *Globiocephalus*. It is the skull of a very old animal, without teeth; but I think I can trace that it has had two front teeth in the lower jaw, if not also along (the edge of) the upper and lower jaw. The animal was taken on our coast."

The figures of the skull which accompany this note appear to me to represent the skull of a species of *Hyperoodon*, which differs from *Hyperoodon* of Europe in having only a low crest on each side of the maxillary bones. I would propose to designate the species *Hyperoodon capensis*.



Skull and lower jaw of *Hyperoodon capensis*.

The length of the skull, from the end of the rostrum to the occipital condyle, is 3 feet; the height of the skull, from the crest of the blower to the condyle, 2 feet; the greatest width of the brain-case 1 foot 7 inches.

April 25, 1865.—Dr. J. E. Gray, F.R.S., in the Chair.

Note on the Systematic Position of Platacanthomys lasiurus. By Dr. W. Peters, For. Memb.

Amongst the many interesting objects which have come under my observation in the British Museum through the kindness of my friends Prof. Owen, Dr. Gray, and Dr. Günther, is a specimen of the curious Rodent shortly noticed by Mr. Blyth (Journ. A. S. B. xxviii. p. 289) under the name of *Platacanthomys lasiurus*. The specimen in question is that exhibited by Mr. Sclater at a Meeting of this Society in 1860*, and subsequently presented by him to the British Museum.

It has always been difficult to me and other workers on the Mammals to understand how a Rodent with only three molars in each jaw could be referred to the *Myoxina*; and I was therefore very anxious to examine this very interesting form. But the results of my observations will show that *Platacanthomys* does not belong to the Dormice, but appertains strictly to the Murine family of Rodents, being nearly allied in many respects to *Phlæomys* and *Meriones*.

The generic characters of *Platacanthomys* may stand as follows:—

Platacanthomys, Blyth.

Habitus myoxinus. Rostrum acutum, rhinario nudo, labro fisso; oculi mediocres; auriculæ mediocres nudæ; vellus molle, setis dorsalibus latis sulcatis; artus mediocres, palmæ plantæque pentadactylæ, digito primo abbreviato, falculis modicis curvatis, acutis; cauda villosa, versus apicem fere disticha. Dentes primores læves, compressi, acuti, molares utrinque $\frac{3}{3}$, complicati. Cranium murinum, sed foraminibus incisivis parvis, coarctatis, ossibus intermaxillaribus inclusis, palato perforato et processu coronoideo brevissimo. Ossa antibrachii sejuncta, cruris connata.

The resemblance of this genus to the Dormouse, at first sight, is very striking, principally on account of the long-haired tail. But in other respects, in its smaller eyes, very thin ears, and the well-developed, although very short, thumb of the fore foot, it more approaches several Murine genera of Tropical India.

The skull is rather broad and flattened behind; but it is quite impossible for any one who knows anything about the craniological characters of the Rodentia not to recognize at first sight the typical form of the *Murinæ*, in the two-rooted zygomatic process of the upper jaw, together with the peculiar form of the foramen infraorbitale, which is very high, narrowed, and widened above, and in the development of supra-orbital ridges, which form together a lyriform figure. As peculiar and deviating from the typical skull of the *Murinæ*, are before all to be noted the small and narrow foramina incisiva formed only by the intermaxillary bones, the imperfect perforate palate, and the very short coronoid process of the lower jaw.

* See P. Z. S. 1860, p. 260.

The incisors are narrow, compressed, and pointed. The molar series are distant from and parallel to each other. The first and second upper molars are nearly of the same size, and much larger than the third and last. All three are composed of five enamel-folds or laminæ, obliquely directed inwards and hindwards: the first and second of these are united as well on their inner as on their outer side; the third, fourth, and fifth are united on the inner side; but on the outer side only the first and fifth enamel-folds are united. The lower molars are of the same size as the corresponding upper ones; but their enamel-folds are all united on the inner, and separate on the outer side, except in the first (which has six enamel-folds) the three anterior ones, and in the second and third (which have four enamel-folds) the first and second ones.

PLATACANTHOMYS LASIURUS, Blyth.

P. *magnitudine* Muris ratti, *auriculis acuminatis, capitis dimidio longioribus, vibrissis longissimis; supra umbrino-fuscus, subtus albidus, jugulo pectoreque flavescentibus, cauda umbrino-fusca, apice albido.*

Long. a rostri apice ad caudæ basin $0^{m}\cdot138$; caudæ $0^{m}\cdot110$.

Hab. India orientalis, prov. Malabar.

The size of this curious little animal is nearly the same as that of the Black Rat. The head is rounded, rather flattened, with pointed snout, naked muzzle, extremely long whiskers, eyes of moderate size; ears moderate, pointed, and, with the exception of a few scattered hairs on the outer side, entirely naked. The fur is soft, on the upper part, from neck to tail, intermixed with flat, longitudinally grooved bristles. The limbs are proportionate and of moderate length, the anterior shorter than the posterior ones. The fourth toe is the longest, but only a little longer than the third; the second and fifth toes are much shorter, and nearly of the same length; but the first is very short, and provided with a well-developed claw. The tail is nearly of the same length as the body; it is thickly covered with hair, which is short on its base, and becomes more lengthened and distichous from its second third.

	mètre.
Total length	0·248
Distance from snout to base of tail	0·138
Length of the head	0·030
——— of the ears	0·014
——— of the anterior extremity (from the elbow to the end of the fourth finger)	0·035
——— of the sole of the hand and fingers	0·014
——— of the hinder extremity (from knee to the fourth toe)	0·050
——— of the sole of the foot and toes	0·025
Total length of the tail	0·110
Length of the tail without hair	0·080

The specimen represented was obtained by the Rev. H. Baker, of

Mundakyum, Alipi, in Southern Malabar, who gives the following note on the species (J. A. S. B. xxviii. p. 289):—

"I was ignorant of the existence of this animal till about a year ago, when I found it in a range of hills about 3000 feet high. It lives in the clefts of the rocks and hollow trees, is said to hoard ears of grain and roots, seldom comes into the native huts, and in that particular neighbourhood the hill-men tell me they are very numerous. I know they are to be found in the rocky mountains of Travancore; but I never met with them in the plains."

May 9, 1865.—Dr. J. E. Gray, F.R.S., in the Chair.

The following extracts were read from a letter addressed to Dr. J. E. Gray by Mr. E. L. Layard, of Cape Town, Corr. Memb.:—

"I send you herewith figures and descriptions of a new species of Zebra. You have had a skin sent you* which you rejected as a 'stray specimen of *E. montanus*, which had got down on the plains and had been shot by accident'†. I am sure you will, on perusal of these notes, alter your opinion; and I shall be obliged to you to read them at the Zoological Society. I wish to name the animal *Equus Chapmanni*, after its discoverer, my friend James Chapman, who has done so much for African discovery, and who has hitherto reaped no reward. I send you photographs of a horse and a mare of this Zebra in different positions to show the markings, which differ entirely from those of *E. montanus* (vel *E. Zebra*) in the union of all the black stripes with a medial one on the belly; also on the back, in wanting the 'gridiron' pattern, as Baines calls it, on the rump. I also send coloured sketches by Baines to show the colour. This new animal also differs from the other Zebras in having the callosities on the legs far larger and of a more rounded shape, in having shorter and more equine ears, measuring only $6\frac{1}{2}$ inches instead of $11\frac{1}{2}$, and in having a shorter and more equine head and tail. The hoofs also are flatter than in *E. montanus*, and not adapted for mountain-work. The mane grows several inches down on the forehead, and stands up between the ears, so that when seen in full face it stands far higher than them. Chapman and Baines give the dimensions of several individuals; and all who have seen them here, who are competent to judge from knowing the other species well, at once detect the differences. I am quite convinced of them myself; and, if you still doubt, please read this letter and the notes, and exhibit the drawings, to the Zoological Society in my name. They roam in large herds, and are first met with about 200 miles from the coast inwards on leaving Walwich Bay, where *Equus montanus* (or rather a variety of that animal) prevails. I add some extracts from

* The skin sent me by Mr. Baines arrived in bad condition, with scarcely any hair on it. It was that of a very young animal, and I could not see any difference, as far as I could judge in its very bad state, from that of a young Common Zebra.—J. E. G.

† I have no recollection of having made such a statement as the latter part of this quotation—J. E. G.

the journals of Mr. Chapman and Mr. Baines relating to this Zebra."

"*Extract from Mr. J. Chapman's Journal, dated May* 21, 1862.

"The Quaggas here, I think, from about Sechellies', though by no means new to me, are different to any we see described in books of natural history. The brush of the tail of one I shot to-day, and which is rather a young specimen, is a dark grey, while the base is white. In older specimens the brush is black, with a few white hairs intermixed. It has a head band traversing the middle of the belly, from which the transverse bands diverge alternately. The stripes are of a very deep rich brown, nearly black; while the ground-colour is raw sienna on the upper parts (back, rump, sides, &c.), but gradually fading into white on the lower parts. It has an erect mane of alternate bands of white and black, edged with brown. The ears are white, with a dark band near the tip and broader band at the base. The muzzle is grey or lead-coloured, and behind the nostrils a brown coffee-colour. It has a bare spot on all four fetlocks, with a brown crescent-shaped spot on either side of it. A bare patch above the knee, on the inside of each fore leg. The pastern joints are brown, excepting at the back, where it is divided vertically by a white line from fetlock to hoof. The ears are decidedly equine. The mane is 6 inches long on the back; commencing from about 4 inches down the forehead, extends to the length of 2½ feet down the back. The markings of it are continuations of the transverse lines which cross the back. The white bands on the mane are quite superficial, the hair underneath being actually black, edged with brown. Length of ears 6 inches. The head measures 2 feet from the top of the skull to the point of upper lip. From the root of the mane on the forehead and from top of forehead narrow lines of white and black (the latter sometimes streaked with brown in the middle) diverge in a triangular manner towards the eyes, where the outside lines, making an angle, continue down the face, drawing closer towards the extremity of the face (the inside lines being straight), where they blend and form a dark brown patch behind and above the nostrils, the muzzle and the lips being grey. Broader bands emanate from this dark muzzle, and cross the chest in a crescent shape, leaving a white margin around the eyes, behind which the regularity of the lines is interrupted by those of the neck; and the space from below the eye is filled up with markings of a hieroglyphical character. The stripes under the chin are light brown. The circumference of the neck is 2 feet. The dorsal line extends to the brush of the tail, which is of a dark grey; and on the base of the tail, which is white, it becomes narrower, and is dotted all the way down on either side with spots of black, edged with brown. The form of the tail approaches nearer to that of the Horse in the largeness of the brush than the Zebra or the Ass; but it is still not exactly like a Horse's tail. On the thighs the stripes are alternately pale brown and deep brown, horizontal, but curving and forming a right-angled triangle on the flank; and an acute and more perfect triangle is formed on the shoulder-blades by the junction there of the stripes from the neck and breast with the transverse stripes. A longitudinal dark band traverses the whole length of the belly, becoming narrower and deeper on the breast, around which it winds and continues, forming one of the oblique lines, to the centre of the shoulder-blades. From out of this ventral line diverge the transverse lines tending towards the dorsal line, but not connected therewith. On the legs the stripes gradually assume a horizontal direction from the top downwards, but continuing the oblique direction longer on the hind legs, and are distinctly, though sometimes only faintly, visible to the hoofs in this specimen. Others are more strongly marked. In some cases the transverse lines do run into the dorsal line; but in no two specimens do the markings seem to be exactly alike, the lines sometimes branching into two or three as they approach the dorsal line on the flank and the angle at the junction of the horizontal or oblique lines, these with the transverse being sometimes filled up with disconnected hieroglyphical characters.

"The height of a young male shot in June 1862, at the shoulder, was $4\frac{1}{2}$ feet, at the rump 5 feet."

"*Notes of a supposed new variety of Quagga observed on the elevated flats between the Botletle and Zambesi Rivers during the late journey of J. Chapman and T. Baines. By* T. Baines.

"Extract from my diary:—

"20th May, 1862.—Chapman had shot a Quagga answering most nearly to the Bonte Quagga or Burchell's Zebra, which is striped over the neck and body, the legs only, from the knees and houghs, being white; in this, however, faint markings were continued all the way down, and a peculiar line was run along the centre of the stomach, making me think it must be a new variety. Unfortunately it is already cut up by Damaras and Bushmen.

"As nearly as I can remember, Chapman, on returning, remarked, 'The Quaggas here are not like those of Vaal River; they have stripes on their legs;' then said, 'and if they are not Zebras they must be new, for only two kinds are described—the common one of Kafirland with no stripes on the rump or legs, and *E. Burchellii*, the Bonte Quagga, with no stripes on its legs'*. Chapman considered they were not Zebras (as the animal is called here), *E. montanus* having longer ears and asinine head and tail, whereas the head and ears of these were more like those of a Horse, and the tail more bushy. Besides this, *E. montanus* is strictly confined to hills and broken ground, while these live in immense herds on the flat, with no mountains within many days' journey. We determined on further investigation.

"Latitude of the camp 20° 5′ 55″ south.

"June 26th.—Chapman shot a Quagga strongly marked, like the former ones, on the parts of the legs that are usually white; he sent

* This passage reads obscurely. Baines means only two kinds of Quagga: the hunters call *E. quagga* and *E. Burchellii* "Quaggas," while *E. montanus* they call "Zebra."—E. L. L.

to let me know; but John, who has no idea of anything that has not a market value, had called the Damaras to cut it up.

"30th.—The head and legs of a Quagga were brought in, the latter being, as before, strongly marked quite to the hoofs, the recurrence of this peculiarity showing that it cannot be a mere individual accident, such as is seen in difference of colour in domestic animals.

"July 10th.—Chapman shot a Quagga and Sable Antelope at a distance from the waggons. I sketched from the skin and horns of the latter, and the legs and ears of the Quagga. This had been a smaller animal, but of stouter and more compact build than those hitherto seen. I have already mentioned those at the Salt-pan with decided markings on the legs below the knees and houghs, while the two described species are perfectly white; and now this animal, besides being stouter and shorter of limb, is more strongly marked, the colours being distinct and pure black and white, the black spreading almost half over the pastern-joint and fetlock, and having a small white edging between it and the hoofs; the ears are strongly banded and slightly tinted with brown. I thought at first it might be a Zebra; but Chapman considered it a true Quagga, and I am inclined to think so too.

"This was at Dākā (lat. 18° 40′ 1″). After coming down off the elevated plain into the mountainous valley of the Zambesi system, we were encamped on one of the spruils of the Luisi, the first running water we had seen since leaving the Botletle river.

"Thursday, 17th, Matietue River.—Chapman had shot a Quagga mare; and, hastening to the spot, I found an eager group of natives with difficulty restrained from rushing at once upon the prey. In this case we had to omit the measurement; but I sketched the stripes carefully, and the camera of course cannot be gainsaid. The general colour was a yellowish or raw-sienna brown on the upper parts, and deepest on the rump, fading into white on the neck, belly, and legs; the stripes were of the deepest brown or nearly black, and the difference between this and the known varieties consisted in their being continued quite down to the hoof on all four legs, slightly fainter on the inside; the belly was marked by a broad black band along the centre, to which all the side stripes were joined; on the back was a similar black line, but only the stripes above the shoulder were connected with it; the mane was upright, as usual (the neck-stripes being continued vertically through it); the ears small and equine, and a bare spot (rather small) was observable on the inside of the fore legs only, the Zebra, I believe, having it on all four, as well as large ears.

"I made two sketches of this, and Chapman two photographs. There are intermediate brown stripes between the black ones on the hind legs above the hough.

"Saturday, July 19th.—We proceeded about a mile north-east by north, when, near the small conical hill on our left, Chapman brought down a fine young Quagga stallion of the same kind as the mare previously killed; but age, I suppose, not having deepened the colours, its whole body was of the purest white, marked with jet-black bands down to every hoof, in the manner of the other, but slightly fainter on the inside of the legs, and also where the stripes of the sides joined to the longitudinal line of the belly, some of those on the flanks having these points so faintly marked that the junction could not be called complete; like the other, a central stripe ran along the back, with which two or three of the shoulder-stripes (on each side) were connected, the broad stripes of the hinder parts originating near the central line about the insertion of the tail, and diverging laterally over the hip, flank, and side till they completely or nearly reached the ventral line, the longest of them meeting on their way the ventral stripes of the sides, and forming the most beautiful possible combination of curves and angles, even the slight variation of regularity on either side conducing to the effect; the ears were small, and banded and tipped with black and dark brown; the head well shaped, with a little sienna-brown towards the nose; and the whole form lighter and more elegant than in the older specimens.

"Sunday, September 14th.—I shot two, which at first I took for Mountain-Zebras; but on comparing notes with Chapman, I came to the conclusion they were also Quaggas. The stallion fell at a distance, and was cut up while I was sketching and observing the mare. She was full-striped, somewhat smaller than most of those Chapman had killed; ears, if anything, shorter and more equine. Callosities or small bare patches of skin on the inside of the fore legs only, and not on the hinder legs; striped right down to the hoofs; inside more faintly marked than the outer. Dokkie and others thought it like the Wilde Paard of Ozembengue, and different to the Quacha of the plains. I believe they would have said anything, so that I would have done talking and let them begin to cut it up.

"Sunday, December 7th.—Went out from Logu Hill, Zambesi River; tracked spoor several hours; wounded a mare, which was run down late in the afternoon, and killed with a stone. Fully striped, as before, down to the hoofs, all four legs, the inside of the forearm and thighs being more faintly marked; the ears small and tipped with black; the stripes on the sides extended from the dorsal line to the ventral, which last, reaching from between the fore legs to the hinder, was of not quite so deep a black; the ground-colour was light-yellowish brown on neck, back, and sides, passing into white on the cheeks, throat, and under parts of body; the teats, two in number, were situated in the after part of the black ventral line. She had warts or callosities on the inside of the forearms only, and none on the inside of the thigh.

"I sketched carefully, and took the skin home, attempting to preserve it; but the weather was so damp that, even in a hut with a fire in it, I could not dry it.

"Tuesday, 14th April, 1863 (after our return to the salt-pan on the elevated plain between the Zambesi and Botletle rivers).—A few Quaggas were standing on the further plain, and creeping behind a point at 300 yards' range. I shot one through the neck and forehead: it proved to be a well-grown, handsomely marked filly of the first year; and as the rest retreated, I noticed that the mare hung back and looked frequently round for her lost little one, returning when the others were out of sight and gazing wistfully at the spot where it lay.

"I had no means of measuring the beautiful little creature on the spot; and for convenience of carrying I had only my small sketch-book, so carefully outlined one of the fore legs. I sent Pompey back for assistance, and in the interval sketched on a small scale, and stripped off the skin, which is a good size for a small museum, and, as carriage is a consideration, suits me better than a large one.

"It is perfectly marked after the manner of Quaggas in this locality, but not so fully as those of Dākā and the Zambesi, and is most certainly an intermediate link between already described varieties and the Zebra. The chief points worthy of note are that the legs, instead of being white as in the Bonte Quagga (*E. Burchellii*) from the houghs and knees, are marked with transverse bands, not so dark as those on the body, quite down to the hoofs; there is a dark stripe, commencing between the fore legs and extending along the belly to between the hinder, where it becomes broader and somewhat fainter; the first three stripes behind the shoulder are joined to this; the dark stripes on the rump are alternated with others of a medium brown, but those on the fore part of the body and neck are of a full deep black; there are callosities on the inside of the fore legs only, and none on the hinder.

"Chapman killed two Quaggas during the day. I believe they were very faintly marked on the legs; but the vultures and Damaras destroyed them. The skins are quite worthless, which is much to be regretted, as we think it certain they are true Quaggas undescribed in any work we know of, and, as a new variety, would have been a handsome gift to any museum.

"Pereira told me subsequently, the Quagga of Damaraland has legs very nearly white; there are faint stripes, but not visible till you come close to them; there are warts on the fore legs only. The Wilde Paard is darker, the stripes blacker; the head is larger, and the ears also; they stand up so as to be visible above the mane. The Wilde Paard goes in the hills, the Quagga on the flats.

"I sent down the skin of the filly to Mr. Logne in Cape Town, and he forwarded it to the British Museum."

With reference to this communication, Mr. Sclater remarked that the female Zebra in the Society's Gardens (presented to the Menagerie, May 26th, 1861, by H.E. Sir George Grey), which he had hitherto referred to *Equus Burchellii*, appeared to answer the description above given in every way, and must probably be referred to *Equus Chapmanni* if that species were allowed to stand.

MISCELLANEOUS.

On the Chilian "Anguilla." By Dr. R. A. Philippi.

Dr. Philippi has succeeded in obtaining a specimen of the fish known under the name of "Anguilla" in Chili: it is a new species of Lamprey, which the author describes under the name of

Petromyzon acutidens.

It is much darker than the three other Chilian freshwater Lampreys; above and on the sides blackish grey, with a violet and rusty-brown lustre, the latter especially on the tail. Each branchial orifice stands in the middle of a whitish spot. The ventral surface is grey, yellowish beneath the branchial orifices. The caudal fins are blackish grey; the two dorsal fins rather light grey. Seen from the side, the muzzle appears rather acute, the mouth being almost in a line with the belly; its hinder end projects somewhat, and is separated from the gular region by a transverse fissure, nearly 3 lines broad, which leads into a sort of shallow pouch. This does not form a sac, as in *Petromyzon? Anwandteri* and *Velasia chilensis*, but is somewhat inflated. The total length is 14 inches; the depth at the last branchial orifice is 9 lines, at the first dorsal $7\frac{1}{2}$ lines, and at the anus 5 lines. The eye is 12 lines from the apex of the muzzle, and 2 lines in diameter; the orifice of the mouth is $11\frac{1}{2}$ lines long; the first branchial orifice is 19 lines from the tip of the snout, and the last nearly 3 inches. The first dorsal commences 7 inches from the tip of the snout, and is 13–14 lines in length and $2\frac{1}{2}$ lines in height. The second dorsal is of the same height, but more than 2 inches long; the interval between them is $1\frac{1}{2}$ inch. The caudal fin is acutely rhomboidal; its dorsal margin is $1\frac{1}{2}$ inch long; its ventral portion runs, gradually diminishing, nearly to the anus, which is 2 inches 4 lines from the extremity of the tail.

On each side of the head there are three rows of mucus-glands: one runs from the snout towards the lower margin of the eye, but without attaining the latter; the second forms an oblique line close to the antero-inferior margin of the eye; and the third commences below the first, halfway between the apex of the snout and the eye, and is continued to the throat, where it terminates between the hinder margin of the mouth and the first branchial orifice.

The mouth forms an ellipse, or, when fully extended, a broad oval, and has double lips, the outer grey, with a row of small warts, the inner white, short, and entire at the margin. The teeth are remarkably acute. In front of the two inner lingual teeth there stands a transverse row of eight teeth; on the palate there are two groups, each consisting of three acute teeth; and, lastly, there are about four concentric series of acute denticles, gradually diminishing in size from the gullet to the margin of the lips.

In the two groups of three teeth, and the lips destitute of fringes, the species resembles *P.? Anwandteri*, which, however, has a row of large teeth in the external circumference of the mouth, and is further distinguished by a large gular sac (as in *Velasia*) and by the different form of the caudal fin. The fish inhabits the brooks of some parts of Chili, and is thrown away by the fishermen, who regard it as unwholesome.—*Wiegmann's Archiv*, 1864, p. 107.

On the Parasitic Nature of the Mistletoe. By Joseph Boehm.

The author divides plants in general into the two following groups:—

1. Chlorophyll-bearing, which assimilate the inorganic substances drawn up by the roots from the soil, and thus become the ancestors of all the rest of living nature.

2. Chlorophyll-free, which either extract the assimilated juices from other organisms, or nourish themselves from dead organic matter. The latter plants alone, which live in the manner of animals, are regarded by the author as *parasites.*

The Mistletoe has always been regarded as a plant which extracts the organic juices from the plant on which it grows, and consequently leads a parasitic existence. Boehm calls attention to the following circumstances, which are particularly adverse to this view:—

1. The mode of insertion of the roots of the Mistletoe into the wood of the tree on which it grows.

2. The occurrence of the plant in question upon more than thirty species of trees, all, however, of indefinite growth (*Endumsprosser*).

3. The different results of the analysis of the ashes of the Mistletoe and its supposed nutritive plants.

4. The comparative size of the branches bearing Mistletoe above and below the insertion of the apparent parasite.

Recent investigations, repeated by Boehm, have placed it beyond a doubt that, in trees with indefinite growth, the ascent of the crude nutritive material takes place in the wood, but the assimilated formative juices descend in the bark. Even Knight was aware that when annular strips are removed from the branches of these plants, the latter become thickened only above the annular wound.

This circumstance enabled the author to decide with absolute certainty that the Mistletoe has precisely the same relation to its nutritive plant as a twig to its parent branch, or the graft to the stock. From thirty branches bearing Mistletoe (on *Acer*, *Populus*, and *Quercus*) the terminal twigs above the attachment of the Mistletoe were cut away and the branches ringed below the Mistletoe. Whilst in *Acer* and *Quercus* the branches thus treated usually died soon, the Mistletoe plants on the Poplars not only continued their normal growth, *but a thickening of the branch above the annular wound took place*. This can only have occurred at the expense of the juices assimilated by the Mistletoe.

The fact that the development of the branches *above* the insertion of the Mistletoe is hindered has, in the author's opinion, nothing to do with the parasitic nature of that plant. The Mistletoe acts only in the same way as any branch of the tree of which the development is in advance of its neighbours. The injurious effect of the presence of Mistletoe upon the growth of the twigs below it is to be ascribed partly to the aborted condition of the terminal shoots, and partly to the fact that the juices assimilated by the Mistletoe are chiefly applied to its own increase, and may be less fitted for the development of the tree on which it grows.—*Bericht der Akad. der Wiss. in Wien*, June 30, 1865, p. 113.

On a Fungus which is developed in Ivory and Bone. By Professor Wedl.

In examining some sections of human teeth which had been macerated for a few days in water, Professor Wedl found that the cement and the peripheral layers of dentine were furrowed by microscopic channels. He soon recognized in these channels small parasitic plants, closely resembling those which perforate the shells of Mollusca. A careful examination of the water in which the sections had been macerated furnished numerous small cells, which might be regarded as the spores of the Fungus. Fragments of normal teeth placed in the same water were soon infested by these little parasites, the operation of which is, however, confined to the cement and dentine, and never extends to the enamel. The Fungus also attacked fragments of bone macerated in the water.

These little Fungi seem to be developed at the expense partly of the organic and partly of the inorganic matter of the ivory and bone; and the conditions of their multiplication doubtless frequently occur in nature. They do not, however, appear to attack teeth until after death; so that they have nothing to do with caries. Professor Wedl has ascertained that these parasites have been in action from a high antiquity, many teeth of fossil Fishes and Mammalia exhibiting unequivocal traces of their action.—*Sitzungsber. Akad. Wiss. in Wien*, July 14, 1864; *Bibl. Univ.* 1865, *Bull. Sci.* p. 231.

Note on the Ammobroma Sonoræ.

This (the literal translation of which is "sand food of Sonora") is the name of an extraordinary root-parasitic plant, of the region at the head of the Gulf of California, which Dr. Torrey has just described and figured in the eighth volume of the 'Annals of the Lyceum of Natural History of New York.' It has been briefly noticed before (but never fully characterized) as a new genus allied to the rare Mexican *Corallophyllum* of Kunth (or *Lennoa*, Lexarza), and still more to the Californian and hardly better known *Pholisma* of Nuttal. It hardly throws any new light upon the affinity of these strange plants, which, though justly thought to be rather Monotropaceous than Orobanchaceous, are still obscure. This plant, growing in a forlorn sandy desert, almost covered by the sand in which it lives, was found by its discoverer, the late Col. A. B. Gray, to form a considerable part of the sustenance of the Papigos Indians of the district, and is said to be very luscious when first gathered and cooked, resembling in taste the sweet potato, only far more delicate.—*Silliman's Journal*, July 1865.

On the Intercellular Matter and the Vessels of the Latex in the Root of the Dandelion. By Dr. A. Vogel.

The back of the root of the Dandelion is traversed by a great number of lactiferous vessels containing a very abundant bluish-white milk. These vessels form a great number of larger or smaller bundles disposed in a tolerably regular concentric manner, and united to each other by numerous ramifications. The ramifications are always parallel to the surface of the root, so that the bundles form concentric sheaths independent of each other. The outermost peridermic layer of the bark, however, is destitute of lactiferous vessels, which exist chiefly in the inner portion. The cellular parenchyma of these two parts of the bark contains a great quantity of intercellular matters, especially in the vicinity of the lactiferous vessels.

According to the author, the lactiferous vessels originate by the union of conductive cells (*Leitzellen*), of which the adjacent septa become gradually converted into pectose, and finally disappear. He has detected many intermediate stages, which leave him no doubt as to this mode of formation of the vessels. According to him, the lateral walls of these same cells likewise finally become converted into pectose; so that the fully developed lactiferous vessels are not formed by a cellulose membrane.

It was by observing the action of iodized liquids, acids, and alkalies upon the substance forming the envelope of the lactiferous vessels, that Dr. Vogel was led to regard it as cellulose in progress of conversion into pectose. He arrived at the same results by setting the same reagents in action upon the intercellular matter of the Dandelion-root, which he also regards as pectose produced by the gradual transformation of the membrane of cells.—*Bericht Akad. Wiss. in Wien; Bibl. Univ.* 1865, *Bull. Sci.* p. 239.

On the Structure of the Luminous Organs in the Male of Lampyris splendidula. By M. Schultze.

The author has found that the numerous branches of the tracheæ in the luminous organs of *Lampyris splendidula* terminate each in a small cell of stellate form. Under the action of osmic acid these cells rapidly acquire a black tinge, whilst the cells of the parenchyma remain uncoloured. These cells therefore readily reduce the osmic acid by absorbing its oxygen; and the author attributes to them an important part in the production of the phenomenon of phosphorescence by this insect.—*Sitzung der Niederrhein. Ges. für Natur- und Heilkunde zu Bonn*, 1864; *Bibl. Univ.* 1865, *Bull. Sci.* p. 232.

De Jeude's Collection of Mollusca.

The fine collection of Mollusca formed by the late Prof. Lithe de Jeude, for many years Professor of Zoology in the University of Utrecht, has been purchased by Mr. Damon (of Weymouth). The collection, rich in the rare shells of the Moluccas, was displayed in 140 glass cabinets, and formed one of the chief scientific attractions in the city of Utrecht.

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XXVII.—*On Ammonites from the Cambridge Greensand.*

By HARRY SEELEY, F.G.S., of the Woodwardian Museum, Cambridge.

[Plates X. & XI.]

Ammonites (*Scaphites*) *æqualis*, Sow.

Shell much inflated, convex, with a wide back, and the convolute portion so coiled as not to produce an umbilicus: this part forms about half the length of the shell, and is always half the width of the back, or wider. The back is about twice as wide as the side, and less convex. When the whorl recurves and forms the mouth, it contracts.

Both spire and hamus are marked with fine elevated ribs, which are most elevated on the sides, and bifurcate before crossing the back. On the spire they are curved slightly away from the mouth, so that the lines are concave in front; on the hamus they pass over straight, and are separated by wider concave channels.

The symmetrical septa consist of a rather small square dorsal lobe, with two small notches on each side, and two digitated terminal branches. The dorsal saddle is enormously wide, extending to the limit of the back, where the ribs bifurcate; it is centrally cleft by a branch half as large as the dorsal lobe. The superior lateral lobe is as wide as half of the dorsal saddle, has one small notch on each side, and terminates in two large branches, which bifurcate, are digitated, and are near together. The inferior lateral lobe is small, and at the base of the side. On the ventrum are the ventral lobe and four pairs of accessories.

The *Scaphitæ* of the Cambridge Greensand are abundant in individuals, though few in forms. Authors have generally, and perhaps rightly, referred similar fossils to the *S. æqualis* of Sowerby.

Nearly all the specimens found are the last chamber, or hamus, which may indicate that, after these had become filled with phosphate of lime, the partitioned part was broken off and floated away at the surface, much as the recent *Spirula* is found drifting. Perfect shells are rare, and young ones never found.

There are three variations from this form: one, which is ornamented with a row of tubercles on each side, is also found in the Gosau Chalk.

Ammonites rostratus, Sow.

Ammonites rostratus, Sow. *A. symmetricus*, Sow.

Numerous citations have been given by Continental writers, to whom the species seems scarcely known, being regarded as synonymous with *A. inflatus*, Sow.

Shell keeled, few-whorled, with a flat back, flat sides, quadrate mouth, and umbilicus becoming relatively smaller with age, but never less than the height of the body-whorl; not very deep, it is angular, though not making a sharp angle with the side. The back is generally a little narrower than the side is high; out of its middle arises the narrow keel, from each side of which the ribs are directed backward and outward at an angle of 45°, then descend straight, elevated, perpendicular, and separated by wide spaces, and terminate, generally separate, in tubercles at the base. On a whorl there are from 25 to 35 ribs, each having a tubercle above the middle, and another where they reach the back. The wide intercostal spaces are smooth. When full-grown, the last two or three ribs incline frontwards; the keel and adjacent lateral parts of the back become elevated, and are directed upward and forward in a curve to form the rostrum, which is hollow and rhomboid in section; for the last rib but one, instead of dying away on nearing the keel, as those behind it do, is continued up its side, becoming less and less distinct. The whole whorl becomes narrow. This rostral prolongation is open in front, and in its upper third curved slightly down.

The septa are symmetrical. The dorsal lobe is longer than wide, extending between two tubercles, and being margined by the rising of the ribs. It has three notches on each side, the two terminal of which become with age digitated branches. The dorsal saddle is relatively very wide, extending down to the lateral tubercle; it is doubly cleft, the upper accessory being much the larger, above the middle, and in a line with the dorsal tubercles. The upper lobe gets relatively wider with age, and is from a third to more than half the width of the dorsal saddle; it has a branch on each side, and two terminal branches digitated with age. The lateral saddle is slightly wider than the superior lateral lobe. The lower lateral lobe is on the ventral angle, and very small.

Besides this, there are four rare forms varying from the type chiefly in the degree of development or suppression of the ribs and tubercles.

This Ammonite is found on every digging along a line of thirty miles, and is the most abundant. The whorls are always coiled on the dorsal tubercles or the homologous thickenings of the ribs; so that the size of the umbilicus depends on the rate of increase in the height of a whorl. As a general rule, the more compressed the shell, the closer the ribs.

In a very young state, the whorls are smooth and round, and continue so for three or four whorls, and then rapidly assume the typical form; and as this part appears devoid of septa, it might have been formed in the egg.

Large specimens are very rare, and the largest found are much inferior in size to those of the Gault at Folkestone or the Upper Greensand of the Isle of Wight and Devizes, though there can be no doubt that some Cambridge specimens reached a diameter quite as great as that of their southern brethren. Part of a whorl with the rostrum attached is only $1\frac{1}{2}$ inch high. Broken rostra are comparatively common; and it can only be supposed that the large shells to which they belonged, having but weak septa and being filled with phosphate of lime, were broken up before fossilization. The result was not the production of the numerous small examples; for, as the last half whorl is almost invariably devoid of partitions, these died small if not young, and there is no evidence that a rostrum was ever formed.

It is probably the true *A. symmetricus* of Sowerby; but that type is seemingly now lost.

Ammonites pachys. Pl. XI. fig. 4.

Keeled, few-whorled; whorls flattened on the sides and back, so as to appear in section nearly quadrate [about half-embracing]. Umbilicus as high as the back is wide, and higher than the side of the last-formed chamber; it is deep, with the ventrum nearly at right angles with the side of the whorl, where it is rounded: this space is marked (at a diameter of $2\frac{1}{4}$ inches) with about twenty-two strong rounded ribs descending from as many large spinous tubercles which margin the base of the side. From each tubercle two ribs (rarely three) ascend the side of the whorl, at first but little elevated, but higher and wider near the back. The interspaces are never wider than the ribs, and on the back are narrower; on the sides, owing to a curve in alternate ribs, they are equal. On the dorsal surface the ribs are curved anteriorly, and become obliterated near the keel. On the back (and in old specimens on the sides too) the ribs are crossed transversely by small elevated lines placed rather close together.

The back is a little inflated. The keel is round, wide, moderately elevated, with the smooth spaces on each side slightly depressed.

The mouth is a little wider than high.

Septa very like those of the southern forms of *A. rostratus* (to which the form is nearly related), but with the lobes deeper, and with finer digitations. The dorsal lobe is as long as the back is wide, extends in width to the line where the ribs arise, has two rather narrow branches on each side, and terminates in two acute branches conspicuous in having no digitations on the inner side. The lateral lobe is in the middle of the side, not quite so long as that of the back, with two branches on each side, and terminating in three, of which the middle one is much the largest. At a diameter of $1\frac{5}{8}$ inch the distance between two septa where they cross the keel is $\frac{3}{4}$ths of an inch. In examples of the southern form of *A. rostratus,* at a diameter of $2\frac{1}{2}$ inches the interseptal space on the keel is only half an inch.

Much as it differs, I incline to regard this as a constituent variety of *A. rostratus,* with near affinities to *A. inflatus.*

Ammonites Timotheanus, Pictet, Grès Vert, pl. 3. figs. 1 & 2.

Few quadrate whorls, enlarging rather rapidly, two-thirds embracing, gibbous; with a flat back, flattened sides, and flat ventrum. The sides, very slightly inflated, round into the umbilicus and into the back, slightly converging, so that the back is narrower than the base. The mouth is nearly a fourth wider than high. The umbilicus is not shallow, and is half as high as the mouth is wide. The cast is perfectly smooth, and only marked with the elegant foliations of complex septa.

The siphuncle is unusually wide, being of the width of the dorsal lobe. The septa are almost exactly the same as in *A. latidorsatus* (Mich.). The dorsal lobe is relatively a little deeper by the terminal branches being separated for only half as far; these and the preceding branch on each side are bifid. The superior lateral lobe is deeply cleft, making the two bifid terminal branches large. The superior lateral saddle is not deeply cleft.

I have seen but two specimens of this form, both collected by Mr. Carter. So far as figures and descriptions enable me to judge, it might be classed as a variety of *A. latidorsatus,* differing chiefly in the flatness of the back, and perhaps in the rate of enlargement; but it appears, from Michelin's figure, that the young states are sufficiently unlike to justify a distinction. This form always had a flat back and trapezoidal mouth, &c., while the other has a round back and lune-shaped mouth. It exactly corresponds with the Ammonite figured by Prof. Pictet in the 'Grès Vert' (pl. 2. fig. 6) as *A. Timotheanus;* but it does not correspond with his description and the figure answering for Mayor's MS. species. That form is spoken of as "ornée de cinq à six sillons qui partent de l'ombilic dans la direction qu'auraient des tangentes au cercle ombilical." This character may perhaps not be sufficient to distinguish a species; but it certainly makes a well-marked form, indicating an animal which formed periodic varices.

Ammonites latidorsatus, Mich.

A. latidorsatus, D'Orb. Paléont. Franec; Pictet, Grès Vert, pl. 3. fig. 5.

Few-whorled, much inflated, whorls two-thirds embracing, a little wider than high, with nearly parallel flat sides, and a rather depressed round back, which rounds into the sides. The body-chamber is half as high again as the whorl at the opposite side of the shell, than which the umbilicus is slightly narrower. The umbilicus is deep, with the flat and almost horizontal ventrum making a sharp angle with the side, though the line of meeting is just rounded. The cast appears perfectly smooth, but is marked by shallow and narrow sulcations arising in the umbilicus and passing over the back, where two are separated by interspaces narrower than the height of the whorl. The mouth is lunate.

The septa are like those of *A. planulatus*, the only difference being that the inferior lateral lobe is not cleft so deeply.

This is a very rare fossil; and the only specimen known to me was detected in the collection of the Rev. J. F. Blake, who has presented it to the University Museum. The diameter is $1\frac{1}{4}$ inch, and the last fourth of the outer whorl is devoid of chambers. It corresponds with the Continental figures and description, though this sulcated form, which cannot be considered typical, is a variety distinguishable from Michelin's smooth shell.

Ammonites Mayorianus, D'Orb.

A. planulatus, Sow. Min. Con.; Sharpe, Chalk Moll. pl. 12. fig. 1.
A. Mayorianus, D'Orb. Paléont. France, T. C.
A. octosulcatus, Sharpe, pl. 19. fig. 3.
A. Griffithsii, Sharpe, pl. 11. fig. 3.

Inflated, with few whorls, more than half embracing; mouth as wide as high. Sides a little inflated, and passing imperceptibly into the round back. Umbilicus about as high as the body-whorl, with the horizontal but inflated ventrum rounding into the side. The depth of the ventrum exposed is about the same as the width of the unembraced part of the adjacent whorl, with which it forms a right angle. The cast commonly shows very fine depressed ribs, arising about the middle of the side, and passing over the back; they are close together, and on nearing the back are curved mouthwards. In the umbilicus arise four or five more or less deep, wide sulcations, which are mostly flexuous, being first directed a little forward, then perpendicularly upward, and finally curved forward on the back to the siphuncle, the two sides meeting there in a broad V-shape and dying away without impressing it. Between each two sulci there are commonly from twelve to eighteen ribs.

The septa consist of the dorsal lobe, three lobes on each side, and one or two in the umbilicus, all except the last much branched, digitated, and close together. The dorsal lobe is longer than wide, has three notches on each side, and terminates in two large branches, which are cleft laterally, the parts which continue backward being also cleft. The superior lateral lobe has two or three small notches on each side, and terminates in three large branches, which are trifurcate and digitated. The dorsal saddle is larger than the lobe; it is centrally cleft, and has a few notches, besides each half being cleft. The inferior lateral saddle is much smaller, but similar.

This form, which differs a little from those most common at Cambridge, has been described first, because one of the types of it is the identical specimen figured by Mr. Daniel Sharpe as *A. planulatus*, and, moreover, it is the most inflated modification that occurs. The example figured, Palæont. Monogr. Cret. Mol. pl. 12. fig. 4, had septa to the end; and so has one of 4 inches diameter, the largest I have; but fragments with the shell preserved occur, showing the back of a whorl to have been from 4 to 5 inches wide. The small line-like ribs passing over it are in this large size a quarter of an inch wide, though but little elevated, being separated by narrow shallow grooves. The sulcations go on deepening and widening.

On comparing small examples with corresponding specimens of *A. Mayorianus*, D'Orb., from the Upper Greensand of the Perte du Rhône, I fail to notice any distinction: compare them as we may, there is no character they have not in common; consequently no hesitation is felt in regarding our form as identical with those of France and Switzerland; but it is not so absolutely identical with the Chalk fossil known as *A. planulatus*. I know that form from a beautifully distinct cast of the umbilicus partly formed by an *Exogyra* growing attached to the specimen; it is from the lower Chalk of Burwell in Cambridgeshire. The umbilicus measured not less than 4 inches across, and was shallow. The umbilical part of the whorls is flat, and the depth of the ventrum exposed only *one-fourth* the width of the unembraced part of the side. On the *Exogyra* are the foliations of the septa. And this enables me to state that the sulci, which were straight on the sides, were not a sixth of the width or depth of the internal casts of those in *A. Mayorianus,* and did not bend into the umbilicus, but terminated at the base of the side. The ribs on the back are more elevated and wider apart; the number of whorls fewer. The sulci are arranged relatively to each other like those figured in 'Cret. Mol.' pl. 12. fig. 3. It will be readily seen, on referring to that plate, how much better the above description coincides with the Lewes Chalk fossil than with the ancestral race figured beside it. Hence Sowerby's name, specially used, should be restricted to the Chalk form to which it was originally given; while D'Orbigny's would with more propriety be preserved for the Continental fossil, with which ours corresponds.

In the variations from *A. Mayorianus,* the whorls gradually become more compressed, with flatter sides rounding into the umbilicus, which is relatively smaller. There are from five to eight sulci. These specimens frequently occur with part of a whorl devoid of septa at a diameter of an inch and a half. In the young state (diam. $\frac{3}{4}$ inch) the sides are flat, and a little converging to the back; and as the sulcations are scarcely impressed, the shell has the aspect of *A. Beudantii.*

Some specimens, which died small, exactly correspond with Mr. D. Sharpe's figure of *A. octosulcatus* in the number of sulcations, their relative size, and the way they pass over the back: though the form of the whorl is not quite the same, yet so near are the two, that I have no doubt of the propriety of regarding *A. octosulcatus* as a slight variety of *A. Mayorianus.*

There are no specimens at Cambridge of *A. Griffithsii*; but, judging from Mr. Sharpe's figure and description, it cannot be regarded as other than a variation from *A. Mayorianus.*

The type of shell here discussed is one of the more abundant of the Greensand Cephalopods, occurring in this neighbourhood wherever that deposit is worked.

Ammonites Weistii, Sharpe, 'Chalk Mollusca,' pl. 21. fig. 3.

Few-whorled, inflated; back round; mouth semilunar, much wider than high; umbilicus moderately open, with its deep border forming a large angle with the side of the shell.

Ornamented with about twenty-two wide, straight ribs, nearly all of equal length; every third rib is somewhat thickened on the sides as it nears the umbilicus, while the ribs between these thickened ones frequently become obliterated before reaching the edge of the umbilicus.

Septa simple, consisting on each side of three lobes. Dorsal lobe marked on each side with two simple digits. The dorsal saddle, half as wide again as the dorsal lobe, is indicated by a small accessory. The superior lateral lobe is about half the width of the dorsal lobe, and much shorter; the terminal branches are similar, only less developed.

Only two specimens of this Ammonite have come under my notice.

The exact affinities of *A. Weistii* are not quite clear. Specimens of *A. navicularis* come very near to it, but have not the constant greater elevation of occasional ribs; rather in this it approaches *A. peramplus*, which, however, has spines in the young state at their umbilical termination.

Ammonites navicularis, Mant., var.

The flattened back is slightly inflated, and rounds into the side; the flattened side, which is also a little swollen, rounds into the umbilicus. The mouth is higher than wide. The few whorls are almost entirely embracing, forming a deep and small umbilicus about half the diameter of the whorl opposite to the mouth.

Ornamented with about (thirty to) forty wide rounded ribs, which are straight, strongest where they pass over the back, and separated by spaces of not more than their own width. About half the ribs arise in the umbilicus, the remainder near the middle of the side.

There are three lateral lobes on each side. The dorsal lobe is wide and square, with three branches on each side, the lower of which have five digits. Dorsal saddle rather wider than the lobe. Superior lateral lobe half as wide as the dorsal saddle, and deeper than the dorsal lobe; it has two branches on each side and a large terminal one which bifurcates. Lateral saddle like dorsal.

The few specimens found show considerable variation in the form of the mouth, which is sometimes as wide as high. They are more flattened than is usual in examples of *A. navicularis* from the Chalk, and differ in never having any tubercles; the umbilicus is also commonly smaller. The Warminster Upper Greensand contains similar shells; but they have tubercles on the back.

It may be necessary to separate the Cambridge shell as a variety; for it is intermediate between *A. Weistii* and *A. navicularis*, and may be an extremely compressed variety of the former. But *A. Weistii* can scarcely claim to be more than a well-marked variety of *A. navicularis*, connecting it with *A. peramplus*. Our fossils also nearly resemble *A. vectensis*, Sharpe, and cannot be distinguished as more than a variety, the only differences being that the ribs are straight (seemingly more elevated), the back slightly flatter, and the umbilicus commonly larger. This being so, confusion may be avoided by marking Cambridge specimens *A. navicularis*, var. *nothus*.

Diam. $2\frac{1}{4}$ inches, with septa to the end.

Ammonites rhamnonotus. Pl. XI. fig. 7.

Few-whorled, flat, with a round back and small umbilicus.

Ornamented with about thirty-six radiating ribs, which continue uninterruptedly over the back, and are alternately long and short. The long ribs mostly arise in the umbilicus, and the shorter ones at a third or half the width of the whorl from the back; they are nearly straight, elevated, and become tumid where the side rounds into the back, but are most elevated in the middle of the side. On the back the ribs are rather less distinct, bend slightly towards the mouth, and each bears in its centre a small sharp tubercle. In a younger state there are also tubercles at the extreme edge of the back, which seem to disappear with a diameter of twelve lines. These are, moreover, the only tubercles in specimens of five lines diam., the back being till then smooth and rounding.

Mouth twice as high as wide, forming more than half the diameter of the shell.

Septa complicated, divided on each side into four lobes. The dorsal, which is wider and shorter than the superior lateral, is ornamented with two branches on each side; the lower of these has three digits. The saddles are all half as wide again as the lobes they correspond to, and divided by an accessory lobe into two unequal parts. The superior lateral lobe, which is long and narrow, has on each side two branches, of which the lower has three digits, and in the middle a branch which bifurcates. In the inferior lateral lobe the terminal branch does not bifurcate, but terminates in three digits.

Height of shell $1\frac{3}{4}$ inch; height of umbilicus less than $\frac{1}{4}$ inch. Height of mouth 1 inch, width $\frac{1}{2}$ inch.

It nearly resembles *A. sexangulatus*; but the much more numerous and finer ribs, differently arranged, and the absence of lateral tubercles from the back, readily distinguish it. The *A. Itierianus*, D'Orb., has a very distant resemblance. Essentially the shell is a compressed form of *A. Mantelli*, with a mesial row of dorsal tubercles instead of two lateral rows.

Loc. Cambridge. Coll. University Museum.

Ammonites sexangulatus. Pl. XI. fig. 1.

Few-whorled, discoidal, compressed, with an angular tuberculated back and small umbilicus.

Ornamented with about twenty-five wide, rounded, radiating ribs, which are somewhat wavy, being for the most part bowed a little forward on the middle of the side: they are separated by spaces never narrower than the width of the ribs. Less than half of the ribs reach the umbilicus, two commonly uniting in a fork at about a third the width of the whorl from it, and a single free one (which dies away at the same distance) sometimes occurring between pairs of forks.

The sides, which are parallel, slope into the umbilicus, and make a large angle with each half of the back, by tubercles being developed on the ribs at the line where the back would begin to round. The ribs are prolonged, somewhat widening and curving forwards, to the centre of the back, where they terminate in prominent tubercles. Thus the back is ornamented with three rows of tubercles.

The mouth is six-sided, with the sides opposite and parallel. It is half as high again as wide, and nearly half the height of the shell.

The septa appear to consist of three lobes on each side. The dorsal is wider and shorter than the superior lateral; they both have three small branches on each side, and at the end two larger ones trifurcate. The dorsal saddle, which is about as wide as the lobe, is cut into by two very small accessory lobes.

In a young state (diameter $\frac{3}{4}$ inch) the sides are perfectly parallel; only one or two of the ribs reach the umbilicus, and all the others are much shorter than the short ones in the larger specimen.

Height $1\frac{5}{8}$ inch; width of umbilicus $\frac{1}{4}$ inch. Height of mouth $\frac{13}{16}$ inch, width $\frac{9}{16}$ inch.

Loc. Cambridge. Coll. University Museum.

This form belongs to the small series with trituberculated backs, typified by *A. papalis*. I am not familiar with any form which closely resembles it. *A. Itierianus*, D'Orb., has some likeness to the young form; but the much more numerous ribs, smaller umbilicus, &c., easily identify the shell described. *A. Brottianus* is nearly related.

Ammonites acanthonotus. Pl. XI. fig. 5.

Few-whorled, compressed, with the sides gently inflated; back rounded, bearing a mesial row of spines; umbilicus as high as the whorl at the opposite side of the mouth.

The umbilicus is shallow, with the lower third of the side, which it includes, gently bevelled down to the preceding whorl; it is marked with radiating ribs, each terminating under the succeeding whorl in a small tubercle.

On the side of a whorl there are about twelve tubercles, from which its upper two-thirds inclines inwards, rounding gently on nearing the back. From each eminence diverge two ribs (in the young state, sometimes three); and there is a free rib not descending quite so far as these, intermediate between each two tubercles. The ribs, parted by spaces of about twice their width, are rather small and obtuse, becoming relatively less elevated and narrower with age. At a third of the width of the side from the back all the ribs are parted by regular distances, but from about that point two of them converge towards a tubercle on the back. The intermediate ribs, which do not pass over the back, terminate where the back and side pass into each other.

The back is about half as wide as the umbilicus is high, and supports on the last whorl a row of spines one-fourth more numerous than the lateral tubercles. They are short and large, having for the base the whole width of the back, are directed forward, and get steadily higher. They are an adult character, the ribs passing over the back till the specimen gets of more than nine lines diameter.

The mouth, less than half the shell's diameter, is about a fourth higher than wide.

The septa are obliterated; they were simple, with a small inferior lateral lobe, and below it three small accessory lobes.

A slight inflation extends all round one side of the whorl; but, from the near resemblance the shell has to *Ammonites glossonotus*, I am not inclined to give that weight to the distortion it otherwise would have.

The late Dr. S. P. Woodward, in 1862, regarded this shell as a monstrosity of *Ammonites lautus*, Sow.,—a view with which I cannot agree.

Ammonites glossonotus. Pl. X. fig. 4.

Few-whorled, discoidal, moderately compressed; back rounded; umbilicus moderately large.

Around the umbilicus are (about ten) prominent tubercular spines, from each of which commonly arise two ribs, and another is generally placed in each of the hollow spaces intermediate between the tubercles. These ribs are elevated, narrow, and not nearly so wide as the spaces between them, which are of about equal width. Two of the ribs ascend the side of the shell, nearly parallel to each other, for two-thirds of its height, when the hinder one bends rather suddenly forward so as to unite, on the side of the back of the shell, with the front one, which curves forward slightly; united, they pass over the back as a thick, elevated, tongue-like fold extending forward. Rarely a rib passes over the back singly.

The mouth, about three-fourths as wide as high, is shaped like an ass-shoe.

The septa are obscure, but appear to be unsymmetrical. The dorsal lobe is short, nearly square, and has a branch on each side, which bifurcates. The dorsal saddle is unequally divided. The superior lateral lobe has a few digits on each side, and two terminal trilobed branches.

Height $1\frac{3}{4}$ inch; width of umbilicus $\frac{1}{2}$ inch. Height of mouth $\frac{3}{4}$ inch; width nearly $\frac{5}{8}$ inch.

This is one of those remarkable Ammonites which undergo a transformation of ornamentation. The characters described are only those of the adult state. In a younger condition, the ribs appear to have been alternately long and short, and to have each passed over the back without a forward curve.

The example figured is the only one I have seen. There is no cretaceous shell that can be compared with it; and one of the few Ammonites having two ribs united to pass over the back is a species from the Lias of Amberg, described by Münster as *A. Fischeri*. That, however, has no umbilical tubercles; the ribs are wide and obtuse, and fewer, and the aspect more compressed.

Loc. Ashwell. Coll. University Museum.

Ammonites Woodwardi. Pl. XI. fig. 3.

Few-whorled, inflated, with convex sides bearing spines, and a round back. Umbilicus mostly higher than the whorl opposite to the mouth, and appearing relatively high from the half-embracing whorls enlarging but slowly: it is quite smooth and rather deep; but the sides are inflated, and round imperceptibly into the sides of the whorl.

Around the side of the whorl, midway between the back and the umbilicus, is a row of some ten or eleven rather elevated spines, from which slight inflations descend to the umbilicus, and strong round elevated ribs arise to pass over the back. In each tubercle are collected three ribs, but only two of them pass over to the corresponding tubercle; for the spines of one side are placed a little between those of the opposite side, rather than facing them, so making a zigzag, which does not, however, strike the eye. The ribs, separated by spaces fully as wide, in the more compressed forms, where the tubercles are a little below the middle of the whorl, pass straight over the back; but in inflated forms the costæ are noticeably arched forward; and in this variety the tubercles are above the middle of the side; and consequently the back, which is very much broader, is much less convex than in the less inflated form. There is no area that can be named a side, the lateral spines dividing the umbilicus from the back; thus defined, the back will be nearly as wide as three-fourths the height of the umbilicus.

The mouth is wider than high, shaped like a moon entered on her fourth quarter.

The septa are simple, the dorsal lobe being square, with two small terminal branches. There are two lateral lobes, one above and one below the spines.

Diameter $1\frac{1}{8}$ inch, with septa to the end.

It also occurs in the Gault of Folkestone; and is not easily distinguished from one described by Von Hauer, from the Lias, as *A. spinescens.*

The name has for some years been associated with that of the late Dr. S. P. Woodward, under whose friendly guidance it was my privilege to gain a knowledge of shells.

Ammonites cœlonotus. Pl. X. figs. 2 & 3.

Few-whorled, much compressed, with nearly flat though slightly inflated sides; back rounding, with a deep mesial groove; umbilicus as high as the whorl at the opposite side to the mouth.

The umbilicus is shallow, but well defined, its narrow horizontal spiral boundary forming right angles with the vertical sides. Around this umbilical angle are about twenty-five little eminences—the thickened origin of the ribs. From these points the ribs ascend towards the back, being directed forward at a considerable curve for about one-fourth of their length. Each rib then, on the side towards the mouth, gives off a branch, and these bend back a little, so as to be for about half their length perpendicular, and then again curve forward in a small arc, passing on to the back, where they continue to be directed towards the mouth till terminating on the margin of the dorsal groove at the distance of the fifth rib in front of their own straight part. The ribs are wide, rounded, and depressed, and separated by sulcations of about half their width, which taper gradually both towards the back and umbilicus.

The back is half the width of the umbilicus, with a deep mesial groove, towards which the sides gently round; the sides of the sulcation make a sharp angle with the back.

The mouth at its base is two-thirds as wide as high; at its upper part, where the sides begin to round into the back, it is half as wide as high.

The septa of this shell are remarkable for the small size of the dorsal lobe, which is contained in the dorsal groove, and bifurcates. There are two lateral lobes: the superior lateral is twice as wide and half as long as the dorsal lobe; there are two notches on each side of it, and at its termination three branches, the central of which has three digits. The dorsal saddle, which is more than twice as wide as the superior lateral lobe, is divided into two subequal parts.

This is one of the less common forms; but the few specimens

I have seen (perhaps twenty-five) show a wide amount of variation. The fossil figured (Pl. X. fig. 2) is one of the most compressed forms; and from it the umbilicus gets higher, the whorls thicker, the ribs more numerous and less elevated, till at last, to judge from fragments, the section of a whorl must have been wider than high. In the form described the dorsal channel is a third the width of the back, but in the widest form it is only a ninth.

A variety occurs in which the whorls are nearly half-embracing (Pl. X. fig. 3), flattened on the sides, rounding on the back, and step-like around the umbilicus, ornamented with about thirty-two rather elevated wide ribs separated by sulcations of about equal width. The ribs are generally alternately long and short, and terminate in fifteen umbilical tubercles. Aperture rather higher than wide. Diameter $1\frac{1}{4}$ inch minimum.

MM. Pictet and Campiche, in their work on the fossils of Ste. Croix, pl. 27. f. 2, have referred this type to *A. falcatus* of Mantell. But at Cambridge no specimen of *A. falcatus* has ever occurred, nor do the ribs vary in the least so as to approach that fossil more than is seen in the specimen figured. The roundness of the back and every feature of the ribs are matter for distinction; hence, and especially as the distribution is different, the forms are separated. It is, no doubt, nearly related to *A. falcatus*, having a channelled back and ribbed sides.

Diam. $2\frac{1}{4}$ inches; septa to the end.

Ammonites splendens, Sow.

A. splendens, Sow. M. C. t. 103; Pictet, Grès Vert, pl. 6. fig. 6; D'Orb. pl. 63.
A. Fittoni, D'Arch.
A. auritus, D'Orb. T. C. vol. i. pl. 65. figs. 3 & 4.

Shell compressed, with a small umbilicus, high, flattened sides, and a very narrow flat back. The umbilicus, about as high as the mouth is wide, and never more than a third the height of the whorl, is shallow, with the horizontal ventrum, which rounds into the side, not much deeper than the unembraced part of the whorl on which it abuts. The sides of the whorls are very slightly inflated, and converge, so that the back is only half as wide as the base. The mouth is less than half the height of the shell. The sides of the cast are smooth, or marked only with a few broad flexuous ribs scarcely elevated. The dorsal angles are each crenated, with a row of minute tubercles, which send slight thickenings a short way down the sides.

Commonly in larger specimens the lower half of the side is slightly inflated, so that the upper half looks more compressed: the same peculiarity occurs rarely in specimens from Folkestone.

Septa commonly unsymmetrical, though the degree of inequality varies. The dorsal lobe is square, with two digitated terminal branches, and two or three small notches on each side. The dorsal saddle is half as wide again as the lobe, and mesially cleft, though not deep. The inferior lateral lobe is almost as large as the dorsal saddle: it terminates in three large branches, all well digitated, the lateral ones bifurcating in full-grown forms, but not into equal parts. There are three other lobes, which are mere notches. The septa are very close together.

I have referred this fossil to the *A. splendens* of Sowerby rather than to the *A. Fittoni* of D'Archiac, because it is quite identical with typical specimens from Folkestone, though, were Sowerby's *figure* followed, no doubt it should be named *A. Fittoni.* But for the mineralization, it might have been supposed that ours were southern Gault fossils, the only difference being that, from the smaller size of the crenulæ, the back is commonly a little convex instead of being slightly concave. Nothing appears to be gained by separating *A. Fittoni* from *A. splendens*; for it is not a well-marked variety, and our specimens are slightly intermediate. It is a common fossil, and abundantly represented in all collections, particularly those of the University and Mr. Carter.

One variety, for which I am indebted to Mr. C. S. P. Darroch, of Trinity College, has the septa at first slightly unsymmetrical, and afterwards symmetrical. The shell is inflated, the mouth being two-thirds as wide as high. The rather deep umbilicus is bordered at the ventral angle with sixteen round tubercles. The dorsal tubercles are larger than those at the umbilicus. The back is round. The sutures are the same as in *A. splendens*, except that there are three small lobes in the umbilicus instead of two, while the lateral lobes are relatively only half as wide.

There are many variations of *A. splendens*, through which the smooth forms pass into others having a sharp and elevated flexuous rib descending from each small dorsal crenulation to the base of the side, where two commonly unite to form a slight thickening; between each two is a free rib, commonly not descending so far. Occasionally two ribs unite in one dorsal tubercle.

Some specimens reach as large a size as those from the Gault, and must have had a diameter of 7 or 8 inches, but are only found in fragments.

Passing on from these forms, the ribs gradually get less sharp and wider apart, the umbilical thickenings more elongated, and unite three ribs with intermediate free ones. Two unite more commonly in each dorsal tubercle, which becomes a trifle larger. The whole shell gradually thickens, the umbilicus enlarges, the ribs strengthen, the umbilical tubercles, as well as those bordering the back, are more elevated; and thus *A. splendens* varies into a new form, which it may be useful to distinguish as *A. cratus.*

Ammonites cratus. Pl. XI. fig. 2.

Form inflated, with half-embracing whorls, and a mouth narrower than high, though wider than the umbilicus. The sides are convex. The flat back is less than half as wide as the mouth.

Around the umbilicus is a row of twelve large and elevated spines, separated by spaces wider than their bases: they send thickenings down the umbilicus, into which the most convex part of the side rounds, abutting on the embraced whorl. They also give rise to extremely elevated narrow ribs, separated by wider, deep, concave channels, curving moderately mouthward. Three ribs are collected in each spine, and there is a free one between each two bundles. About one half reach the back single, and terminate each in a strong, elevated, tubercular thickening, which extends obliquely forward into the middle of the back; the remainder unite in twos at the dorsal angle, and form similar tubercles. These tubercles are so arranged as to give a slightly dendritical aspect to the back.

Septa symmetrical, consisting of the dorsal lobe and, on each side, three (? or more) lobes. The dorsal lobe is rather longer than wide. The dorsal saddle, much wider than the lobe, is centrally cleft. The superior lateral saddle is as wide as the dorsal, has a single notch on each side, and terminates in three large trifurcate branches. The other parts of the suture have the same structure as those described, but get rapidly smaller. As the forms depart from the original series, and the whorls get more inflated, the septa become less and less unsymmetrical.

This extreme form is not common. The largest example in the University Museum measures 3½ inches high, and has septa to the end.

Another branch of the series now passes on rapidly to *A. auritus,* Sow., with which should be united *A. Guersanti,* Pict. (not D'Orb.); for our specimens are almost identical with fig. 7, pl. 5 of the 'Grès Vert,' differing only in having rather fewer tubercles on the back—a character which is the only one to show that the figure is not copied from D'Orbigny's *A. auritus,* pl. 67. vol. i. 'Terr. Crét.'

Ammonites leptus. Pl. X. fig. 5.

Few-whorled, greatly compressed; sides nearly flat; back very narrow; umbilicus rather more than half the height of the last whorl.

The umbilicus, which is angular, is bordered on the side by about fifteen (somewhat elevated, but not very large) tubercles, separated from each other by fully the width of their bases. To each of these tubercles converge three or four ribs, two or three of which generally die away on reaching the eminence. The ribs are round, very gradually widen, and are separated by sulcations about equally wide; for the lower two-thirds of their length they are straight, and then gracefully curve forward, dying away either separately or uniting in twos in large expanded dorsal tubercles, which occupy the whole of the back, bend a little outwards, and (probably) somewhat resembled those of *A. auritus*; they numbered about thirty on each side, and were neither opposite nor regularly alternate.

The mouth is high and narrow, with the sides converging not unlike an Egyptian doorway; it is more than twice as high as wide.

Height $2\frac{1}{8}$ inches; width of umbilicus $\frac{9}{16}$ inch; height of last whorl $\frac{15}{16}$ inch; width of base of mouth $\frac{7}{16}$ inch.

The specimen described is the only one I have seen. Though the shell is otherwise well preserved, the dorsal tubercles are all broken off quite at their bases. A line of the last whorl, broken away, extends two-thirds round the shell; so that perfect specimens were probably not less than 4 inches in diameter.

The affinities of this form are very near to *A. splendens*, Sow., very evident with *A. serratus*, Park, and not too distant to recall the idea of *A. auritus*, Sow. The close ribbing, large dorsal tubercles, and compressed aspect sufficiently and severally distinguish it from all of them.

Loc. Ashwell. University Museum.

Ammonites auritus, Sow.

α. *A. auritus*, Sow. M. C. vol. ii. pl. 134; D'Orb. T. C. vol. i. pl. 65.
A. Guersanti, Pictet (not D'Orb.), Grès Vert, pl. 5. f. 7.
β. *A. Raulinianus*, Pictet & Campiche, T. C.; Ste. Croix, pl. 29; D'Orb. pl. 68. T. C.; Pictet, Grès Vert, pl. 7. fig. 2.

As has already been seen, *A. Fittoni* passes into *A. auritus*; and similarly *A. auritus* passes into the fossil figured by Pictet and Campiche as *A. Raulinianus*, which is only a variety of the *A. Raulinianus* of D'Orbigny. The *A. auritus* figured by Sowerby is a more robust form than that of D'Orbigny, more intermediate in the series, and consequently a convenient type for our forms.

The first form is a compressed shell, with the umbilicus half as high as the mouth, which is nearly two-thirds as wide as high. The sides are very slightly inflated, and converge so that the back is only half as wide as the lower part of the mouth; they round into the umbilicus, bordering which are ten slightly elevated tubercles, forming the boundary for the embracing whorl. The flat back has on each dorsal angle a row of eighteen or nineteen tubercles, which alternate, are larger than those of the umbilicus, and are directed slightly upward, though scarcely rising above the back. From the tubercles arise flexuous ribs twice or three times as numerous as the dorsal tubercles, at which they meet commonly in twos, sometimes in threes, with usually a free rib between each two tubercles; they are similarly collected at the umbilicus. The degree of elevation of the ribs, which are sometimes indistinct, varies much, as does the degree of flexure.

The septa are unsymmetrical, with a square dorsal lobe having two branches on each side, and two terminal branches, between which are a row of dorsal tubercles. The dorsal saddle, wider than the lobe, is cleft mesially by a branch in a line with the other row of dorsal tubercles. The superior lateral lobe is longer than the dorsal, has on each side two lateral branches, and terminates in three branches larger than the others. There do not appear to be any accessory lobes.

From this, forms diverge having the septa variously symmetrical and unsymmetrical, in which the whorl is thicker, while the umbilical tubercles are elevated into spines, and those of the back become higher and wider. These are more typical forms of *A. auritus*, about intermediate between the figures of Sowerby and D'Orbigny.

Ammonites Raulinianus, var.

This is quite inseparable as a species from *A. auritus*.

Shell inflated, with a flat back tuberculate at the sides; whorls half-embracing. Umbilicus nearly as high as the mouth, and bordered with spines.

Mouth as wide as high, with the sides slightly converging to the back; in their lower third they round into the umbilicus, and on its margin support a row of nine or ten spines, generally large, but varying. The back has about eighteen tubercular spines, larger than those of the umbilicus, sometimes directed upward, sometimes outward. The rows on the two sides are alternate, so that the ornament of the back is zigzag. The ribs are commonly strong and obtuse, and slightly curved forward. Three always diverge from each umbilical spine, and two always meet in each dorsal tubercle. Occasionally a dorsal tubercle sends down a free rib.

Septa nearly symmetrical, with a square dorsal lobe, narrower than the back, with two notches on each side, and terminating in two small branches. The dorsal saddle is considerably wider. The upper lateral lobe is long and narrow, terminating in three small branches, and having one branch on each side. The lower lobe is very small, and in a line with the umbilical tubercles.

It is unwillingly that this form has been described separately from *A. auritus,* of which it is a badly marked variety, differing chiefly in a different inflation of the shell. It has been classed by the Swiss naturalists with *A. Raulinianus*; but in this series names nowhere mark real boundaries or breaks.

The young shell so nearly resembles *A. Studeri* that I am unable to discover any character not common to the two forms. This circumstance in no way invalidates the conclusions arrived at on the affinities of this shell; for all the forms, from *A. Fittoni* to the most extreme variation of *A. Studeri,* have round backs in the young state; and if this shell is more inflated than usual, that is because the adult is one of the most gibbous of the series.

There are many variations from this form, in one of which the ribs disappear; in another the dorsal tubercles gradually become obsolete, while the back gets narrower and the sides more convex, till at last the back as a flat region becomes obsolete, and the alternate ribs almost meet in alternate thickened terminations along its middle. The ribs curve much toward the mouth as they near the back. This small shell with a dendrous back is probably immature.

Ammonites Salteri, Sharpe, Cret. Moll. pl. 23. figs. 5 & 3, is a variation including those more compressed forms in which the dorsal spines are reduced to tubercles and the umbilical spines are small and the ribs slightly elevated.

In a variety which may be named *A. tetragonus* the shell has flat sides and a flat back, and the mouth nearly quadrate. On the lower third of the side is a row of ten or eleven small spines, which are moderately elevated and separated by wide intervals. At each dorsal angle is a row of about eighteen tubercular spines, larger than the umbilical row, and, though short, directed laterally, which widens the back. These spines are connected by ribs, which on the last half-whorl are very slightly elevated, and ultimately become obliterated. Three appear to have always diverged from each umbilical spinous eminence. The last half-whorl is devoid of septa. Diameter 2 inches; width of mouth $\frac{7}{8}$ inch.

Another shell (Pl. XI. fig. 6) of the same group scarcely differs as a variety from *A. Renauxianus,* P. & C. Ter. Crét. Ste. Croix, pl. 31. figs. 2–5; D'Orb. T. C. vol. i. pl. 27. Shell compressed, with very few whorls, one-third-embracing, and enlarging very slowly. The flat sides, so slightly converging as to be almost parallel, are half as high again as wide. The ventrum is horizontal, and rounds into the side. The shallow and open umbilicus shows that, up to the first, the whorls were smooth. Here there are fourteen thickenings, which rapidly become moderately elevated tubercles. A rib given off from each of these bifurcates a little way up the side, but is very little elevated. One or both of the branches reach the back, terminating in a tubercle not larger than that at the umbilicus. In the last quarter-whorl the ribs are curved towards the mouth, and are obliterated in the upper part of the whorl. The dorsal tubercles in the same space rapidly get smaller, becoming oblique thickenings; they form a row of twenty-five. The last half-whorl is devoid of septa. These shells are as unsymmetrical as any in the young state, but become finally nearly symmetrical. The square dorsal lobe, more than half the width of the back, has a notch on each side and two small terminal branches. The dorsal saddle is of the same width, and mesially cleft. The upper lateral saddle is rather narrower, with a notch on each side and three terminal branches. The other parts are similar, but much smaller. There are two small accessory lobes.

The dorsal tubercles are alternate, and the back slightly convex. There are other specimens, one-fourth larger, with the mouth perfect and as wide as high, with the shell inflated. The dorsal angle is obtuse and rounded; the side rounds more noticeably into the ventrum.

I believe these shells to be variations from *A. auritus*.

Ammonites Vraconensis, Pictet & Campiche, T. C. Ste. Croix, pl. 31. fig. 1.

Inflated, few-whorled; whorls two-thirds-embracing, with (diam. 2 inches) flat sides and a nearly flat back. The sides converge, giving the mouth something of the outline of an inverted flower-pot. At one-third up the side is a row of eight or nine large elevated spines, the space interior to which rounds down to the whorl it embraces, and is smooth. From each spine commonly arise (three or) four ribs, which extend up the side to the margin of the back. At the angle where the side and back meet is a row of tubercles about three times as numerous as the umbilical spines, and in these the ribs terminate, commonly two, sometimes but one, in each; so that there are generally one or two free ribs between all the spines. Many of the ribs are straight; but the hinder one of the two, meeting in a dorsal tubercle, necessarily has a bend in its upper third. The dorsal tubercles of the two sides are not opposite, but alternate, and, compared with the umbilical spines, small. The umbilicus is deep, and about as high as or higher than the whorl opposite the mouth.

Ammonites Studeri, Pictet & Campiche.

A. Studeri, P. & C.; Ste. Croix, pl. 30.

Few-whorled, more than two-thirds-embracing, greatly inflated, with a flattened back, and umbilicus as high as the whorl opposite the mouth, and bordered by a row of large spines.

The mouth is rather wider than high, and nearly twice as wide as the back. The exposed part of the ventrum is inflated and nearly horizontal; but quite on its border, where the side rounds into it, is placed the row of ten massive tubercles; these are much-elevated cones, with bases a fourth the height of the side; above them the sides are flat, and converge to the back. From each spine arise two or three ribs, which are slightly curved mouthward, obtuse, and not much elevated till reaching the margin of the back, where they terminate each in a thickening which can scarcely be termed a tubercle, and which extends a short way on to the back. Those of the two sides are alternate, so that the slightly convex back presents a distant approach to the kind of zigzag ornament which marks the back of *A. Raulinianus*.

In the most typical specimens the septa are almost effaced; they appear nearly, if not quite, symmetrical. The dorsal saddle is wide and unequally cleft by a small branch. The superior lateral lobe is long, with two small notches on each side, and terminates in three trifid branches. The inferior lobe is small, and in the line of the tubercles.

Specimens identical with those figured in the 'Paléontologie Suisse' are rare; but small specimens having all the characters of ornament the same, and differing only in being relatively much less inflated, are by no means uncommon. But it is with doubt that I have cast these in with *A. Studeri*; for the young state of *A. Raulinianus* is identical.

The adult shells of this type vary much in the degree of elevation and number of the ribs, as well as the way in which they are gathered in the tubercles.

I believe the facts given in this paper compel the union under one specific type of every shell it describes after *Ammonites cœlonotus*. Throughout the series the variations in the septa are insignificant. Every variety of shape is nothing but an inflated form of *Ammonites splendens* modified by the different development of crenulæ and ribs. The four chief species, *Ammonites splendens*, *A. auritus*, *A. Raulinianus*, and *A. Studeri*, are inseparably linked together by intermediate forms; while the young of *A. auritus* is the species *A. splendens,* and small shells like *A. Studeri* become with age the species *A. Raulinianus.*

Yet the other forms all have a value, though for convenience they may be regarded as varieties of these types, which are but subspecies of a larger group now named *Ammonites permutatus.*

Ammonites (*Crioceras*) *occultus.* Pl. X. fig. 1.

Moderately compressed, flattened, with few whorls, which rapidly enlarge, and are so closely coiled that, while the whorls do not appear to have actually touched, the tubercles of the back have impressed themselves into the underside of the succeeding whorl. The transverse outline of the last whorl is four-sided. The back is flat, and the base is a little concave. The sides round into the base, and approximate each other with increasing rapidity as they near the back, into which they also gradually round. The back is half as wide as the base, and one-third the height of the side. In the earlier whorls the back appears to have been more round.

The shell is ornamented with a great number of moderately elevated rounded ribs, which, below the middle of the side, are slightly inflected forwards, as they are on nearing the back. At the base of the side the ribs are collected in twos and threes, forming elongated, elevated, obtuse tubercles; they ascend the side at about equal distances apart, and so pass over the back; but, at the angles which the sides make with the back, every third or fourth rib developes a large elevated tubercle, the base of which is at least as wide as the space between the ribs: the tuberculated ribs are often stouter than the others. On the basal side, where the ribs are bent forwards, are two impressed lines marking the width of the back of the preceding whorl; the space between the lines is rather more than a third of the width of the base.

The septa are indistinct. The dorsal lobe is twice as long as wide, and extends over three ribs; it has two large, bifurcating, many-digited, terminal branches, and two branches on each side, the lower one being large. The dorsal saddle is as wide as half the height of the side, divided by one large and many smaller branches. The superior lateral lobe is about as large as that on the back, but longer; it terminates in a trifid branch, the central ramus of which has three digits. The inferior lateral lobe is short; the basal lobe minute.

This remarkable *Crioceras* was obtained by the Rev. Dr. Cookson from near Hunstanton. But I suspect that both it and the *Trigonia* formerly named *T. Hunstantonensis* have been obtained from the Drift. It has been liberally presented to the University Museum.

For the drawings which illustrate this paper I am indebted to the kindness and skill of the accomplished artist, Mr. Robert Farren.

EXPLANATION OF PLATES X. & XI.

[All the figures are of the natural size.]

PLATE X.

Fig. 1. *Crioceras occultus*, Seeley: *a*, lateral view; *b*, ventral view, showing how the dorsal spines indented the succeeding whorl; *c*, a section and septum; *d*, dorsal view.
Fig. 2. *Ammonites cœlonotus*, Seeley.
Fig. 3. —— ——, var.
Fig. 4. —— *glossonotus*, Seeley.
Fig. 5. —— *leptus*, Seeley.

PLATE XI.

Fig. 1. *Ammonites sexangulatus*, Seeley.
Fig. 2. —— *cratus*, Seeley.
Fig. 3. —— *Woodwardi*, Seeley.
Fig. 4. —— *pachys*, Seeley.
Fig. 5. —— *acanthonotus*, Seeley.
Fig. 6. Var. of *A. Renauxianus*, Pictet & Camp.
Fig. 7. *A. rhamnonotus*, Seeley.

XXVIII.—*Descriptions of new Genera and Species of* Gallerucidæ. By J. S. Baly.

Fam. Gallerucidæ.

Subfam. Halticinæ.

Genus Simæthea.

Corpus elongatum, parallelum, subcylindricum. *Caput* exsertum, fere perpendiculare, pone oculos constrictum; *oculis* orbitu circumdatis, prominentibus, integris; *facie* inter antennarum insertiones elevata; *encarpis* triangularibus, supra fossa transversa profunda terminatis; *antennis* corporis longitudini fere æqualibus, filiformibus, articulis cylindricis, primo breviter curvato, a basi ad apicem paullo incrassato, secundo brevi, obconico, tertio ad primi longitudinem æquali. *Thorax* transversus, basi vix transversim sulcatus, disco convexus, lateribus anguste marginatis, rotundatis, angulis anticis dente obtuso armatis. *Elytra* thorace paullo latiora, parallela, apice subacute rotundata, supra convexa, regulariter punctato-striata. *Pedes* robusti; *coxis* anticis non contiguis, suberectis; *femoribus* paullo, *posticis* magis incrassatis, his subtus non sulcatis; *tibiis* omnibus apice spina acuta armatis; *tarsorum* posticorum articulo primo duobus sequentibus paullo breviore; *unguiculis* appendiculatis. *Prosternum* distinctum sed angustissimum.

Type, *Simæthea Laportei*, Baly.

Simæthea must be placed in close proximity to *Podagrica*. In addition to its much greater size, it may be at once known by the absence of the short perpendicular grooves present at the base of the thorax in *Podagrica*; it presents also an abundance of other distinctive characters.

Simæthea Laportei.

S. elongata, parallela, subcylindrica, nitida; ore, pectore femoribusque piceis; tibiis tarsisque fusco-fulvis; antennis flavis, apice paullo infuscatis; thorace profunde sed remote punctato; scutello rufo-piceo; elytris sat profunde punctato-striatis, rufis, apice nigris.
Long. 4 lin.

Hab. Tringanee.

Epistome triangular, the lower part of its surface plain, the apical portion obliquely elevated; face thickened and elevated between the insertions of the antennæ, but without forming the usual facial ridge; encarpæ contiguous, large, subquadrate, the lower and inner angle of each produced downwards; bounding the encarpæ above is a deep transverse groove, the upper edge of which is oblique, and gradually lost on the surface of the front; running upwards from this groove are a number of short, nearly perpendicular grooved lines. Thorax rather broader than long; sides narrowly margined, moderately rounded; upper surface convex. Scutellum trigonate, its apex obtuse. Elytra scarcely broader than the thorax, parallel, each elytron faintly impressed on the middle of the disk just below the basilar space; deeply punctured, the punctures somewhat remotely placed in ten or eleven longitudinal rows; the black apex varies greatly in extent, in some specimens being nearly lost, in others occupying almost a third of the surface.

Genus Xuthea.

Corpus elongato-ovatum, convexum. *Caput* exsertum; *facie* triangulari, *carina* lata, modice elevata; *encarpis* non contiguis; *antennis* gracilibus, filiformibus, corporis longitudine brevioribus, articulo primo paullo curvato, incrassato, secundo illo fere dimidio breviore, a basi ad apicem modice incrassato, cæteris gracilibus, singulatim primo æqualibus; *oculis* orbitu circumdatis, prominulis, integris. *Thorax* transversus, lateribus anguste marginatis, fere parallelis, angulis anticis tuberculo setifero armatis, dorso ante basin transversim sulcatus, sulco utrinque fossa perpendiculari brevi ad basin producta terminato. *Elytra* regulariter punctato-striata. *Pedes* modice robusti; *coxis* anticis distantibus, prosterno fere æquialtis; *femoribus* posticis modice incrassatis, subtus leviter sulcatis; *tibiis* omnibus apice spina acuta armatis; *tarsorum* articulo basali ♂ ampliato, *posticorum* articulo basali duobus sequentibus conjunctim fere æquali, tibiæ apici inserto; *unguiculis* appendiculatis. *Prosternum* angustum.

Type, *Xuthea orientalis.*

This genus resembles *Diplaulaca* in the form of its thorax, *Crepidodera* in the form and punctuation of its elytra; from the latter it is separated by all the tibiæ having a short spine at their apex, from the former by the entirely different shape and punctuation of the elytra.

Xuthea orientalis.

X. elongato-ovata, convexa, supra viridi-cyanea, nitida, subtus obscure viridi- aut piceo-ænea; coxis, tibiis tarsisque piceis, plus minusve æneo tinctis; thorace fortiter subremote punctato; elytris nitidis ♂, minute granulosis, subnitidis ♀, regulariter punctato-striatis; antennis fulvis, extrorsum piceis.

Long. 3–3¼ lin.

Hab. India.

Head exserted, face triangular; mouth pale piceous; space between the eyes rugose; carina moderately elevated, not very broad; encarpæ ill defined, remote; face separated from the front by a deep flexuose groove which runs obliquely upwards on either side from the apex of the carina; vertex obsoletely wrinkled in front, very remotely impressed with large punctures; whole face clothed with coarse, depressed, whitish hairs. Thorax one-half as broad as long; sides straight and parallel, slightly converging and sinuate in front; surface nitidous, strongly but subremotely punctured, all the angles slightly produced, acute, the anterior somewhat reflexed. Elytra smooth and nitidous in the ♂, subnitidous and very minutely granulose in the ♀, regularly punctate-striate, interspaces plane; basilar space in each elytron bounded by a semicircular depression. Body beneath clothed with coarse, adpressed, whitish hairs. Basal joints of all the tarsi in the ♂ dilated, the middle elevated into a longitudinal ridge.

Subfam. Gallerucinæ.

Genus Cynorta.

Corpus elongatum, angustum, parallelum. *Caput* exsertum; *facie* subelongata, plana, subporrecta, inter antennarum insertiones elevata; mandibulis sat robustis, antrorsum productis; *antennis* gracilibus, filiformibus, corporis longitudini fere æqualibus, articulo primo elongato, paullo curvato, a basi ad apicem incrassato, secundo brevissimo, obovato, cæteris fere æqualibus, singulis primo brevioribus, quarto tertio paullo longiore; *palpis* maxillaribus apice ovatis; *oculis* prominentibus. *Thorax* transverso-quadratus, lateribus anguste marginatis, fere parallelis; disco modice convexo, profunde impresso. *Elytra* thorace paullo latiora, parallela, crebre punctata, leviter elevato-vittata. *Pedes* elongati, graciles; *coxis* anticis contiguis, erectis; *femoribus* vix incrassatis, subcompressis; *tibiis* omnibus singulatim apice spina acuta armatis; *tarsorum* posticorum sequentibus longitudine æquali; *unguiculis* appendiculatis. *Prosternum* obsoletum.

Type, *Cynorta porrecta.*

The long, narrow form and produced head will serve to distinguish this well-marked genus at first sight from its allies.

Cynorta porrecta.

C. elongata, subfiliformis, viridi-ænea, nitida; capite (vertice excepto), thorace femoribusque fulvis; thorace granuloso, arcuatim bisulcato, violaceo-æneo suffuso; femoribus dorso, tibiis, tarsis antennisque (his basi exceptis) piceis; elytris granulosis, elevato-vittatis, interspatiis confuse bifariam punctatis, interstitiis inter se reticulatis.

Long. $3\frac{1}{2}$ lin.

Hab. Java.

Face subporrect, vertex granulose, metallic green, apex of jaws and palpi piceous. Thorax scarcely broader than long; sides slightly diverging from their base to beyond their middle, then slightly converging to the apex; disk moderately convex, somewhat flattened in the middle, impressed on the centre with two curved foveæ, contiguous at the base, diverging towards their apices.

Genus Nadrana.

Corpus anguste ovatum, sat convexum. *Caput* modice exsertum, perpendiculare; *antennis* corporis longitudine, gracillimis, filiformibus, articulo primo curvato, a basi ad apicem leviter incrassato, secundo brevi, tertio secundo fere duplo longiore, quarto tertio dimidio longiore, cæteris articulo quarto singulatim fere æqualibus; *oculis* sat magnis, modice prominulis, integris; *palpis* maxillaribus apice ovatis, acutis. *Thorax* brevis, transversus, lateribus marginatis, angulis anticis obliquis, incrassatis; disco leviter transversim sulcato. *Elytra* ovata, convexa, infra basin non transversim impressa, confuse punctata. *Pedes* graciles, sat elongati; *coxis* anticis erectis, contiguis; *femoribus* posticis non incrassatis; *tibiis* omnibus apice spina acuta armatis; *tarsorum* posticorum articulo primo elongato, duobus sequentibus conjunctim plus duplo longiore; *unguiculis* appendiculatis. *Prosternum* fere obsoletum; *metasternum* utrinque oblique depressum.

Type, *Nadrana pallidicornis.*

Nadrana is nearly allied to *Luperodes*; it is to be distinguished from it by the grooved thorax and more slender antennæ, together with the relatively longer third joint of the latter.

Nadrana pallidicornis.

N. elongato-ovata, valde convexa, nigra, nitida; vertice, tibiis quatuor anticis apice tarsisque piceis; antennis pallide flavis; elytris tenuiter subcrebre punctatis, rufis.

Long. $3\frac{3}{4}$ lin.

Hab. Tringanee.

Thorax three times as broad as long; sides rounded, their outer margin narrowly reflexed; above transversely convex, very finely punctured; middle of disk covered with a broad, shallow, transverse excavation, which does not quite extend to the outer border of the thorax. Apical border of elytra narrowly edged with piceous.

Genus Antipha.

Corpus ovatum, postice ampliatum, convexum. *Caput* exsertum, subperpendiculare; *antennis* gracillimis, filiformibus, corpore brevioribus, articulis cylindricis, primo curvato, a basi ad apicem incrassato, secundo brevi, tertio primi longitudinis aut breviore, quarto duobus præcedentibus æquali aut longiore, cæteris singulatim quarti longitudini fere æqualibus, iis prope apicem paullo brevioribus; *oculis* magnis, prominentibus, integris. *Thorax* transversus, dorso non impressus, lateribus fere rectis, parallelis, angulis anticis incrassatis. *Elytra* thorace multo latiora, oblonga, postice paullo ampliata, convexa, infra basin non transversim impressa, confuse punctata. *Pedes* graciles, simplices; *coxis* anticis suberectis, non contiguis; *femoribus* posticis non incrassatis; *tibiis* omnibus apice muticis; *tarsorum* posticorum articulo basali duobus sequentibus conjunctim longiore; *unguiculis* appendiculatis. *Prosternum* angustissimum, distinctum.

Type, *Antipha picipes.*

The glabrous upper surface, smooth thorax, long slender legs and antennæ, unarmed tibiæ, and appendiculated claws afford sufficiently good characters (taken conjointly) for the foundation of the present genus.

Antipha picipes.

L. ovata, postice ampliata, valde convexa, nitida, fusco-fulva; oculis nigris; epistomate, antennis (basi excepta), thorace infra, abdominis limbo pedibusque piceis, thoracis disco fusco maculato.

Long. $4\frac{1}{2}$ lin.

Hab. India.

Face triangular: thorax nearly twice as broad as long; sides straight, slightly converging from base to apex, hinder angles acute, anterior thickened, oblique; smooth on the disk, very finely punctured on the sides: elytra more coarsely punctured, on the outer disk is a longitudinal costa which runs parallel to the outer margin for its middle two-fourths.

Genus Momæa.

Corpus elongatum aut subelongatum, convexum. *Caput* crassum, valde exsertum; *fronte* lata, declivi; *facie* perpendiculari; *mandibulis* magnis; *antennis* corporis longitudini æqualibus aut paullo brevioribus, filiformibus, ad apicem attenuatis, articulo primo curvato, a basi ad apicem incrassato, secundo primi dimidiæ parti æquali aut paullo breviore, tertio elongato, articulo quarto longiore, cæteris singulatim quarto æqualibus; *palpis* maxillaribus crassis, apice acuminatis; *oculis* vix prominulis, integris. *Thorax* transversus, lateribus anguste marginatis, obtuse angulatis, angulis omnibus tuberculo setigero instructis; disco transversim concavo, medio longitudinaliter excavato, utrinque transversim sulcato. *Elytra* metallica, thorace latiora, fere parallela, convexa, infra basin transversim depressa, confuse punctata, glabra aut postice pube tenuissima sparse vestita. *Pedes* modice robusti, sat elongati; *coxis* anticis erectis, fere contiguis; *femoribus* posticis non incrassatis; *tibiis* omnibus apice muticis; *tarsorum* posticorum articulo basali duobus sequentibus longiore; *unguiculis* bifidis. *Prosternum* lineariforme.

Type, *Momæa viridipennis*.

The longer third joint of the antennæ, together with the different manner in which the thorax is excavated, will separate this genus from *Nicea* and *Eumæa,* two nearly allied forms. There is a slight error in the characters given by me of the latter genus (Annals, January 1865, p. 37); it ought to read—"*Prosternum* angustissimum aut obsoletum; *tibiis coxis* anticis contiguis." In both *Nicea* and *Eumæa* all the tibiæ have their apices unarmed.

Momæa viridipennis.

M. elongata, convexa, fusco-fulva, nitida; capite (epistomate excepto) nigro-piceo; pedibus antennisque nigris; elytris viridi-æneis, crebre punctatis, sparse fusco-sericeis.

Long. $5\frac{1}{2}$ lin.

Hab. Mysol.

Head large; jaws robust, prominent; forehead deflexed, impressed in the middle with a deep longitudinal fovea; surface shining, irregularly but not closely punctured: encarpæ contiguous, triangular; lower portion of face, together with the base of the jaws, obscure fusco-fulvous. Thorax more than twice as broad as long; sides obtusely angled, diverging and slightly sinuate from their base to just beyond the middle, then converging to their apex; upper surface transversely concave, impressed on the hinder half of the middle disk with a large longitudinal fovea; on either side is a deep but ill-defined transverse depression which extends from the outer border nearly to the medial line. Elytra subelongate, nearly parallel, convex; their surface convex, excavated and sinuous below the basilar space, about the middle of the disk, and on the sides; on the hinder disk are several shallow, ill-defined, longitudinal sulcations.

Genus Mimastra.

Corpus elongatum, modice convexum, dorso subdepressum. *Caput* exsertum; *facie* subperpendiculare; *antennis* corpore brevioribus, gracilibus, filiformibus, articulo primo elongato curvato, a basi ad apicem incrassato, secundo ad tertiam partem primi æquali, tertio secundo duplo longiore, quam articulum quartum paullo breviore, cæteris singulatim quarto fere æqualibus; *palpis* maxillaribus lanceolato-ovatis, apice acuminatis. *Thorax* transversus, lateribus anguste marginatis, obsolete angulatis; disco irregulariter excavato. *Elytra* thorace latiora, postice paullo dilatata, lateribus anguste explanato-marginata, modice convexa, dorso deplanata, confuse punctata. *Pedes* graciles, sat elongati; *coxis* anticis erectis, contiguis; *femoribus* posticis non incrassatis; *tibiis* omnibus apice muticis; *tarsorum* posticorum articulo basali duobus sequentibus conjunctim æquali; *unguiculis* bifidis. *Prosternum* obsoletum.

Type, *Mimastra arcuata.*

The less exserted and smaller head, the shorter third joint of the antennæ, the flattened upper surface, together with the obsolete prosternum, separate the genus before us from *Momæa.*

Mimastra arcuata.

M. elongata, subnitida, dorso subdepressa, subtus obscure olivacea; capite thoraceque fusco-fulvis, illo vertice, hoc disci maculis quinque metallico-olivaceis; antennis pedibusque piceis, femoribus infra tibiisque apice fulvis; scutello nitido, nigro; elytris subelongatis, postice leviter ampliatis, granulosis, obsolete rugulosis, tenuiter punctatis, metallico-olivaceis, singulatim limbo laterali fasciaque arcuata prope medium posita, ad marginem adfixa, fulvis.

Long. $4\frac{1}{2}$ lin.

Hab. India.

Thorax one-half broader than long; sides distinctly margined, nearly straight and parallel, moderately dilated, obtusely angled just before their middle; upper surface covered with about six large excavations; the green patches are arranged two in the middle of the disk, and three in front of the basal margin, the two lateral larger than the others.

Genus Sastra.

Corpus elongatum, convexum, supra pube brevissima adpressa plus minusve dense vestitum. *Caput* exsertum; *facie* perpendiculari, brevi, transversa; *mandibulis* mediocribus; *antennis* corporis longitudini fere æqualibus, gracilibus aut sat gracilibus, filiformibus; articulo primo curvato, a basi ad apicem incrassato, secundo brevi, tertio duobus præcedentibus longitudine æquali aut paullo longiore, quarto et sequentibus singulatim tertio brevioribus, inter se fere æqualibus; *oculis* magnis, prominentibus, integris; *palpis* maxillaribus apice anguste ovatis, acuminatis. *Thorax* transversus, lateribus medio sæpe angulatis; disco subplano, medio longitudinaliter sulcato, utrinque transversim impresso; angulis omnibus tuberculo setigero armatis. *Elytra* elongata aut subelongata, fere parallela, postice vix ampliata, anguste explanato-marginata, convexa, dorso subdeplanata, infra basin non aut vix transversim depressa, pube sericea plus minusve dense vestita, confuse punctata, sæpe disco exteriore longitudinaliter sulcata. Pedes graciles, elongati; *coxis* anticis contiguis aut fere contiguis; *femoribus* posticis non incrassatis; *tibiis* omnibus apice muticis; *tarsorum* anticorum articulo basali duobus sequentibus longiore; *unguiculis* bifidis. *Prosternum* angustissimum, sæpe fere obsoletum.

Type, *Sastra placida.*

The smaller head, much shorter and transverse face, together with the much more pubescent upper surface of the body, will sufficiently distinguish *Sastra* from *Momæa.*

Sastra placida.

S. elongata, modice convexa, sordide flava, nitida; abdomine antennisque fuscis, his basi pallidioribus; elytris dense punctatis, pube adpressa fusca vestitis, pallide fusco-violaceis.

Long. 4 lin.

Hab. Mysol.

Head impressed with a longitudinal groove, which extends from the anterior edge of the epistome to the vertex; encarpæ contiguous, large, pentagonal. Thorax nearly twice as broad as long; sides nearly parallel, slightly rounded in front, narrowed posteriorly; middle of disk impressed with a longitudinal sulcation, which extends from base to apex, but is interrupted in its middle; on either side is a broad transverse depression which occupies nearly a third of the whole surface; scattered distantly over the thorax, but rather more crowded on the anterior margin, are some large deep punctures. Elytra subparallel, lateral border narrowly dilated, flattened along the suture, closely punctured; densely clothed with adpressed fuscous pubescence; on the outer disk are two shallow longitudinal sulcations, separated from each other by an elevated ridge.

Sastra limbata.

S. elongata, pallide flava, nitida; oculis nigris; elytris metallico-violaceis, singulatim pallide flavo limbatis.

Long. $3\frac{2}{3}$ lin.

Hab. New Guinea.

Face short, transverse; space between the insertions of the antennæ broad, impressed with a longitudinal groove, which runs downwards across the epistome and upwards to the vertex; carinæ large, contiguous, subpyriform; antennæ four-fifths the length of the body, slender; apex of jaws piceous. Thorax nearly twice as broad as long; sides subparallel, slightly rounded, narrowed and sinuate behind their middle; surface smooth, impunctate, the longitudinal sulcus interrupted in the middle, less deeply impressed than the lateral foveæ, which are broader and deeper, but ill defined. Elytra not very closely punctured, nearly glabrous in the single specimen before me (which is, in all probability, worn); the entire limb, with the exception of a small space near the scutellum, narrowly edged with flavous; basilar space bounded beneath by a shallow depression; running along the outer disk, and bounded exteriorly by an indistinct ridge, is a broad, shallow, longitudinal groove; on the hinder disk near the middle are also to be seen the traces of a second, very ill defined.

XXIX.—*On the Australian Species of* Paludina.

By E. von Martens, M.D., C.M.Z.S.

Only one Australian species is mentioned in the list of the species of this genus given by Frauenfeld in the 'Verhandlungen des zoologisch-botanischen Vereins in Wien,' 1862, as well as in Reeve's 'Conchologia Iconica.' Having enjoyed the advantage of examining some others in the British Museum and in the Zoological Museum of Berlin, I shall here give comparative descriptions of them.

1. *Paludina australis*, Reeve, Conchol. Icon. 1863, no. et fig. 71.

Probably *P. essingtonensis*, Shuttleworth, Frauenfeld, *l. c.* p. 1162.

P. testa conico-globosa, perforata, tenui, confertim spiraliter undulato-striata, virescenti-cornea, fasciis rufo-fuscis 3–5 picta; spira gradata; anfr. 5–6 inflati, sutura profunda distincti; apertura subperpendicularis, circulari-ovata, angulo supero modice acuto; peristoma interruptum, album.

Altitudo 38, diameter major 31, minor 25, aperturæ altitudo 21, latitudo 17 mill.

Operculum normale.

Australia; collected by Mr. Gilbert at Port Essington. (B.M.)

Similar in size and form to the European *P. vivipara*, Müll., Lam. (*P. Listeri*, Forbes), but readily distinguished by its sculpture being similar to that of some species of the Indian Archipelago. The three principal bands occupy the same place as those of the European species, or as the principal ridges in the Indo-Chinese (*P. angularis*, Müll., and *P. costata*, Q. & G.); but in several specimens there are two additional bands, narrower and paler, the one above, the other beneath the uppermost of the three principal ones.

2. *Paludina affinis.*

P. testa conico-ovata, suboblate perforata, solidula, lineis spiralibus impressis, subtilissimis vel obsoletis, fusco-cornea, fasciis rufo-fuscis 3–6 picta; spira convexo-conoidea; anfr. 5, convexi, sutura mediocriter profunda divisi; apertura paulum obliqua, subcircularis, angulo supero rotundato; peristoma subcontinuum, iterate nigro limbatum.

Alt. 27, diam. major 23, min. $18\frac{1}{2}$, apert. alt. $16\frac{1}{2}$, latit. $13\frac{1}{2}$ mill.
Operculum normale.

Australia; collected at Fitzroy river and near Port Essington by Capt. Wickham, R.N.; other specimens by J. R. Elsey, Esq. (B.M.)

This species stands nearly in the same relation to the preceding as *P. fasciata*, Müll. (*P. achatina*, Drap., Lam.), to *P. vivipara*, Müll., the chief difference being in the outlines of the whorls; besides, the spiral sculpture is much less developed in *P. affinis.* The bands are almost the same as in *P. australis*; but there is a third, secondary band between the second and third principal ones.

This species varies somewhat in the elevation of the spire, several smaller specimens found at the same localities having it more produced, and therefore being of a more oblong form, and having a relatively smaller aperture. The dimensions of one of these are as follows:—altit. $19\frac{1}{2}$, diam. maj. 15, min. 12, apert. alt. $11\frac{1}{2}$, lat. 9 mill.

3. *Paludina polita.*

P. testa globoso-conica, perforata, nitida, lineis spiralibus impressis subtilissimis haud valde confertis sculpta, corneo-lutea vel pallide carnea, fasciis nullis; spira conoidea, subgradata; anfractus 5, inflati, valde convexi, sutura mediocri; apertura paulum obliqua, ovata, angulo supero modice acuto; peristoma plerumque continuum, iterate fusco limbatum.

Alt. $22\frac{1}{2}$, diam. maj. 19, min. 17, apert. alt. 13, lat. 11 mill.
Operculum normale, rufum.

South Australia, on the Balonne river, New South Wales; found by John Macgillivray. Other regularly decollated specimens, of a brighter red colour, in Lake Alexandria, found by Mr. Strange. (B.M.)

XXX.—*An Examination of the Dejeanian Genus* Cœlomera (Coleoptera Phytophaga) *and its Affinities.* By the Rev. Hamlet Clark, M.A., F.L.S.

The genus *Cœlomera* of Dejean's Catalogue (3rd edition, 1837) and of cabinets consists of a variety of forms. As at present constituted, it represents simply one of several forms of Gallerucidæ, which can neither be referred, on the one hand, to any of the genera shadowed forth by *Adorium*, nor, on the other, to the group of insects more immediately related to *Adimonia* and *Galleruca* proper. In Dejean's Catalogue it is made to comprehend six or seven distinct real genera, the species of which are found in North America, South America, Africa, and Asia; while in modern cabinets the limits of the group would appear to be, if possible, more undefined still; so that the name has become a sort of refuge for everything in the neighbourhood which is unknown or which has been uncharacterized. An examination of my material, during my summer holiday, has enabled me to fix with some certainty the limits of the several genera which it has comprised. I need not here analyze the Dejeanian species: they will be found in the following pages in their natural places. I have been able to trace them all. It may be convenient, however, to prefix a brief synoptical table of the several genera which contain the species, and which are dealt with in this paper.

List of Genera.

Antennæ robust, short, incrassated; body ovate ...	I. CEROCHROA.
Antennæ incrassated, cylindrical, joints 3, 4, and 5 being equal; body subcylindrical, subovate	II. ALPHIDIA.
Antennæ incrassated, joint 3 being longer than 4, joints 5–11 broadly compressed; body ovate......	III. CLITENA.
Antennæ incrassated, joints 1, 3, 4 being subequal, and 9 and 2 minute and equal; body subparallel	IV. HYMENESIA.
Antennæ incrassated, serrated, joints 3–7 being the broadest, joints 3–7 equal in length; body ovate	V. ORTHOXIA.
Antennæ incrassated in ♂, joints 4–7 dilated and compressed, 3rd joint shorter than 4th; body ovate	VI. PYESIA.
Antennæ incrassated in ♂, very long, joints gradually diminishing in thickness from 1 to 11.........	VII. PROCALUS.
Antennæ robust, filiform, joints 3, 4, and 5 being subequal; body robust, subparallel..................	VIII. PACHYTOMA.
Antennæ filiform, robust, joints 1 and 3 equal, and 4, 5, 6 equal and somewhat shorter; body short, parallel	IX. SPHENORAIA.
Antennæ filiform, joints 4 and 5 equal and shorter than 1 and 3; body parallel; thorax much constricted at the base	X. DIRCEMA.
Antennæ filiform, moderate in length, joints 4 and 5 subequal; body robust or broadly ovate	XI. MONOCESTA.
Antennæ filiform, moderate in length, third joint very long; body generally broadly ovate	XII. CŒLOMERA.
Antennæ filiform, robust, nearly as long as the body, joints 3 and 5–10 nearly equal; body parallel ...	XIII. CORAIA.
Antennæ filiform, slender, nearly as long as the body; body subparallel..................................	XIV. NESTINUS.

Genus I. Cerochroa, Gerstäck. Peters, Mossamb. 1862, Zool. Ins. 341; Bericht Akad. Berl. 1855, p. 3.

Ovata. *Caput* verticale; *palpi maxillares* subcylindrici, apice acuminato. *Thorax* elytris multo attenuatior, lævis, latere anteriore paulum emarginato, angulis anticis satis porrectis et acutis, lateribus paulum rotundatis, haud marginatis, margine postico subtransverso; disco lævi punctato. *Scutellum* subtriangulare, apice rotundato. *Elytra* thorace latiora, versus medium ampliata, lævia, vix marginata, crebre punctata. *Pedes* robusti, unguiculis fortiter appendiculatis. *Metasternum* versus apicem vel obsolete, vel in dentem acutum productum. *Antennæ* robustæ, breves, incrassatæ, articulis 4°–11^{m} brevibus et subæqualibus, 1° longiore, 3° primo breviore.

The species on which this genus is based (*Cerochroa ruficeps*, Gerst.) is more nearly allied to *Adorium* than to *Cœlomera*. The genus may be separated from all other neighbouring forms by its short and robust antennæ; it is also conspicuous for the very narrow breadth of the thorax. From *Adorium* it may be separated by the form of its antennæ; from *Rhombopala*, by its more elongate form; from *Cœlomera*, by its smooth and even thorax. Three species of this genus are known:—

1. *C. ruficeps*, Gerst. Bericht Verh. Akad. Berl. 1855; Peters, Reise Mossamb. Zool. 341.

2. *C. brachialis*, Suffr. Œfver. Vetens. Ak. Förh. 1858. Caffraria.

I think it probable that this species may prove to be a variety of *C. ruficeps*.

3. *C. maculicollis*, Baly, Descript. of Uncharacterized, &c., Trans. Ent. Soc. Lond. 1864, p. 232. Old Calabar.

Genus II. Alphidia.

Robusta, subparallela. *Caput* verticale. *Palpi maxillares* art. penultimo globoso. *Thorax* declivis, transversus, angulis anticis depressis, posticis obsoletis; disco lævi. *Scutellum* triangulare, læve. *Elytra* robusta, lævia, punctata. *Antennæ* robustæ, incrassatæ, art. 4°–11^{m} gradatim incrassatis, art. 3°, 4° et 5° longitudine æqualibus. *Pedes* robusti, unguiculis simplicibus.

The genus *Alphidia* will stand near to *Clitena*; it is separated from it by its cylindrical (not flattened) incrassation of the antennæ, by the 3rd, 4th, and 5th joints being equal in length, and by the simple unguiculi.

A. comitata, (*Galleruca*) Klug, Ins. von Madagascar, p. 124.

A common species, apparently, in Madagascar. In colour flavous, with elytra bright green or bluish green. Length $4\frac{1}{2}$, breadth $2\frac{1}{2}$ lines.

Genus III. Clitena, Baly, Descript. of Uncharacterized, &c., Trans. Ent. Soc. Lond. 1864, p. 229.

Callopistria, Chev. Dej. Cat. p. 402.

Robusta, subparallela. *Caput* fortiter punctatum. *Thorax* transversus, angulis anticis prominulis, margine anteriore circulariter emarginato, lateribus subrotundatis et marginatis, basi subcirculari et leviter marginato; disco lævi (vix ut in *Cœlomera* transverse depresso) punctato. *Scutellum* subquadratum, apice circulari. *Elytra* thorace latiora, parallela, apice rotundata, ante medium transverse depressa vel constricta, lævia, punctata, nitida. *Antennæ* robustæ, satis elongatæ, art. 1^o, 3^o et 4^o subæqualibus, art. 2^o brevi, art. 5^o–11^m latis compressis, art. 6^o–11^m brevibus. *Pedes* robusti, unguiculis bihamatis.

Clitena differs from *Cœlomera* and others in the form of its elytra, which are more robust and antemedially depressed, in the smooth form of the thorax, which shows no trace of the usual deep transverse depression, and especially in the peculiar articulation of the antennæ, the apical joints of which are flattened, broad, and short. Two species have been described by Mr. Baly —*C. limbata* and *C. melancholica*, both from Siam.

C. cyanea.

C. Indica, Dej. Cat.

C. robusta, subparallela, cyanea, pedibus et antennis nigris; *caput* fortiter punctatum, nigro-cyaneum; *thorax* leviter punctatus; *scutellum* nigrum; *elytra* robusta, ante apicem transverse depressa, lævia, punctata; *corpus subtus, antennæ,* et *pedes* vel nigra vel nigro-cyanea.

Long. corp. lin. 5; lat. lin. $2\frac{3}{4}$.

Java.

Genus IV. Hymenesia.

Parallela, subdepressa. *Caput* verticale. *Palpi maxillares* art. penultimo triangulari, robusto. *Thorax* transversus, angulis anticis brevibus, posticis rotundatis, disco inæquali. *Scutellum* triangulare, læve. *Elytra* parallela, confuse punctata. *Antennæ* robustæ, articulis presertim apicalibus inæqualibus (subcylindricis, vix depressis), art. 1^o, 3^o et 4^o subæqualibus, 5^o, 6^o, 7^o et 8^o brevioribus et robustioribus, 9^o et 2^o brevibus, minutis æqualibus 10^o et 11^o conjunctis. *Pedes* robusti, tarsorum art. basali et 2^o penitus æqualibus, unguiculis bipectinatis.

I have formed this genus on the species *H. Tranquebarica*, Fab.: it is quite distinct, by reason of the very peculiar articulation of the antennæ.

H. Tranquebarica, Fab. Syst. El. i. p. 479. 8, Suppl. p. 93. 6, 7,

is punctate and rufous, the antennæ, legs, and underside being black; the elytra are thickly punctate and rufous, the apex being marked by a purple transverse band, which broadly extends, near the margination, for nearly half the elytra. The length is $4\frac{1}{2}$, breadth $2\frac{1}{2}$ lines. From the East Indies.

Genus V. Orthoxia.

Subparallela et satis depressa. *Caput* verticale. *Palpi maxillares* articulis apicali et penultimo globosis. *Thorax* transversus, margine antico transverso, lateribus subrotundatis, margine postico sinuato, angulis anticis vix prominentibus, disco in typo inæquali. *Scutellum* triangulare. *Elytra* thorace paulum latiora, parallela. *Antennæ* robustæ, serratæ, articulis (presertim 3^o–7^m) apud apices incrassatis, art. 3^o–7^m longitudine subæqualibus. *Pedes* robusti; unguiculis ad apices extremos, bihamatis.

This genus is nearly related to *Monocesta*, but differs from it in the globularly inflated maxillary palpi, in the minute bifurcation of the unguiculi (those of *Monocesta* being cleft almost to the base), and the serrated articulation of the antennæ.

O. Boisduvallii, Dej.

O. subparallela, satis robusta, crebre rugosa, rufa, elytris, antennis, capite et pedibus nigris; *caput* rugosum, nigrum; thorax transversus, angulis anticis subobsoletis, marginibus leviter rotundatis, versus apicem obsolete angulatis, basi sinuata, disco depressione media basali, alteraque utrinque inæquali obliqua versus latera; thorax crebre punctatus, rufus; *scutellum* rufum; *elytra* thorace paulum latiora, parallela, robusta, creberrime punctata, obsolete tomentosa, nigra; *antennæ* robustæ, articulis 3^o–6^m sensim ampliatis, nigræ: *corpus subtus* rufum; *pedes* nigri.

Long. corp. lin. 4; lat. lin. 2.

Java.

Genus VI. Pyesia.

Differt a genere *Monocesta* in antennis art. 3^o primo breviore, tenui, art. 4^o tertio multum longiore, art. 5^o et 6^o subæqualibus et tertio paulum longioribus; antennis in ♀ simplicibus, filiformibus; in ♂ art. 4^o–7^m dilatatis, compressis.

P. laticornis, Germ. Insect. Spec. 589, 843.

Closely allied in pattern to *M. consularis*, Dej., but a much smaller insect, and more depressed in form; the elytra are not finely rugose, but levigate and punctate. The articulation also of the antennæ, both in ♀ and ♂ (which is the special character of the separate genus into which it must be erected), abundantly distinguishes it from this insect.

Brazil.

Genus VII. Procalus.

Robustus, parallelus, brevis. *Caput* verticale. *Palpi maxillares* elongatuli. *Thorax* magnus, transversus, vix elytra amplitudine æquans, margine anteriore valde excavato, angulis anticis rectis, lateribus subrotundatis, marginatis, angulis posticis obsoletis, basi transversa, disco lævi. *Scutellum* triangulare, læve. *Elytra* parallela, brevia, robusta, thorace paulum latiora, punctata (punctis confusis, inæqualibus); *antennæ* vel filiformes vel incrassatæ; in ♂ penitus corpus ipsum longitudine æquantes, et ad basin valde robustæ, compressæ, sensim versus apicem attenuantur; art. 1° valde ad apicem ampliato, 2° et 3° minoribus, brevioribus, et subæqualibus, 4°, 5° et usque ad 11^{m} longitudine subæqualibus, latitudine sensim attenuatioribus; in ♀ antennæ filiformes; *pedes* robusti, satis breves, femoribus subincrassatis, tibiis versus apicem robustioribus et ad insertionem tarsorum subtus excavatis; unguiculi ab infra breviter utrinque bidentati.

This diagnosis is based on a Chilian species, *Cœlomera mutans* of cabinets, which is very different from all allied groups, not only by reason of its shorter and more robust form, but also by the largely developed basal joints of the antennæ in the male.

P. mutans.

P. et colore et maculis incertus, flavo-viridis vel fuscus, thorace et elytris, vel neutro vel utroque, nigro maculatis; *caput* longitudinaliter oblique foveolatum, rufo-flavum; *thorax* rarius punctatus, vel flavus vel nigro maculatus, maculis quatuor (duabus mediis et una utrinque postmedia laterali); *scutellum* impunctatum; *elytra* punctis subordinatis minutis, plerumque flava, sed aliquando maculis nigris juxta basin transverse ordinatis, maculisque etiam juxta apicem; *antennæ* nigræ, flavo annulatæ; *corpus subtus* in ♂ abdominis apice fortiter ad medium foveolato, fuscescens, abdomine aliquando rufo; *pedes* rufi, tibiis et tarsis nigris.
Long. corp. lin. 3–4; lat. lin. $1\frac{3}{4}$–2.

The head-quarters of this species is Chili, where it would appear to be abundant; it is widely distributed. I have received specimens from Brazil and also from Bolivia.

Genus VIII. Pachytoma.

Robusta, brevis, parallela. *Caput* breve, verticale. *Palpi maxillares* graciles, elongatuli. *Thorax* declivis, elytris paulum attenuatior, angulis anticis prominulis, lateribus paulum curvatis, margine basali subsinuato; disco lævi, punctato. *Scutellum* triangulare, apice truncato. *Elytra* brevia, robusta, confuse punctata. *Antennæ* filiformes, robustæ, art. 1° longissimo, 2° brevi, 3°, 4° et 5° subæqualibus. *Pedes* robusti, unguiculis pectinatis.

1. *P. Westermanni*, Dej. Cat.

P. e majoribus, fusca, antennis, pedibus et corpore subtus nigris; *caput* longitudinaliter foveolatum, punctatum; *thorax* crebre et fortiter punctatus; *scutellum* nigrum; *elytra* crebre punctata;

corpus subtus et *pedes* nigra; *antennæ* nigri, articulis 1°–3^{m} flavescentibus.

Long. corp. lin. 6; lat. lin. $3\frac{1}{2}$.

Western Africa.

2. *P. flava.*

P. subovalis, lata, punctata, flava; *caput* in medio leviter longitudinaliter foveolatum, punctatum, flavum, basi transverse nigra; *thorax* transversus, lateribus et angulis posticis rotundatis, lateribus marginatis, disco crebre punctato; *scutellum* triangulare, nigrum; *elytra* post medium paulum ampliata, confuse et minute punctata vel rugosa; *antennæ* nigro-fuscæ; *pedes* et *corpus subtus* nigra.

Long. corp. lin. 5, lat. lin. 3.

Natal.

Genus IX. Sphenoraia.

Lata, subdepressa, brevis, parallela. *Caput* verticale. *Palpi maxillares* art. penultimo incrassato, brevi. *Thorax* transversus, lateribus marginatis et rotundatis, angulis anticis prominulis, basi subsinuato. *Scutellum* triangulare, læve. *Elytra* parallela, brevia, striato-punctata (punctis interdum penitus confusis). *Antennæ* filiformes, robustæ, art. 1° et 3° æqualibus, et art. 4°, 5° et 6° (articulo primo paulum minoribus) inter se æqualibus. *Pedes* tenues, unguiculis simplicibus vel leviter appendiculatis.

1. *S. flavicollis.*

S. rufo-flava, elytris (marginibus et sutura exceptis) nigris; *caput* transverse foveolatum, impunctatum; *thorax* rufo-flavus, impunctatus (punctis sparsis in medio disco obsoletis); *scutellum* rufo-flavum, impunctatum; *elytra* parallela, punctata (punctis nec magnis nec acie instructis, confuse ordinatis), fusco-nigra, sutura et marginibus tenuiter flavis; *pedes, antennæ* et *corpus subtus* flava.

Long. corp. lin. $3\frac{3}{4}$; lat. lin. 2.

Northern India.

2. *S. nigripennis.*

S. flava, elytris, thorace maculis et femoribus apicalibus nigris; *caput* inter oculos transverse foveolatum, læve, flavum basi nigra; *thorax* flavus, macula utrinque nigra insulata, fortiter sed sparsim punctata et paulum depressa; *scutellum* læve, nigrum; *elytra* striato-punctata (punctis magnis et profundis), nigra; *antennæ* nigro-fuscæ, art. 1°–4^{m} flavescentibus; *corpus subtus* et *pedes* fusco-flavescentia.

Long. corp. lin. 4; lat. lin. $2\frac{1}{3}$.

Northern India.

Genus X. Dircema.

Parallelum, satis depressum. *Caput* verticale. *Palpi maxillares* elongatuli. *Thorax* transversus, margine anteriore paulum emarginato, angulis anticis porrectis, lateribus oblique arcuatis, angulis posticis obsoletis, disco valde transverse depresso. *Elytra* parallela, depressa, subtiliter rugosa. *Antennæ* filiformes, art. 1° et 3° subæqualibus, 2° minuto, 4° et 5° subæqualibus et tertio paulum brevioribus. *Pedes* graciles, unguiculis utrinque bifidis.

The form of the thorax in this group is peculiar; it is narrowly transverse, the anterior angles are laterally producedconsiderably beyond the head; the sides converge gradually towards the base, being arcuate or constricted medially; the basal angles are slightly prominent; and the disk of the thorax is distinctly and deeply transversely depressed. I know of three exponents of this form, all common species in the tropics of South America.

1. *D. nigripenne*, Fab. Ent. Syst. i. ii. 14. 9; Syst. El. i. 480.

Notable by its uniformly opaque-black elytra (rugose and tomentose) and its clearly coloured rufous or flavous thorax. Long. corp. lin. $4\frac{1}{2}-5\frac{1}{2}$; lat. lin. $2-2\frac{1}{4}$.

The species is very common in Cayenne: some examples have the apical joints of the black antennæ testaceous; and one example in my cabinet has the head testaceous instead of black.

2. *D. cinctipenne.*

D. oblongum, parallelum, opacum, reticulosum, tomentosum, fuscoflavum, elytris (sutura et marginibus exceptis) et capite nigris vel viridi-nigris; *caput* inter oculos longitudinaliter foveolatum, crebre punctatum, nigrum; *thorax* fortiter transverse depressus, punctatus, plus minus tomentosus, flavus, macula utrinque nigra magna aliquando insulata; *scutellum* flavum; *elytra* parallela, nigra vel nigro-viridia, sutura et marginibus tenuiter flavis; *pedes* nigri, femoribus plus minus flavis; *corpus subtus* flavo-fuscum; *antennæ* nigræ, art. $9^{o}-11^{m}$ flavis.

Long. corp. lin. $3\frac{1}{2}-7$; lat. lin. $1\frac{1}{2}-2\frac{1}{3}$.

D. cinctipenne varies not only in size, but in the sculpture and coloration of the thorax, which is either entirely flavous or flavous with two submedial black markings, one on either side, these markings sometimes occupying nearly the whole disk. The species has been found at Para, by Mr. Bates and others. I have two Columbian representatives of it, which have the elytra opaque green instead of black, and the thorax of which is not so deeply depressed. I have seen some interesting examples of this species in Mr. Baly's cabinet, which, at first sight we are tempted to declare, represent distinct species: I have little doubt, however, on more mature examination, that the above diagnosis is the true definition of the species. The insect is as variable as it is beautiful; and at present, at any rate, we have not sufficient material to justify us in breaking it up into distinct races or species.

3. *D. ruficrus*, Chev.

D. parallelum, opacum, tomentosum, rufo-flavum, elytris, antennis et genibus nigris; *caput* leviter rugosum, impunctatum, flavum; *thorax* subpubescens, rufo-flavus; *scutellum* fuscum; *elytra* parallela, tomentosa, nigra; *antennæ* nigræ; *corpus subtus* rufo-fuscum; *pedes* fusci, femoribus rufo-fuscis.

Long. corp. lin. $4\frac{1}{2}$; lat. lin. $1\frac{3}{4}$.

Cayenne.

Genus XI. Monocesta.

E majoribus, robusta, plerumque versus apicem dilatata. *Caput* verticale, basi longitudinaliter foveolatum. *Thorax* transversus, margine anteriore paulum emarginato; angulis anticis sat productis, lateribus subrotundatis; angulis posticis omnino vel penitus obsoletis; discus transverse et fortiter depressus est. *Scutellum* transversum, apice rotundatum. *Elytra* robusta, thorace latiora, post medium plus minus dilatata, aliquando versus apicem dehiscentia, et utrinque angulata, marginata, punctata. *Antennæ* vel filiformes robustæ vel subincrassatæ, art. 1^{o} apice incrassato, art. 1^{o}, 3^{o} et 4^{o} subæqualibus, art. 2^{o} minore, art. 5^{o} et 6^{o} subæqualibus, paulum quarto brevioribus, art. 7^{o}–11^{m} paulum sexto brevioribus et gradatim attenuatis. *Pedes* robusti, art. tarsorum basali penultimo duplo longiore; unguiculis fortiter utrinque bifidis.

The genus *Monocesta*, as thus defined, is very natural: it represents those species in which the elytra are postmedially dilated, the thorax is transversely depressed, and the antennæ in the more broadly ovate species filiform, in the more parallel species subincrassated, the third and fourth joints being subequal, and the apical joints sufficiently produced and attenuate. These characters comprehend two distinct subgroups, which will constitute an excellent genus, well bounded and separated from the several other forms with which the species representing them have been, in Dejean's Catalogue, mixed up. The metropolis of the genus is evidently the tropical region of South America and Mexico. One species (*M. coryli*) is found as far north as Illinois, where it infests the hazel; and one other (*M. elegantula* of this paper) I have received as from Brazil.

Division A.

Species of large size; in form (for the most part) postmedially dilated; the thorax is deeply transversely depressed; the antennæ filiform and sufficiently elongate. Species 1–12.

Section I.

Elytra for the most part bright blue or bright green, with flavous markings. Sp. 1–5.

1. *M. imperialis.*

M. grandis, apice dilatato, crebre punctata, nigro-cærulea, elytrorum dimidio apicali rufo-flavo; *caput* fovea longitudinali ad frontem, impunctatum; *thorax* subtiliter punctatus; *scutellum* transverse quadratum, impunctatum; *elytra* thorace latiora, et versus apicem multum ampliata, marginata, crebre punctata; *antennæ, corpus subtus* et *pedes* nigra, femorum apicibus rufo-fuscis.

Long. corp. lin. $9\frac{1}{2}$; lat. lin. ad humeros 4, ad apicem $6\frac{1}{2}$.

Columbia.

2. *M. equestris*, Dej.

M. e majoribus, versus apicem subampliata, crebre punctata, viridis vel azurea, fascia media in elytris transversa flava; *caput* longitudinaliter foveolatum, punctatum; *thorax* ut in speciebus aliis in medio valde transverse depressus, punctatus; *scutellum* subquadratum, impunctatum; *elytra* versus apicem ampliata, crebre et rugose punctata, fascia recta flava transversa ad medium, versus margines latior, elytra ornat; *antennæ, corpus subtus* et *pedes* nigra.

Long. corp. lin. $9–6\frac{1}{2}$; lat. lin. $5\frac{3}{4}–2\frac{1}{2}$.

M. equestris, the Cayenne species, differs clearly and uniformly in pattern from the Mexican species, *M. ducalis*. In the species before us, the transverse band on the elytra is medial and even, sometimes, by reason of its greater breadth towards the margins, being slightly inflected; in *M. ducalis* the transverse band is never straight, but arcuate, in each elytron, broader in size and more irregular in pattern.

Mr. Baly has shown me in his cabinet a species taken by Mr. Bates on the Amazons, in which the transverse band is a trifle broader, and rather nearer the scutellum, than in *M. ducalis*—*M. Batesii*, Baly. It is probable that the two are slight modifications of the same species.

The males of *M. equestris* have sometimes the apex of the elytra, at a little distance from the suture, produced into an angle.

A common species in Cayenne.

3. *M. ducalis.*

M. elongata, versus apicem subampliata, punctata, nigro-cærulea, fascia lata et apice flavis; *caput* foveolatum, punctatum; *thorax* transverse depressus, leviter punctatus; *scutellum* læve; *elytra* crebre punctata vel subrugosa, nigro-cærulea, fascia lata inæquali, ad margines versus humeros et apicem tendente, et apice flavis; *pedes, antennæ* et *corpus subtus* nigra.

Long. corp. lin 8–6; lat. lin. 5–3.

I have before me several specimens of this form, which agree entirely in pattern, and are readily separated from the Cayenne species, *M. equestris*: the band of the elytra is broader, more irregular in outline, and extending along the margination to the apex, and sometimes to the shoulders. I have an interesting variety in which the transverse band is represented by a medial spot, the margins being obscurely flavous.

Mexico. A common species.

4. *M. splendida.*

M. versus apicem leviter ampliata, punctata, læte viridis; *caput* obsolete punctatum; *thorax* crebre punctatus, ad medium transverse depressus; *scutellum* subquadratum, leviter punctatum; *elytra* crebre punctata (punctis minutissimis) et leviter rugosa; *corpus subtus* fusco-viride, testaceo pubescens; *antennæ* nigræ; *pedes* nigro-virides.

Long. corp. lin. $7\frac{1}{2}$, lat. lin. $4\frac{1}{2}$.

Conspicuous among its congeners by its uniform brilliant green colour.

Para. I have in my collection a single example, received from the Marquis La Ferté.

5. *M. consularis,* Dej.

M. subparallela, postice paulum dilatata, satis robusta, vix depressa, tomentose rugosa, vix punctata, rufo-flava, elytris (fascia media excepta rufo-flava) viridibus; *caput* longitudinaliter foveolatum, rugosum, rufum; *thorax* rugosus, rufus; *scutellum* rufum; *elytra* subparallela, apice transverse rotundata et subdilatata, subtiliter rugosa, cærulea, fascia media transversa æquali rufo-flava; *antennæ* fusco-nigræ, art. 1° rufo; *pedes* et *corpus subtus* rufa.

Long. corp. lin. $6\frac{1}{2}$; lat. lin. $3\frac{3}{4}$.

This species resembles as to pattern the *Pygesia laticornis* of Germar; but, besides being a larger insect, it is more robust, less depressed, and the surface is not, as in that species, punctate, but thickly rugose and tomentose.

Brazil. One of the examples in my collection is labelled Mexico.

Section II.

Elytra for the most part flavous, with darker markings. Sp. 6–12.

6. *M. illustris.*

M. satis lata, subparallela, crebre punctata, pube flava subvestita, rufo-flava, elytrorum apicibus fuscatis; *caput* fronte foveolatum, punctatum; *thorax* transverse ad medium depressus, punctatus; *elytra* leviter pubescentia, punctata, rufo-flava, apicibus nigris; *antennæ, pedes* et *corpus subtus* nigra.

Long. corp. lin. 6; lat. lin. $3\frac{1}{2}$.

Cayenne.

7. *M. coryli,* (*Cœlomera*) Say, Acad. Philad. iii. 1824, p. 455; Complete Writings, vol. ii. p. 220.

This is the only species which represents the genus on the

North American continent: it is found in Illinois, Maryland, and Virginia; in the latter State it is so abundant that it often entirely strips the *Corylus americanus,* on which it feeds.

8. *M. depressa.*

M. late ovalis, valde depressa, flava, antennis, elytrorum marginibus et apice necnon corpore subtus nigris; *caput* longitudinaliter foveolatum, leviter punctatum; *thorax* valde ad medium transverse depressus, impunctatus; *scutellum* flavum; *elytra* lata, valde depressa, late marginata subtiliter rugosa, subpubescentia, flava, apice et marginibus late nigrescentibus; *antennæ* nigræ, art. 1°–3^{m} flavis; *corpus subtus* nigrum; *pedes* flavi.
Long. corp. lin. $5\frac{1}{2}$; lat. lin. $3\frac{1}{4}$.

I am indebted to Mr. Baly for this species, received by him from the river Magdalina.

9. *M. Balyi.*

M. late ovalis, nigra, thorace, capite, elytrorum basi et femoribus anticis rufo-flavis; *caput* leviter longitudinaliter foveolatum, impunctatum; *thorax* late transverse depressus, lateribus ad medium subangulatis, impunctatus; *scutellum* impunctatum, rufum; *elytra* ampliata, late marginata, subdepressa, rugosa, opaca, nigra, basi tenuiter fulvescente; *antennæ* fusco-nigræ, art. 1° et 2° flavis; *corpus subtus* nigrum; *pedes* nigri, femoribus anticis rufo-flavis.
Long. corp. lin. 7; lat. lin. 4.

Brazil.

10. *M. elegantula.*

M. pallide purpurea, thorace maculisque 4 elytrorum flavo-pubescentibus; *caput* ad basin foveolatum; *thorax* omnino flavo pubescens; *elytra* macula utrinque magna media, alteraque minore circulari ad apicem flavo pubescentibus; *antennæ* rufo-fuscæ; *pedes* et *corpus subtus* fusco-purpurea.
Long. corp. lin. 5; lat. lin. 3.

Brazil.

11. *M. Hopfneri,* Dej. Cat.

M. subparallela, crebre punctata vel rugosa, testaceo-flava, tibiis, tarsis et antennis nigris; *caput* leviter longitudinaliter foveolatum; *thorax* transversus, subquadratus, transverse modice depressus, lateribus rotundatis, crebre et fortiter punctatus; *scutellum* subtriangulare, subpunctatum; *elytra* thorace latiora, subrugosa vel crebre punctata; *antennæ* sat elongatæ, nigræ; *corpus subtus* fuscum; *pedes* flavo-fusci, tibiis et tarsis nigris.
Long. corp. lin. 5; lat. lin. $2\frac{1}{2}$.

M. Hopfneri may be distinguished not only by its flavous coloration, but by its thorax, which is less deeply transversely depressed, and coarsely and closely punctate.

Mexico.

12. *M. sanguinicollis.*

M. elongatula, postice subdilatata, crebre punctata, nigra, thorace rufo, elytris rufo vittatis; *caput* punctatum, rufum; *thorax* in medio transverse depressus, lateribus rotundatis, punctatus, rufus; *scutellum* impunctatum, rufum; *elytra* versus apicem subdilatata, satis depressa, crebre punctata, rufa, vittis duabus parallelis (subsuturali et laterali) basin sed vix apicem attingentibus, post medium elytrorum conjunctis; *antennæ* nigræ, art. basali interdum rufo; *pedes* et *corpus subtus* vel nigra vel rufo-fusca.
Long. corp. lin. $3\frac{1}{3}$–$4\frac{1}{2}$; lat. lin. $1\frac{3}{4}$–$2\frac{1}{4}$.

I have examples of this species from Bolivia, and also from Brazil.

[To be continued.]

XXXI.—*On the Occurrence of* Orcynus alalonga *on the Coast of Devon.* By Dr. W. R. Scott.

Several fish of but rare occurrence in British waters have from time to time been taken on the Cornish and Devon coasts. The close and accurate observations of Mr. Couch have seldom allowed any found on the former to pass unnoticed. On the coast of Devon, however, recorded captures of these rarer species are less common, owing probably in some degree to the want of that zealous watchfulness which has animated the labours of the Cornish ichthyologist. Amongst the rarer species that pay our coasts an occasional visit are those of the genus *Thynnus*; and amongst the very rarest of these is the Germon, separated now, however, by Cuvier into a distinct genus, and which fish he has named *Orcynus alalonga*, from the length of its pectoral fin—which constitutes the chief, if not the only, difference between it and the true Tunnies.

The *Orcynus alalonga* has been very rarely found in British seas. One has been recorded as taken at Portland, which was presented to the British Museum, and it has been twice taken in Mounts Bay, Cornwall.

I have pleasure, therefore, in now recording another specimen of this rare British fish, taken in Devonshire. This fish was captured on the 26th of August last, not really in channel, but a little way up the river Exe, about three miles from its mouth, and at about half-tide. The fish had got entangled amongst some palings which had been driven into the river about a foot from the edge, where a kind of quay had been made, and which formed a *cul-de-sac*. Into this the fish got; and so violent were its struggles to get out, that it drew the attention of some workmen who were at a little distance, when one of them got his gun and shot it. They describe its efforts to free itself as shaking the palings like the strength of two men, which agrees with the observations of Mr. Couch, who says that a specimen taken in Mount's Bay showed "extraordinary strength when caught with a line."

Unfortunately I did not hear of this fish having been captured till a week after, and when it had become much putrified, and, indeed, had been buried; so that I cannot give so full and accurate a description of it as might be desirable. Still enough remained to show to what species it belonged; and on showing the plates of the Tunnies in Mr. Couch's volume to the person who killed it (an intelligent foreman of some works near the river), he declared it to agree with that of the Germon.

The shot by which the animal was killed had destroyed all the first dorsal fin and part of the second, so that no examination could be made of these; but the general form was not much injured, and the other fins remained sufficiently defined to enable me to mark their position and numbers; and the pectoral fin, one of the most important in identifying the species, was the least injured of all. From this state of the fish I was enabled to note the following particulars.

The full length of the fish, from the nose to the base of the caudal fin, was 24 inches, the girth round the pectoral fin 19, and the girth immediately in front of the second dorsal $15\frac{1}{2}$ inches; the flesh in this part was very firm and solid.

The head was pointed, the under jaw slightly the longest, the teeth small and incurved, and the gape about 4 inches; the nostrils very obscure; the eye was large, and, when fresh, was slightly elevated, and placed over the angle of the mouth. The sections of the gill-covers were well defined; and from the nose to the gill-opening was about 7 inches.

The pectoral fin, lodged in a deep depression, was $8\frac{1}{2}$ inches long, and reached to about the middle of the anal fin. I could not say if the anal and second dorsal were falcated, as the upper parts of both had perished; but I was informed that both were so. I could trace that there was a short space between the first and second dorsal fins, and that the finlets were eight above and seven below, which I was told had been tinged with yellow, but not so deeply as are those in Mr. Couch's plate. The tail was deeply cleft; but, one-half being gone, I could only judge of this approximately. The weight of the fish when caught was twelve pounds, and nothing was found in its stomach.

On comparing this fish with the figure given by Couch, I thought the latter more slender for its length than the former; but this appearance might have arisen from the body having become depressed, from the treatment to which it had been subjected. The length of the pectoral fin was also not so great as that figured by Couch. The proportions given in the specimen killed at Portland are—length of body 30 inches, length of pectoral fin $11\frac{1}{2}$ inches; while in the specimen examined by me the length of body was 24 inches, and the pectoral fin $8\frac{1}{2}$ inches. This latter length, however, comes quite up to that given by Cuvier for the species. He says the *Scomber thynnus* has the pectoral fin one-fifth part of its length, while the *Orcynus* has it one-third the length of the body, and that this difference is the only one between the two fishes. It will be seen, then, that $8\frac{1}{2}$ inches is nearly the proportion given by Cuvier, being a little more than one-third of 24 inches, the full length of the fish.

It is fortunate that the pectoral fin was sufficiently perfect to allow of its being accurately measured, and thus enable us to record another instance of this south-of-Europe fish paying a visit to our northern shores.

It is further worthy of remark that Mr. Couch has reported the capture of the *Short-finned Tunny* (a fish never before taken on our coasts) on the 16th of August last. It would be interesting to know what causes have led these fish so far north on this occasion.

XXXII.—*Proofs of the Animal Nature of the Cilio-flagellate Infusoria, based upon Investigations of the Structure and Physiology of one of the* Peridinia (Peridinium cypripedium, *n. sp.*). By Prof. H. James Clark, A.B., B.S.*

[Plate XII.]

Whatever tends to elucidate the doubtful nature of any group of beings which stands undecided (as it were on the dividing line) between sentient and non-sentient things has an importance at the present day which would not have been deemed worthy of very grave consideration before the theories of Spontaneous Generation and what is sometimes mistakenly called Darwinism had been revived. The resurgence of these doctrines has given a prominence to the discussion of the character of the lowest, obscure forms of life, simply because, in their extreme simplicity, they hardly seem to rise above a state of inorganic nature, and their vitality is exhibited in such a guise as would readily be mistaken for the operation of exo-endosmotic, inanimate, inorganic forces. Hence the readiness, the eagerness, with which the physicists of the Materialistic school clutch at these "toys"

* Communicated by the Author, having been read before the American Academy of Science and Arts, February 14, 1865.

of the older microscopists, hoping therein to find an abundance of argument by which they may prove that rock and flesh do not incompatibly jostle each other whenever they come in contact.

Claiming, and justly too, that these extremes of the inorganic and organic bodies are naturally and incontestably related to each other through their common basis the simple elements of the chemist, it does not seem possible to the materialist that their relations should be changed or dissevered by the introduction of any modes of existence, however varied or elevated. The carbon, the hydrogen, the nitrogen, and the oxygen once being established as definite existences, they always remain C, H, N, and O, no matter under what forms or relations they may be disguised, the various *modes of being* not in the least changing the *fact* of their existence. For instance, they say, the transition from one kind of animate being to another kind is only a graduated change in the mode of existence, or of the manner of an outward expression of the relations of the component *elements* of the organism; certainly not an actual metamorphosis of the nature of these elements. To this assertion there may not possibly be any objection; but if the same explanation were urged for the transition to the Monad from the infinitesimally small, vibrating, inorganic corpuscle of the "Brownian motion," we have not come to that state of knowledge of the forces of nature to accept it so readily as in the former case. Still the growing tendency, among the philosophical chemists, to merge the vital and the inorganic forces into one would seem to be inevitably preparing us to regard such a transition as identical in kind with that which obtains among the undoubtedly organized bodies, whether animals or plants.

In this state of hesitancy to step across the vanishing line of demarcation between the animate and the inanimate, we can at least safely venture to give, in general terms, an expression of the relations of the three forms of existence. We may say that it is the *mode of existence* which constitutes the difference between the inorganic and the organic bodies, or between the two forms of organic life, viz. animals and plants; so that every fact enunciated in regard to an animal or plant is the record of a *symbol* of one of the methods of existence, or of the nature of the influences which enter into the life of the being.

From this point of view the study of these insignificants rises to the rank of the highest philosophical inquiry, and the minute wonders of the microscopist become the agents in the pursuit after the knowledge of the ways of the Infinite, which one could hardly have the temerity to smile at.

These thoughts have been suggested by the results of some investigations into the thus far doubtful animal nature of the

Cilio-flagellate Infusoria, as the Péridiniens and their congeners are designated by Claparède in his, conjointly with Lachmann, most recent publications upon the Infusoria*.

In order that the various points of the proof that the Péridiniens are undoubted animals may be comprehended in systematic sequence, it seems most desirable to present them under separate sections, each devoted to some particular vital function.

Habitat and Form.—There is probably no generic difference between the species in question here and those described and figured by Allman in the third volume of the 'Journal of Microscopical Science,' 1856, and by Claparède in the memoir above referred to; but in their specific relations no doubt they are distinct. This (Pl. XII. figs. 1, 2, 3) has an oblique pyriform outline, more than one-third longer than its greatest breadth, and hollowed on one side by a broad longitudinal depression (*d*), extending from the narrower end (P) to a short distance beyond the broadest part of the body. Not far from the narrower end the so-called flagellum (*fl*) is attached, in the middle line of the broad depression, and is so long as to project beyond the end near to which it is situated. As the narrower end (P) is always the posterior, and the broader end (A) the anterior, in the act of swimming, and the relations of the other parts of the body, such as the position of the mouth (*m*) and particularly the trend of the œsophagus (*œ*), correspond to these, the one which precedes should be called the anterior, and the other the posterior end of the body; and as such they will hereafter be designated in this article.

There are two shallow furrows which encircle the body; one (*pf*), rather broad, passes obliquely backwards and around it just behind its middle, and the other (*af*), quite narrow, encircles the broader end just in front of the termination of the broad longitudinal depression above mentioned. The whole of the body posterior to the narrower transverse furrow is clothed with vibratile cilia; but the anterior end is devoid of them, and appears to be covered by a low cap (*pc*) in the form of a segment of a sphere. In the young this cap is so shallow as to be readily overlooked during the motions of the animal. Close to the posterior end there is a large, clear vesicle (*cv*), which is quite conspicuous, even during the rapid motions of the animal. This is the *contractile vesicle*, which will be described presently. In point of sensitiveness this *Peridinium* exhibits it in almost as great a degree as *Pleuronema* and many other timid Infusoria. These are the most evident and striking features, such as readily attract the attention when the body is in motion; and moreover

* Claparède and Lachmann, "Étude sur les Infusoires et les Rhizopodes," Mém. de l'Ins. Genévois, tomes v., vi., vii. (1858–1861).

they are the chief and characteristic traits of this species. The specific name is derived from the resemblance in the form of the body to the labellum of one of the Orchidaceæ, viz. *Cypripedium*. It is very common in the freshwater ditches and slow streams about Cambridge, U.S.; and in the aquarium congregates in great numbers around decaying matter. It varies from $\frac{1}{300}$ to $\frac{1}{200}$ of an inch in length; but occasionally adults were found $\frac{1}{150}$ of an inch long. It is probable, however, that the latter were in a preparatory state, just before self-division. The colour is a uniform light brown, which resides mostly in the derm.

Contractile Vesicle.—This organ (*cv*) is so conspicuous, in the species before us at least, that one is apt to wonder why it has not been discovered before. The only reasonable excuse for this seeming delinquency would appear to be, that the animal is so incessantly active and so rapid in its motions, that a large amount of patience could hardly compensate for the want of a quiet subject. Fortunately, at the present day our lenses, even of moderate power, are constructed with such large angles, broad fields, and excellent definition, that the difficulty of keeping the Infusorian in sight, and of getting a clear decided view of its interior, is almost done away with. By strewing the glass slide with abundance of indigo, little lagoons are formed here and there, in which, when the specimens are plentiful, there is no difficulty in finding and confining any particular individual, without the necessity of a thin glass covering. In this way the motions of the body are reduced to a simple revolution on its longer axis, with an occasional inversion, end for end. The eye soon gets accustomed to the rhythmical appearance of any particular region as it comes round at each revolution, so that, by a systematic study of each and every feature, a knowledge of the whole organism may be obtained as readily as in most Infusoria. The contractile vesicle is invariably situated close to the narrower, or posterior, end of the body, but at a considerable distance from the ventral, dorsal, or lateral surfaces. At the moment just before systole it has a perfectly globular form (Pl. XII. fig. 1 *cv*), and a very sharp, strongly refracting, conspicuous contour, and occupies rather more than the middle third of the transverse diameter of the body at this point. The systole and diastole are as regular in their recurrence as in any of the ciliated Infusoria, and as conveniently observed. The systole, in perfectly fresh specimens, occurs with perfect regularity *once in forty seconds*, as numerous and carefully registered observations prove. As in other Infusoria, between diastole and systole, the vesicle is more or less irregular in outline, but gradually approximating to a spherical form. At the moment of systole it rather quickly changes from a broad spheroidal figure to one which is globular, and then contracts suddenly and rapidly until it is nearly invisible. The diastole then follows slowly, and during this it passes from a jagged rounded outline (fig. 3 *cv*) to a lenticular form (fig. 2), then to a hemispherical shape (fig. 4) with the flattened side next to the posterior end of the body, and finally, assuming a spheroidal contour, it remains quiet awhile, until the time for the next systole. If the water is not renewed, the specimens become unhealthy, which they exhibit by changing their form, and swelling up into an oval and finally a globular mass. In such a condition the systole of the contractile vesicle oftentimes occurs five or six times in a minute, and will continue at that rate even when the animal is very much flattened out, and until it bursts or falls to pieces. Tincture of opium stops the action of the contractile vesicle almost immediately, even before the rest of the body is sensibly affected by it. The effect is to swell the vesicle to an enormous size; and then, breaking through the posterior end of the animal, it expands to a dimension often exceeding that of the whole body, before it bursts.

The Mouth (*m*).—That this creature has a mouth might be premised from the manner in which particles of indigo or carmine approach and recede from the body. When the animal is moored by its flagelliform appendage (*fl*), and gyrates about it as if on a pivot, these particles of coloured food may be seen to pass along the face of the broad longitudinal depression (*d*), and, striking the body just behind its mid-region, glance off in a backward direction. At the point where the indigo strikes may be seen an obliquely longitudinal ovate opening (*m*), which leads into an elongated funnel-shaped cavity (*œ*): the former is the mouth, and the latter is the œsophagus. The mouth lies altogether within the posterior obliquely transverse furrow (*pf*), and extends from its anterior to its posterior edge, trending diagonally across the axial plane of the body, from the right, backwards, toward the left. Its anterior edge (m^1) is broad, and thence it gradually narrows to a sharp angle, which forms the posterior edge. It is so inconspicuous that in all probability it is nearly or altogether closed, except when taking in food; certainly it is not one of the prominent features of the organism, although one of the most important. When the animal is in a sickly condition, and swollen up, the mouth is easily descried; but its relations are not readily made out, because in this state the annular furrows are all obliterated; yet its connexion with the œsophagus at such a time is clearly seen. There are no appendages whatever about or belonging to the mouth; not even the flagelliform body (*fl*) has anything to do with it, but is attached to the body at a very sensible distance (fl^1) behind it. It would seem, therefore, to be dependent upon the simple cilia around it for the transfer of food to its lips. From the mouth the *œsophagus* (*œ*) passes obliquely backwards and toward the dorsal region, at least halfway through the body, and then terminates rather abruptly just before the contractile vesicle, but a little to the right side (fig. 3 *œ*) of the axial plane. At the mouth it is widest antero-posteriorly, but suddenly narrowing a little, it afterwards gradually lessens its calibre as it extends into the body, and finally ends as just described. The whole track of this channel is much more readily seen than the mouth. The food is taken in such excessively small particles that its entrance into the mouth cannot be detected with any degree of satisfaction; and a single digestive vacuole (*dv*) requires from twenty minutes to half an hour to form and fill; and although it may be comparatively quite large, even two-thirds of its fullest capacity, yet so infinitesimally minute are the particles, that even indigo or carmine is not readily seen, although it may be the only kind of food present. Beyond this point, however, these colouring-matters become rapidly visible, so that when a vacuole is fully formed, the indigo or carmine is as conspicuous as in any other Infusorian. These vacuoles are very large, in fact equalling in size the contractile vesicle; and as they form sometimes pretty far back, they are apt to obscure the latter—without doubt thus causing this vesicle to be mistaken for one of them, since they bear a certain resemblance to it. No anus was detected during these investigations, although the specimens at times were kept well fed.

The Locomotive Organs.—The most prominent among the cilia is the so-called flagellum (*fl*). This, however, is not a single filament, as has usually been asserted; but, owing to the manner in which it is used, it very naturally appears to be so. Most frequently its compound nature becomes apparent when the numerous cilia of which it is composed divide into two groups (fig. 7 *fl*, *fl*^{1}), thus simulating a double flagellum*. At other times, after having divided into two groups, they twist about each other in such a way as to resemble a sharply pointed screw, with a long drawn-out double thread. Such is the condition in which this pseudo-flagellum is most frequently seen, and then, with the best magnifying-powers, up to five hundred diameters, its compound nature is not easily recognized. But there are times when the whole group of cilia spreads out into a distinct brush, so that each individual cilium may be seen. The base (*fl*^{1}) of attachment is in the axial plane of the body, a short dis-

* Claparède (*loc. cit.*) speaks of frequently noticing that some of the Ceratiums, &c., appeared to have a double flagellum. Probably they were a group of cilia divided as here described.

tance posterior to the mouth (*m*), and distinctly disconnected from it, as has been already noticed. When not in motion, which seldom occurs, the brush lies along the median furrow (*mf*), which trends from the mouth to the posterior end of the animal; and in this position it projects for nearly half its length beyond the body. Its most ostensible use would seem to be that of a sort of rudder when the creature is swimming, and as a means of attachment when not progressing. The body may be seen gyrating and at the same time revolving on its longitudinal axis, for long periods, around a point to which the pseudo-flagellum is attached, and upon which it turns like a pivot. Most frequently, during this act, a part of the brush separates from the rest, and performs the office of an extra propeller. When the animal is darting and spinning through the water, this appendage projects obliquely from its point of attachment (as in fig. 1), and always following, with the narrower end of the body, in the rear, it seems pretty evidently to be the main agent in the various and sudden tackings to which this Infusorian is addicted, and also the axis upon which the body revolves; at least the latter whirls, repeatedly changing as quick as thought from right to left, or *vice versâ*, upon an imaginary axis, which is oblique to its greatest length, and which exactly corresponds to the trend of the flagelliform appendage when operating in this capacity. Under these conditions the animal shoots along with a compound motion, which might be described as wabbling, or like the action of an excentric wheel. Apparently in confirmation of this view, the annular obliquely transverse anterior (*af*) and posterior (*pf*) furrows trend almost exactly at right angles to this imaginary axis. These two furrows seem, at first sight, to be bands of *vibrating cilia*; and in fact it is in the line of their trend that these cilia are most readily detected, simply because they are rather more crowded along their edges than elsewhere; but an attentive examination reveals their presence all over the body, posterior to the anterior transverse furrow. Between the two furrows (*i. e.* from *af* to *pf*) they are longer than at the narrower end of the body, and at both points they have a pretty uniform length, moderate extension, and are very delicate, so as not to be easily observed when the body is in motion. At the anterior transverse furrow they appear to be a little longer than elsewhere, and, acting more or less in concert, they have the semblance of a wreath disposed along the edge of the low skullcap-like covering (*pc*) of the anterior end.

The Cuirass (*pc*).—It is pretty evident that in the species before us this is a mere dermal specialization, without any trace of indurated matter which would entitle it to the name of a genuine cuirass. Where vibratile cilia are present, no such covering can be said to exist; and as the broad anterior end (A) of the body is devoid of them, its skull-cap covering is the only portion of the derm where one could expect to find a cuirass. But this it is only in form, since it participates with the rest of the body in the general expansion when an individual is dying. It has, without doubt, a different character from the rest of the skin; for the style of ornamentation is not of the same kind, and, curiously enough, too, it is less truly ornamented than the other regions of the body, amounting to a mere scattered punctuation; whereas over the field where the cilia prevail these punctuations, which are in reality minute, cylindrical, strongly refracting bodies standing perpendicularly to the surface of the derm, are arranged in perfectly regular rows, which have a different character in the three regions posterior to the pseudo-cuirass. In the space (fig. 5 D) between the anterior (*af*) and posterior (*pf*) transverse furrows, the rows trend longitudinally and transversely; in the posterior transverse furrow (*pf*) they have the same arrangement as the last, but they are more closely set together; and in the region behind the latter furrow they trend in decussating lines (P), like those in the carapace of *Arcella vulgaris*.

This region is also characterized by being divided longitudinally, on the ventral side, by a furrow (fig. 1, 2, 6 *mf*) which trends in a direct line from the end of the body to the mouth, and gradually widens anteriorly, where it joins the annular transverse furrow (*pf*). At this point of juncture the flagellar appendage arises, and opposite to it the anterior edge of the transverse furrow just mentioned forms an inequilateral angle at the broader margin (m^1) of the mouth, so that the right and left halves of this furrow are rendered asymmetrical—a character in perfect accordance with that of many, if not of all, the *Peridinia*.

The Nucleus (*n*).—At the period when these observations were made, viz. early last December, the genital organ invariably lay transverse to the longitudinal axis, and occupied a very large portion of the bulk of the posterior end of the body. Most frequently it had a U-shaped form (fig. 3 *n*), and embraced the contractile vesicle with its two limbs. It was then of a yellowish-brown colour, and perfectly homogeneous. Occasionally it was observed to be divided into three or four masses, which extended toward the region encompassed by the posterior annular furrow. While in the U-shaped form, the whole semiopaque mass was enclosed in a transparent envelope (*ne*). Oftentimes there was to be seen immediately over and close to the dorsal region of the nucleus, and directly in the plane of the axis of the body, a minute, clear, vesicular corpuscle (fig. 3 *t*), which seemed to have the character of a "nucleolus" or (as is now becoming the belief, since the investigations of Balbiani and Claparède) a *testicle*.

Reproduction from the egg has not been observed, but transverse division occurred in a number of instances. In the latter case it agrees, in the process, with what Allman (*loc. cit.*) has described, excepting that the resultants (fig. 6, I. II.; fig. 7) are quite different in their proportions from the adults (figs. 1, 2, 3). At the moment of separation the young offshoot (fig. 7) is about two-thirds the size of the adult, and is almost as broad as long, and bulges strongly on the ventral side (v), in front of the mouth (*m*). It has a very flat anterior end, and the pseudo-cuirass (*pc*) of this part is represented by an inconspicuous unguiform body. The anterior transverse furrow, on account of its narrowness, hardly attracts attention, except along its ventral edge (*af*), where it is rendered conspicuous by the strong projection of the unguiform cuirass. As in the adult, it is broadest ventrally, but, growing shallower, thins out (af^1), going dorsally to almost nothing. The relations and structure of the various organs, cilia, &c., are the same as in the full-grown individuals; but with progressing growth the proportions of the different regions of the body change insensibly, as may be seen by comparing figures 7, 4, and 1, which are respectively representations of the youngest, middle-aged, and adult individuals.

EXPLANATION OF PLATE XII.

[In all the figures the same letters refer to corresponding parts.]

A. The anterior end of the body. P. The posterior end.

D. The dorsal side. V. The ventral side. R. The right side. L. The left side.

af, anterior transverse or annular furrow; af^1, dorsal part of *af*; *pf*, posterior transverse or annular furrow; *mf*, median or longitudinal furrow; *d*, depression on the ventral side; *cv*, contractile vesicle; *m*, mouth, m^1, anterior edge of *m*; *œ*, œsophagus; *dv*, digestive vacuoles; *fl*, pseudo-flagellum, fl^1, base of *fl*; *n*, nucleus or generative organ; *ne*, envelope of *n* (this is the reproductive organ, properly speaking, and *n* is the contents or reproductive material, the future eggs); *t*, nucleolus or testes; *pc*, pseudo-cuirass.

I., II. The two products of self-division. III. The annular constriction which finally separates I. and II.

Figs. 1 to 7. *Peridinium cypripedium*, n. sp.

Fig. 1. Profile of an adult, seen from the left side; magn. 500 diams.

Fig. 2. View of the ventral side of an adult; magn. 500 diams.

Fig. 3. Posterior view of an adult, the anterior end in the distance; magn. 500 diams.

Fig. 4. A young individual; magn. 300 diams.

Fig. 5. An adult, gradually dried up; dorsal view, to show the arrangement of the punctiform ornamentation of the derm; magn. 500 diams.

Fig. 6. The process of self-division, just half an hour before separation; ventral view; magn. 200 diams.

Fig. 7. Profile of I. fig. 6, just at the moment of separation; magn. 200 diams.

BIBLIOGRAPHICAL NOTICES.

Travels and Researches in Crete. By Captain T. A. B. Spratt, R.N., C.B., F.R.S. &c. In two vols. 8vo. London: Van Voorst, 1865.

In carrying out the Mediterranean Survey, the Island of Crete came under examination by Capt. Spratt, whose acquaintance with the requirements of his own profession, with the ancient and modern history of the Greeks, their early works of art, coins, monuments, and buildings, with the natural history of land and sea in the Mediterranean area, and with the geological structure of every mountain, coast, and islet he visited, render him peculiarly capable of doing justice to so interesting a region as Crete. The form and character of that island, from mountain to plain, the sites of its cities, its ravines, caves, and water-courses, are so visibly explicable by their rocky structure, that to shut one's eyes to their geological is to misinterpret their topographical relations. Its highlands and valleys, as well as the coast and the deep sea, are strikingly remarkable in their natural products. Its old forgotten cities rise up to intelligent research, and the ancient ruins take definite form and their true place in history, when learning and sagacity unravel the half-true legends of the place. In Crete are found statuary and coins of the finest style, and of a school dating from an earlier time than Athenian art could boast of; for it was the cradle of Greek learning and much of Greek mythology. Lastly, there still exist genuine Cretan Greeks, whose ancestors (under the Roman sway) heard Paul preach at Fair Havens,—under the Byzantines, Saracens, Franks, and Venetians, played their mediæval part in quarrels, bigotry, and trade, and, well versed in war, withstood the Turk for more than twenty years,—and under the Turk have suffered all that brings out the debasing vices and exceptional virtues of a conquered race.

Following Capt. Spratt in his account of Crete (the eastern part of which he more particularly treats of, as having been left undescribed by Pashley), we find the natural features of the country, the remnants of Greek buildings and works of art, mediæval relics, the peculiarities of the present population—the old highland Sfakiote breed, hardy, unscrupulous, and cruel, and the lowland Candiotes of mixed origin—all carefully noted and elucidated by a scientific acquaintance with nature and by a knowledge of classic literature and history; whilst an eye for beauty in nature and art—enthusiasm in working out the traces of long-past civilization, the early source, in great part, of our present culture—a warm sympathy with all that is human, lowered though it be as the outcast leper of benighted Crete—and a hearty, honest, common-sense view of men and manners, give a good tone and genuine feeling to all his observations. In fact, the naturalist, geologist, geographer, antiquary, and general reader cannot fail to be interested and instructed by this work. Its illustrations are first-rate: two excellent geological and topographical maps; a dozen good chromo-lithographs of scenery, with some other plates; numerous small lithographs on india-paper inserted in the text, besides several woodcuts, are all well executed, and help the reader. A delicately tinted lithograph of *Cestum Veneris* and *Beroë* illustrates a long and careful account of these beautiful creatures. A chapter is devoted to the sponge-divers and their surroundings; and a picturesque group of their fishing-boats is shown in a coloured plate.

Appendices on Cretan and modern Greek (by Viscount Strafford); on Deep-sea Soundings; on Currents in the Mediterranean; on the Salinity of the Black Sea and Mediterranean; on the Geology of Crete, and its relations with Malta and Africa; on the Birds (by Col. Drummond-Hay) and the Land-Shells of Crete; and on the Greek inscriptions found in Crete (by Dr. Churchill Babington), carry out more fully some of the researches and favourite topics of our author.

One of the characteristics of Capt. Spratt is most pleasantly shown in the honest and genial acknowledgment of the labours of his colleagues in the Nautical Survey, of the aid of other friends in his scientific and literary work, and of the strong and lasting influence that he believes the genius and philosophy of his lamented friend Edward Forbes have had in rousing, shaping, and supporting that activity of research which is so handsomely represented by these volumes—which is so well known by many circles of his countrymen and foreigners, and always so modestly referred to by himself.

Handbook of British Water-weeds, or Algæ. By Dr. John Edward Gray, F.R.S., late President of the Botanical Society of London. *The Diatomaceæ,* by W. Carruthers, F.L.S. &c. London: Hardwicke, 1865.

This little work contains an arrangement of all the Algæ or Water-weeds hitherto recorded as found in Great Britain and Ireland, referred to the most recent genera, and fills up a desideratum that has for several years been felt by the botanical student.

The black- and red-seeded Algæ, which, with very few exceptions, are all marine, are arranged in the families, genera, and subgenera used by Professor Jacob George Agardh in his 'Species, Genera, et Ordines Algarum,' lately published in Sweden, with the alterations suggested in the system proposed by Professor Harvey, in his account of the American Algæ, published by the Smithsonian Institution. The species are all accompanied by a short diagnosis and a reference to the best figure which has been given of them from specimens in a living state, Harvey's 'Phycologica Britannica' being the work almost always referred to.

The Green Algæ (*Chlorospermæ*), which contain both freshwater and marine species, are arranged according to the system proposed by the author in his paper on the distribution of those Algæ, published in the 'Annals of Natural History' for November 1861.

As these plants are very difficult to be distinguished, except in a living state (the chief character often disappearing when they are dry, and indeed often shortly after they are gathered), the author has not attempted to give any diagnosis of the species, but has only referred to the works in which the species or presumed species are figured, preferring, where he can, figures that are taken from living specimens.

Dr. Gray has suggested some improvements in the arrangement of the Algæ. Thus he has proposed to separate the families of *Melanospermæ* used by Agardh and Harvey into three orders, according to the structure of the frond; thus—

Order I. Scytophyces. Frond leathery or membranaceous, formed of compact cellular substance: containing—1. *Fucaceæ*; 2. *Laminariaceæ*; 3. *Dictyotaceæ*; 4. *Sporochnaceæ*.

Order II. Trichophyces. Frond subarticulate, with a jointed axis, and furnished with tufts of pinnate, jointed (deciduous) threads. 5. *Arthrocladiaceæ*.

Order III. Arthrophyces. Frond formed of jointed filaments, which are either free or united into a compound body. 6. *Chordariaceæ*; 7. *Ectocarpaceæ*.

In the families he has characterized three new genera, viz.,

1. *Fasciaria* for *Laminaria fascia*.
2. *Sphærophorus* for *Ectocarpus granulosus* and its allied species.
3. *Hincksia* for *Ectocarpus Hincksii*.

In the Rhodosperms he regards the anomalous genus *Hapalidium* as the type of a family. It has been suggested that that genus may be only the very young state of *Melobesia*; but this theory wants further examination, as the glassy texture, the form of the frond, and cells are very unlike those of any species of the latter genus, which is always calcareous and opake, and formed of several layers of cells, even in its thinnest state of development. Again, if it is the young state of that very common and universally spread genus, why is it so seldom observed, when the *Melobesiæ* are to be seen on almost every kind of marine body?

In the Chlorosperms, Dr. Gray has characterized the following genera as new, viz.—

Leptocystea for *Cladophora pellucida*.
Vagabunda for *Cladophora fracta*.
Cystothrix for *Cladophora Rudolphiana*.
Cystophora for *Cladophora littorea*.
Calonema for *Callothrix mirabilis*.

The list of the Diatomaceæ seems to have been prepared by Mr. Carruthers with great care; and it will be very useful for the collectors of that very numerous and intricate class of minute plants.

Natural-History Transactions of Northumberland and Durham. Vol. I. Part 1. 8vo. 1865.

The 'Natural-History Transactions of Northumberland and Durham,' of which this is the first part, are to be looked upon as a continuation of the 'Transactions of the Tyneside Naturalists' Field-Club' under a different title, being in fact the Proceedings of the "Natural-History Society of Northumberland, Durham, and Newcastle-on-Tyne," incorporated with those of the Tyneside Naturalists' Field-Club.

To make perfect catalogues, zoological and botanical, for the natural history, recent and fossil, of Northumberland and Durham is a main object of the Tyneside Field-Club and of the naturalists now associated with them. This aim is well kept in view in the present volume of their Transactions, which is largely composed of "Reports of Deep-Sea Dredging on the Coasts of Northumberland and Durham in 1862–64," edited by Mr. G. S. Brady. Among the new or little-known species are especially mentioned:—Echinoderms—*Echinocardium pennatifidum*, Norman, MS., *Psolus squamatus, Echinus pictus*, Norman, *Antedon rosaceus, Ophiocoma nigra.* Mollusca—*Chiton albus*, L. Several stalk-eyed Crustacea—*Atelecyclus heterodon, Pagurus Cuanensis, P. Hyndmani, P. ferrugineus, Crangon Allmani, C. spinosus, C. nanus, C. fasciatus.* Of Amphipods, *Lysianassa Costæ* and several others. Of Ostracods, six new species of *Cythere* were taken; also a new and very interesting Copepod (*Calanus Clausii*, Brady) and a new Pycnogon (*Nymphon rubrum*, Hodge). Among Polyzoa, *Lepralia annulata* and *Tubulipora lobulata* are new to the coast. Lastly, some rare Hydrozoa were collected; and five Foraminifera were added to the local list.

Mr. Joshua Alder reports on the Mollusca, Tunicata, and Zoophyta; the Rev. A. M. Norman on the Crustacea; Mr. G. S. Brady on the Pelagic Entomostraca; Mr. G. Hodge on the Pycnogonoidea and the Echinodermata; and Mr. H. B. Brady on the Foraminifera. These reports are accompanied with tabulated catalogues showing the species found in 1862, 1863, and 1864 respectively, with notes as to frequency and other conditions. Eight plates illustrate this part of the volume.

Mr. Norman, in the next succeeding memoir, describes *Cyanea imporcata* (a new Medusa taken off the Northumberland coast), and illustrates it with a beautiful chromolithograph (pl. 11) by T. West. Mr. Alder then describes three new or rare Polyzoa (pl. 8)—*Eschara Landsborovii*, Johnston, *E. pavonella*, Alder, and *Scrupocellaria Delilii*, Audouin. Mr. Kirkby's paper on some remains of Fishes and Plants from the Upper Limestone of the Permian series of Durham succeeds, with Plate 9, illustrating *Palæoniscus altus, P. varians*, and *P. Abbsii.* The next memoir is entitled "A Catalogue of the Recent Foraminifera of Northumberland and Durham, by H. B. Brady," with Plate 12, in which ten forms figure as new or rare in the British seas. One point of interest mentioned in this paper is the occurrence of certain Foraminifera in brackish pools at Hylton Dene, and near the mouths of the Wansbeck and the Coquet, such as *Quinqueloculina agglutinans, Polystomella striato-punctata, Nonionina depressula, Rotalia Beccarii, Trochammina inflata* (abundant), and *Globigerina bulloides* (one specimen). These often present modified shell-structure, and are evidently the remnants of sea-born families, left to struggle with the adverse influence of fresh water, herein reminding us of the marine Crustacea found in fresh-water lakes in Norway, and of other like instances.

Mr. G. S. Brady supplies a suggestive paper on Naturalists' Field-Clubs and their objects, giving some statistics as to half-a-dozen of the best, comparing some of the different methods of research adopted, and concluding with a well-urged plea against the destruction of small birds by the farmer, even for his own sake, and against the extermination of rare plants by curiosity-hunting botanists, for science-sake. Very valuable papers and notes on meteorology (Mr. Atkinson), flowering-time of plants (Mr. G. S. Brady), entomology (Mr. Bold), &c., complete this rich volume of natural-history facts collected by the men of Northumberland and Durham.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

May 9, 1865.—Dr. J. E. Gray, F.R.S., in the Chair.

DESCRIPTION OF A NEW GENUS OF TRICHIUROID FISHES OBTAINED AT MADEIRA, WITH REMARKS ON THE GENUS DICROTUS, GÜNTHER, AND ON SOME ALLIED GENERA OF TRICHIURIDÆ. BY JAMES YATE JOHNSON, CORR. MEM. Z. S.

Order ACANTHOPTERYGII.

Fam. TRICHIURIDÆ.

NEALOTUS, gen. nov.

Body elongate, compressed, incompletely clothed with delicate scales. Cleft of the mouth deep. Small teeth in the jaws and on the palatine bones; none on the vomer. First dorsal fin continuous, extending to the second; finlets behind the second dorsal and anal fins. Each ventral fin represented by a single small spine. A dagger-shaped spine behind the vent. No keel on the tail. Caudal fin well developed. Seven branchiostegal rays.

This genus may be entered in the synopsis of Trichiuroid genera in the 'Catalogue of the Collection of Fishes in the British Museum' thus:—

Each ventral represented by a single spine; a dagger-shaped spine behind the vent.

NEALOTUS TRIPES, sp. n.

First D. 21. Second D. 19. P. 13. A. 18. C. 16.

The compressed body is very elongate, and has a few large deciduous simple scales of delicate structure scattered here and there on the skin, which is faintly reticulated with oblique grooves or wrinkles, and has a steel-grey colour with a silvery lustre. The height of the body, compared with the total length, is as 1 to $9\frac{1}{2}$; whilst the length of the head, compared with the total length, is as 1 to $4\frac{1}{6}$. The black compressed head is flattened above, and is concave between the eyes, where there are four low ridges, the inner pair of which enclose an elongated diamond-shaped space. The lower jaw is longer than the upper, and each is armed with a single series of small deltoid distant teeth. Those of the upper jaw are inserted in the premaxillary. In front there are seven longer teeth, which are conico-compressed, and curve slightly backwards; two of them at each side stand within the outer row of teeth. On the palatine bones there is a single row of minute teeth; whilst the vomer is unarmed. The tongue is also without teeth, and is black like the rest of the mouth and the inside of the gill-covers. A membrane with a tongue-like lobe stretches across the palate.

The diameter of the round lateral eye is contained in the head about five times, and is distant from the muzzle $1\frac{2}{3}$ of its diameter. Near the angle of the preopercle are three very small flat teeth. The opercle terminates in two obtuse projections separated by a notch.

The first dorsal fin commences a little in front of the root of the pectoral fin. Its height is rather more than half the height of the body; and its length is less than half that of the fish. It rises out of a groove, and is supported by twenty-one slender spines, which are not tuberculated. The second dorsal fin commences shortly behind the termination of the first, to which it is not quite equal in point of height, and it is less than half as long. It is supported by nineteen rays, of which the first one or two are short; and it is followed by two longish finlets. The pectoral fin is inserted under the angle of the opercle; it contains thirteen rays, and equals in length the second dorsal fin. The pair of spines representing the ventral fins are inserted close together under the hinder part of the roots of the pectoral fins. Their length is about a fourth of the height of the body; and, being longitudinally grooved, each appears to consist of two or three spines fused together. The vent is a little behind the middle of the fish. Behind the vent there is a flat dagger-shaped spine, which is longitudinally grooved. Its length is less than half the greatest height of the body; but it is rather longer than the ventral spines. The anal fin commences about the length of the spine behind it, and is opposite to, but rather shorter than, the second dorsal fin. It contains eighteen rays, and is followed by two finlets, the second of which is elongated. The deeply forked caudal fin contains sixteen rays, with five or six short exterior rays on each side.

The lateral line falls obliquely from its commencement above the opercle to the middle of the length of the fish, and is then continued with a gentler obliquity along the posterior part of the body to the tail, where it has two-thirds of the height above it.

The single specimen of this fish which has occurred was obtained in the month of December, and it has been deposited in the British Museum. The fish bears a close external resemblance to the

"Coelho" of Madeira (*Thyrsites Prometheus*, Gthr.; *Prometheus atlanticus*, Lowe). From that fish it may be distinguished by the possession of a dagger-shaped spine in front of the anal fin*, by the spines of the first dorsal fin being twenty-one in place of eighteen, by the rays of the second dorsal fin being nineteen in place of twenty-one, and by the rays of the anal fin being eighteen in place of sixteen. It may be further noticed that in the present fish the ventral spines are placed under the posterior angle of the base of the pectoral fin, instead of being inserted a little before that fin, and that the lateral line does not descend rapidly under the anterior part of the first dorsal fin, as in *Prometheus atlanticus*. With *Nesiarchus nasutus* it cannot be confounded, since the latter has perfect ventral fins and fleshy and cartilaginous prolongations of the jaws.

The dimensions of the fish which has afforded materials for this description are given in the following table:—

	inches.
Total length of fish	10
Height	$1\frac{1}{10}$
Thickness behind pectoral	$\frac{6}{10}$
Head, length	$2\frac{4}{10}$
Eye, diameter, nearly	$\frac{1}{2}$
Teeth, length of largest	$\frac{1}{5}$
First dorsal, distance from muzzle	2
First dorsal, length	$4\frac{1}{8}$
First dorsal, height in front	$\frac{6}{10}$
Second dorsal, length	$1\frac{3}{10}$
Second dorsal, height	$\frac{6}{10}$
Pectoral, distance from tip of lower jaw	$2\frac{3}{10}$
Pectoral, length	$1\frac{3}{10}$
Ventral spines, length	$\frac{1}{4}$
Ventral spines, distance from tip of lower jaw	$2\frac{4}{10}$
Spine in front of anal, length	$\frac{7}{20}$
Anal, length	$1\frac{1}{10}$
Anal, height in front	$\frac{7}{10}$
Caudal, length	$1\frac{1}{2}$

The family of *Trichiuridæ* is composed, according to Dr. Günther's Catalogue, of the genera *Aphanopus, Lepidopus, Trichiurus, Epinnula, Dicrotus, Thyrsites*, and *Gempylus*. To these have to be added the recently described genera *Nesiarchus* and *Nealotus*. With respect to *Dicrotus*, Günther, a genus founded on a small fish only $2\frac{1}{2}$ inches in length, it appears to me that it ought to be abolished, the fish having been most probably a young individual of some species of *Thyrsites* or *Gempylus*—an opinion which has been entertained by Dr. Günther himself for some time. From *Thyrsites Prometheus*, for example, it would seem to differ only by the absence of finlets and the presence of minute teeth on the vomer. But finlets are not

* *Aphanopus carbo*, Lowe, and *Nesiarchus nasutus*, a fish described by me in the Society's 'Proceedings' for 1862, p. 173, pl. xxii., have a similar spine between the vent and the anal fin.

developed in very young fishes, such as *Dicrotus armatus* probably was; and teeth are apt to disappear from the vomer when fishes acquire their full growth. It may be mentioned in confirmation of this view, that I obtained a scaleless fish, not quite six inches in length, which had its ventrals reduced to single spines, had teeth on both palatines and the vomer, and had the last four or five rays of the second dorsal fin distant from, and unconnected by membrane with, the rest of the fin; whilst the last two or three rays of the anal fin were separated from the anterior portion. This was therefore a *Dicrotus* with imperfectly formed finlets, showing a closer approach to a fully developed *Prometheus atlanticus* than *D. armatus*.

After attentively considering the descriptions of the species placed by Dr. Günther under the genus *Thyrsites* (Brit. Mus. Cat. ii. 350), as well as some of the fishes themselves, it appears to me that a more satisfactory arrangement would be to distribute the species amongst three genera, thus:—

1. Thyrsites. Fishes having teeth on the palatines, perfect ventrals, finlets, and a skin naked or furnished with simple scales.

T. Atun, C. & V., and *T. lepidopoides*, C. & V.

2. Ruvettus. Includes a single very distinct species, remarkable for having a keeled abdomen, and the skin everywhere furnished with bony bodies, each bearing several spines—possessing also teeth on the palatines, perfect ventrals, and finlets.

R. pretiosus, Cocco.

3. Prometheus. Distinguished by having each ventral reduced to a single spine, as well as by having teeth on the palatines, finlets, and a skin either naked or furnished with simple scales.

P. atlanticus, Lowe; *P. Solandri*, C. & V.; *P. prometheoides*, Bleek.

The genus *Gempylus* is distinguished from all these by the absence of teeth from the palatines.

To return for a moment to *Ruvettus pretiosus* ("ce curieux, ce précieux poisson,"—*Valenciennes*), the "Escolar" of Madeiran fishermen, it may be noted that, although one of the characters given in the 'British Museum Catalogue' is the want of a lateral line, this line may be made out in fishes fresh from the sea. It commences on a level with the upper border of the opercle, but at some distance behind it, and then descends gently until it arrives at the middle of the height of the fish, which position it keeps on the posterior half of the body.

May 23, 1865.—John Gould, Esq., F.R.S., in the Chair.

Notice of a New Species of Australian Sperm Whale (Catodon Krefftii) in the Sydney Museum. By John Edward Gray, Ph.D., F.R.S., V.P.Z.S., F.L.S., etc.

In a letter which I lately received from Mr. Gerrard Krefft, the intelligent Secretary and Curator of the Australian Museum, he sent me some photographs (taken like those formerly sent by Mr. Henry

Barnes) of a separate atlas vertebra and of the second and other cervical vertebræ united into one mass of a species of Whale, which are contained in the museum under his charge. The two bones, though not united, fit one another so exactly that Mr. Krefft has no doubt of their having belonged to the same animal; and the photographs sent justify this conclusion. However, should there be any mistake in this matter, it will not in the least invalidate the conclusion that I have come to, from the examination of these photographs, that they indicate the existence of a second species of Sperm Whale in the Australian Seas, very distinctly characterized by the subcircular form of the atlas vertebra and of the neural canal in it.

The mass formed by the second and other cervical vertebræ is somewhat similar to these bones in the skeleton of the Australian *Catodon* lately received by the Royal College of Surgeons, which I hope will shortly be described by Mr. Flower, the energetic Curator of their Museum, who, in his late paper on the *Balænidæ*, has shown how well he can describe and determine the species of Whales.

The genus *Catodon* should be divided into two subgenera, according to the form of the atlas, thus:—

I. *The atlas oblong, transverse, nearly twice as broad as high; the central canal subtrigonal, narrow below.* Catodon.

1. Catodon macrocephalus of the Northern Ocean. A skeleton from Scotland, in the British Museum.

2. Catodon australis, Macleay, of the Southern Ocean. A skeleton in the Museum of the Royal College of Surgeons, from Hobart Town.

II. *The atlas subcircular, rather broader than high; the central canal circular in the middle of the body, widened above.* Meganeuron.

Catodon (Meganeuron) Kreffti, sp. nov.

The atlas vertebra oblong transverse, about one-third wider than high; the lateral processes only a little produced beyond the articular surface, with an arched edge; the lower edge arched; the neural arch low, broad, with a slight central prominence on the upper surface; the canal for the spinal marrow very large, circular, rather contracted on the sides above, and then dilated, becoming oblong and transverse.

The atlas is thin, high, being only about one-fourth wider than it is high. The lower and lateral margins are arched, the lower edge being the most so. The neural arch is low, transverse, with a nearly straight lower edge. It is thickest in the middle. The upper surface is shelving on the sides, with an angular central prominence.

The central aperture is very large, nearly circular, and dilated above into an oblong transverse aperture, which is rather wider than the widest part of the central circle. The front articulating surface is horseshoe-shaped, continued to the upper outer angle, and obliquely shelving off on the upper edge to the base of the oblong part of the aperture. The articulating surface of the hinder side is similar; but the articulating surface is shorter at the sides, and transversely truncated in a line with the middle of the upper, oblong, transverse opening (figs. 1, 2).

Fig. 2. Fig. 1.

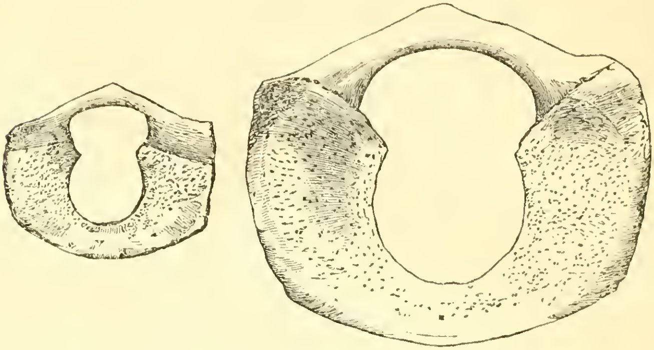
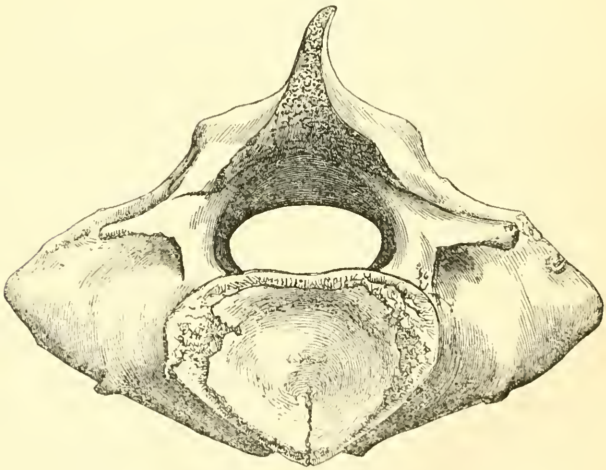


Fig. 1. Front of atlas of *Catodon Krefftii.*
2. Hinder side of ditto (reduced).

The second and other cervical vertebræ are all united together into one mass, anchylosed by their bodies, lateral processes, and neural arches. The neural arches form a triangular mass, which is strongly

Fig. 3.

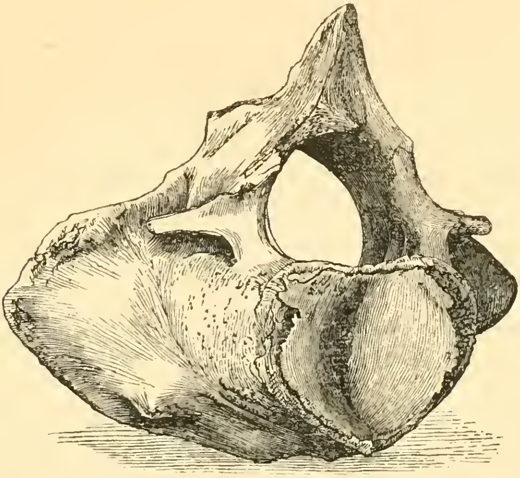


Hinder view of cervical vertebræ of *Catodon Krefftii.*

keeled on the central line; and the keel is stronger and produced into an acute point at the hinder end (figs. 3, 4).

The lateral processes of the second, third, and fourth vertebræ are produced and united into a broad, thick, angular process, which is expanded at the side, giving the united mass a rhombic appearance, the width of the side being about one-fourth more than the height of the mass.

Fig. 4.



Side view of the hinder side of the cervical vertebræ of *Catodon Krefftii.*

There is a tubercle, which is most probably the end of the lower lateral process of one of the anterior cervical vertebræ, at the lower part of the hinder side of the front lateral expansion.

The three hinder vertebræ have no distinct lower lateral processes; their place is only marked by three slight ridges on the lower edge of the hinder side of the mass. The upper lateral processes of the hinder cervical vertebræ are small, slender, forming a strap-like section, rather tapering towards and truncated at the tips on the side of the apertures for the passage of the nerves for the neural canal. The neural canal is rather large, oblong transverse, the height being about two-thirds of the width; it is rather larger and higher behind.

The hinder surface of the body of the last cervical vertebra is oblong transverse, about two-thirds of the height of its width at the widest part; the lower edge is rounded and rather angularly produced in the centre, and the upper margin transverse, with a slight central depression; the surface is concave, with a central, linear, perpendicular, compressed line.

The cervical vertebræ in *Catodontidæ* are united into a single mass by their bodies, the neural arch, and the lateral processes. The lateral processes of the anterior vertebræ are produced, and form a thick, subconical, triangular prominence on the side of the mass. The front side is nearly flat, and the lateral processes of the hinder vertebræ are shorter and shorter to the last. The hinder surface shelves from before backwards, and is crested with some conical prominences which indicate the lateral processes of the different vertebræ of which the mass is formed. The first dorsal vertebra is sometimes partially anchylosed with the seventh cervical.

The arm-bones are very short.

Notes upon the Cuckoos found near Sydney, New South Wales. By Edward P. Ramsay.

(1.) The Bronze Cuckoo (*Chalcites lucidus*): Gould, B. Austr. iv. pl. 89.

We have for many years been under the impression that the females of this species lay two distinct varieties of eggs, which, although in many instances exactly the same in size, differ widely in colour and in style of marking.

The most satisfactory way of determining this question was to procure specimens of each of these different eggs, and to place them in nests of the *Malurus cyaneus*, or of various *Acanthizæ* (which had been built sufficiently near our residence to admit of our occasionally visiting them), until they were hatched, and then to compare the young birds so hatched from each of the different eggs. This we succeeded in doing in more instances than one, and found that the young birds were in every case alike, and that when they were sufficiently fledged we had no difficulty in recognizing them to be the young of the Bronze Cuckoo (*Chalcites lucidus*).

The first variety of the eggs in question (var. A), usually recognized as the egg of the Bronze Cuckoo, varies in colour from a uniform ashy grey to a rich dark olive-brown or bronze, many of the light ashy-grey specimens having minute dots of deep olive towards the larger end. In one specimen, in which these dots form a blotch, they are more inclined to reddish brown.

Var. B has a purely white ground, blushed with pink before the egg is emptied, and minutely freckled over the whole surface with dots of light brownish red or dull salmon-colour, running in some instances into blotches which stretch half across or round the surface, leaving patches of the white ground without any markings. Occasionally we find a specimen in which the salmon-colour and bronze seem to be blended, forming a curious brownish-lilac tint.

Both varieties vary much in size: we have specimens of var. A varying from 8 by 6 lines to 10 by $5\frac{1}{2}$ lines; of var. B, from 8 by 5 lines and $8\frac{1}{2}$ by 6 lines to $9\frac{1}{2}$ by 6 lines in breadth. The colouring-matter of both varieties easily rubs off, especially when the eggs are freshly taken. The Bronze Cuckoo seems to give no preference to any particular character of country, being found equally numerous in all parts. In the thick shrubs and low brushwood it finds a secure place for depositing its eggs in the nests of *Malurus Lamberti* and *Acanthiza pusilla*. In the half-cleared patches of land and even in our gardens and shrubberies it seeks for the nests of the *Malurus cyaneus*, *Acanthiza lineata*, *A. reguloides*, and *A. nana*.

From a nest of this last-mentioned species (*A. nana*) I remember taking, in the year 1855, no less than six eggs. Among them were three of the Bronze Cuckoo—two of var. A and one of var. B. In November last (1864) we took another nest of the same species, containing one of each variety. In this instance one of the eggs, var. A, was imbedded below the lining of the nest, and had evidently been laid before the nest was completed, as is not unfrequently the case. The other egg, which was a specimen of var. B, my brother Percy placed in a nest of *Acanthiza lineata*, which he had found on the previous day and left for such an occasion. On returning to it about a week afterwards we found that the young Cuckoo had been hatched. After the lapse of seven days the bronze feathers were just commencing to appear, and in about a week or ten days more the young bird was nearly able to fly, the bronze on the wings, head, and back now showing plainly.

All the species of *Acanthizæ* that we have met with construct oval dome-shaped nests, having the entrance near the top, and more or less covered with a hood. The nests are either suspended (as in the case of *A. lineata*) from the end of some drooping or horizontal bough, or, like those of the *Maluri*, placed in some low bush or cluster of vines, or, as is often the case with *A. reguloides*, placed in the thick forks or loose hanging pieces of bark of the *Eucalypti* and white-barked Tea-trees (*Melaleuca*).

Now, as the apertures of the nests of the *Acanthizæ* are exceedingly small, a question naturally arises whether the Bronze Cuckoo lays its eggs in the nest, or places them there by some other means. To this I can only answer that the apertures of those nests which have contained Cuckoos' eggs are nearly twice as wide as the openings of those nests which we have taken before the Cuckoo's egg has been deposited in them. This is more easily noticed in the nest of *A. lineata*, of which the aperture is very small, and neatly covered over with a hood.

The following are a few extracts from my note-book, showing the species which are most frequently the foster-parents of the Bronze Cuckoo:—

	Nest.	Eggs of owner.	Eggs of Cuckoo.
Sept. 29th, 1862 ...	*Acanthiza pusilla*	2	1 of *C. lucidus*, var. B.
Sept. 11th, 1863* ...	"	2	1 of *C. lucidus*, var. A.
Sept. 12th, 1864 ...	*A. lineata*	3	1 of *C. lucidus*, var. A.
Sept. 12th, 1864 ...	*A. reguloides*	2	1 of *C. lucidus*, var. B.
Sept. 14th, 1864 ...	*Malurus cyaneus* .	3	1 of *C. lucidus*, var. B.
Sept. 14th, 1864 ...	*A. reguloides*	3	1 of *C. lucidus*, var. A.
Nov. 1864	*A. nana*	4	2 of *C. lucidus*: 1 of var. A and 1 of var. B.
Sept. 16th, 1864 ...	*Meliphaga sericea*	1	1 of *C. lucidus*, var. B.
Oct. 2nd, 1864	*Meliphaga sericea*	1	1 of *C. lucidus*, var. B.

Mr. Gould tells us that the Bronze Cuckoo is dispersed over the

* This nest also contained one of *Cuculus cineraceus*.

20*

whole continent of Australia, as well as New Zealand. In the latter country I have myself met with it at every port I visited, from Stewart's Island to Auckland, where it arrives about September, and leaves during February and March.

(2.) The UNADORNED CUCKOO (*Cuculus inornatus*): Gould, B. Austr. iv. pl. 85.

When the eggs of two or more species of Cuckoo are found in the same locality, and the birds themselves equally plentiful during the same months, it becomes difficult to determine which is the egg of each species, except perhaps where there is a great difference in the size of the birds. Even this, however, must not be depended upon in too great a degree, as will be seen in the present case. Following the same plan as in the case of the Bronze Cuckoo (*Chalcites lucidus*), we succeeded in procuring two young Cuckoos from eggs which we had left in the nests of the Yellow-whiskered Honey-eater (*Ptilotis auricomis*). These, when fledged, we at once recognized to be the young of *Cuculus inornatus*.

The young, upon leaving the nest, have the throat, face, and shoulders black; the rest of the upper and under surface and tail irregularly marked with dashes and stripes of black, scarcely two feathers, even of wings, being alike. They retain this plumage until March and April, during which months all the specimens I procured were commencing to assume the more dusky plumage of the adult. During these months all the old birds seem to have left us, the young of the last season alone being found.

The present species arrives early in September, and is usually met with in pairs, showing a preference for the half-cleared land and belts of trees skirting the more cultivated parts. They may frequently be seen perched upon the dead tops of trees, or among the lower open branches, or often on the posts and fences, from which they pounce down upon any unhappy grasshopper or cricket that they may have discovered lurking in the grass.

Their food consists chiefly of *Gryllidæ* and *Phasmidæ*, various species of *Mantis*, and often the beautiful larvæ of the *Cæquosa triangularis* and *Antheræa eucalypti*, which they obtain among the leafy tops of the *Eucalyptus* trees. The crops in some specimens, procured in October last, contained nothing but grasshoppers, which appear to be their favourite food.

In this neighbourhood they usually deposit their eggs in the nests of *Ptilotis auricomis*, but also occasionally in those of *Ptilotis chrysops*, but rarely in those of *Ptilotis fusca* and *Melithreptus lunulatus*; in other districts, doubtless, in any nests suitable for the purpose. I have frequently observed that whenever the eggs of Cuckoos have been deposited in open nests, there is manifested a decided preference for those of birds which lay eggs similar to their own.

The Cuckoo's eggs mentioned in my notes upon the Yellow-whiskered Honey-eater (*P. auricomis*) in the 'Ibis' (vol. vi. 1864, p. 245) as being found in the nest of that bird, I have now no doubt belong to *Cuculus inornatus*, and not, as I then supposed from their small size, to *Cuculus cineraceus*.

The eggs of the Brown Cuckoo (*C. inornatus*) closely resemble the large and almost spotless variety of the Yellow-whiskered Honey-eater; they are, however, somewhat more rounded, and of a much lighter tint, being of a pale flesh-colour, sprinkled with a few dots of a deeper hue, but often without any markings at all. In length they vary from 11 to $12\frac{1}{2}$ lines, being from $8\frac{1}{2}$ to 9 lines in breadth.

They are usually hatched about the twelfth or fourteenth day, when the young Cuckoo, a little fat helpless creature, is scarcely larger than its foster-brethren. However, as it grows more rapidly, it soon fills up the greater part of the nest, and its unfortunate companions, either smothered by its weight or starved to death through its greediness, are thrown out by their parents.

On the 30th of October last (1864) we found two unhappy young birds which had been hatched in company with a Cuckoo in a nest of *Ptilotis auricomis*, tossed out and lying upon the ground just under the nest; they were of course quite dead, and appeared to have been about three or four days old.

During the months of October and November it is no uncommon sight to see the smaller birds feeding the young Cuckoos; even the little *Acanthizæ*, which I believe are never the foster-parents, at least of this species (*C. inornatus*), join in supplying their wants, which are easily made known by their continual peevish cry, stopping only when being fed, or when their appetites are appeased.

While walking towards home, through a half-cleared paddock, on the 27th of last October, I was not a little surprised, upon hearing the cries of a young Cuckoo, to see a pair of adult birds of the same species (*C. inornatus*) flying after it, settling beside it, and apparently paying it great attention. Several times they flew away, but returned to it again; and from their actions I feel convinced that they were feeding it, although, much to my regret, I was unable to obtain a view sufficiently close to make sure of the fact.

(3.) The Cinereous Cuckoo (*Cuculus cineraceus*): Gould, B. Austr. iv. pl. 86.

This, the third and remaining Cuckoo which annually visits us, arrives much earlier than either of the former species.

During May I have found it very plentiful, preferring the lonely and more closely wooded parts, and the sandy scrub-lands studded with aged *Banksiæ* (*B. serrata*) and widely branching *Eucalypti*, where the undergrowth consists of low, thick, scrubby *Lambertiæ* (*L. formosa*), Acacias, and dwarf Banksias, &c. Such are the parts of our neighbourhood frequented by this species for nearly a month after its arrival. Their clear wailing cry is often heard from the depths of the bush, giving quite a melancholy tone to the surrounding neighbourhood.

June comes, and they leave their lonely haunts for the more open wooded parts. Here they may be seen, either singly or in pairs, often frequenting the gardens and orchards, where, among the leafless fruit-trees, their undulating flight and the peculiar cuckooish upward jerk of their tails at once render them conspicuous. As spring advances, their melancholy cry assumes a more cheerful tone, but is less often heard, giving place to a quicker and more harsh note.

The shrill whistle of the Bronze Cuckoos (*Chalcites lucidus*) is now more often heard, accompanied by the mellow notes of the Brown Flycatcher (*Micrœca macroptera*), singing on the topmost bough of some neighbouring tree; and the twittering of the *Acanthizæ* as they sport among the leafy branches of the *Eucalypti*, clinging to the ends of the twigs and leaves in every possible attitude, the tremulous anxious piping of the Spine-bills (*Acanthorhynchus tenuirostris*), the varied inward note of the Silver-eye (*Zosterops dorsalis*), with other species far too many to mention here, keep up a merry chorus, and, tired of the winter fogs, welcome the bright spring mornings.

As the birds pair off and the nesting-season commences, this Cuckoo seems to be less plentiful. Either some of them leave us, or they scatter over the bush so thinly that we do not observe their numbers. If some do migrate at this time, still many remain to deposit their eggs and to avail themselves of the nests of those species most suited to become the foster-parents of their young, after which they commence to leave us, and, with the exception of a few stragglers and young, appear to have all departed before the end of December.

Among those species the nests of which are favoured by visits from this "parasite" is *Acanthiza pusilla*, from a nest of which, in September 1863, we took no less than four eggs—two laid by the rightful owner of the nest, the other two by Cuckoos. One of these was a very fine specimen of var. B of *Chalcites lucidus*, the other an egg of the present species—*Cuculus cineraceus*. The entrance of this nest was greatly enlarged, being in width fully two inches; and the hood, which usually conceals the entrances (which are near the top of the nest, and not generally wider than one inch across), was pushed back to such an extent that the eggs were rendered quite visible.

I have now before me ten nests of *Acanthizæ* and four of *Maluri*, the former comprising *Acanthiza lineata*, *A. nana*, *A. pusilla*, and what at present I believe to be that of *A. reguloides*, the latter *Malurus cyaneus* and *M. Lamberti*.

Now, having compared the greatly enlarged entrances of those from which we have taken Cuckoos' eggs with the entrances of those which did not contain the egg of a Cuckoo, and which we took as soon as the bird had laid its full number of eggs for a sitting, I cannot but feel convinced more than ever that the eggs of these parasites are laid in the nests, and not deposited in any other manner. The average width of the entrances of the nests of *Acanthiza lineata* which have not been visited by a Cuckoo is 1 inch, while those which have contained Cuckoos' eggs vary from 2 to $2\frac{1}{2}$ inches. In addition to the nests of *Acanthiza pusilla*, we have known this Cuckoo (*C. cineraceus*) deposit its eggs in the nests of *A. reguloides* (?) and *Chthonicola minima*. How great is the difference between the Cuckoo's eggs and those of this last bird (*Chthonicola minima*), which are of a bright reddish chocolate!

The eggs of *Cuculus cineraceus* are from 10 to $10\frac{1}{2}$ lines in length, by 7 to $7\frac{1}{2}$ in breadth. The ground-colour is a delicate white, spotted and dotted with wood-brown, deep brownish lilac, and fair lilac dots, which appear beneath the surface.

Some specimens are faintly sprinkled all over, and the dots have a washed-out appearance; others are marked more strongly, and in these the markings formed are in a distinct zone at the larger end, which is sometimes broken by a batch of very deep-coloured dots.

I have seldom met with the eggs of this species in collections (although sometimes I have seen those of *Cuculus inornatus*), whereas the eggs of *Chalcites lucidus* are to be found in almost every collection of eggs made in New South Wales. It is curious that one variety of the egg of the *Chalcites lucidus* (var. A) should be so different from the eggs of the species in the nests of which it is placed, whereas both the other species here mentioned lay eggs very similar to those of their foster-parents.

June 13, 1865.—Dr. J. E. Gray, F.R.S., in the Chair.

Report on a Collection of Animals from Madagascar, transmitted to the Society by Mr. J. Caldwell. By P. L. Sclater, M.A., Ph.D., F.R.S.

Mr. J. Caldwell, of Port Louis, Mauritius, has recently transmitted to me a small collection of animals in spirits, collected in Madagascar, in the vicinity of Antananarivo. The species represented in the series are two Mammals, five Reptiles, and a Crayfish.

The Mammals, which have been kindly determined for me by my friend Dr. W. Peters, are of the following species:—

1. Nyctinomus (Mormopterus*) jugularis, Peters, n. sp.

N. *supra fuscus, pilis basi albis, subtus fusco-canus, alis nigris; capite depresso, rostro lato; auriculis triangularibus, sejunctis; fovea jugulari magna.*

The only specimen of this very interesting species is a male, distinguished from all other species by a deep transverse fossa immediately before the manubrium sterni.

The head appears more flattened than in any other species, and terminates with a broad flattened snout. The triangular large ears are, compared with those of other species, rather thin, not united, but separated by an interspace of 4 millim.

The fur is soft, of moderate length. The hair of the upper parts is dark brown, at the base white; that of the underside greyish.

* *Mormopterus*, nov. subg. In the formula of the teeth $\left(\frac{3.1}{3.2}\,\frac{1}{1}\,\frac{1-1}{4}\,\frac{1}{1}\,\frac{1.3}{2.3}\right.$, when younger $\left.\frac{3.1}{3.2}\,\frac{1}{1}\,\frac{1-1}{6}\,\frac{1}{1}\,\frac{1.3}{2.3}\right)$ it differs from *Nyctinomus* with $\frac{5}{5}$ molars, and approaches more to *Molossus*. The lips also are not so much plicated as in *Nyctinomus*. It is a species intermediate between *Nyctinomus* and *Molossus*, thus showing another instance of the relationship of the fauna of Madagascar to the American fauna.

The skull is more flattened than in other species, and remarkable for a strongly developed ante-orbital crista.

	mètre.
Total length	0·089
Length of the head	0·021
—— of the ear in front	0·014
Breadth of the ear	0·012
Length of humerus	0·024
—— of forearm	0·037
—— of thumb	0·0085
—— of second finger	0·0335
—— of third finger	0·067
—— of fourth finger	0·0565
—— of fifth finger	0·035
—— of thigh	0·013
—— of tibia	0·0105
—— of foot with claws	0·008
—— of tail	0·019
—— of free end of the tail	0·011

2. Mus, sp.?

A very young, indeterminable specimen, with only two molars developed. Above brown, penicillated with black, with the bases of the hairs blackish grey; below white. In its colour and the length of the ear, this species is allied to the South-African Fieldmice, as *Mus colonus, M. natalensis*, &c.

The Reptiles, which Dr. Günther has named for me, consist of two Snakes (*Dipsas colubrina* and *Herpetodryas Bernieri*), a Chameleon (*Chamæleon lateralis*, Gray), several fine specimens of a Lizard of the genus *Gerrhosaurus* (*G. lineatus*, Cocteau = *Cicigna ornata*, Gray), and an example of another Lizard (*Liolepisma Belli*, Gray). All these are species already known to the fauna of Madagascar.

The Crayfish I have submitted to Mr. Spence Bate, as our leading authority on this branch of natural history. Mr. Spence Bate pronounces it to be a new species of *Astacus*, which he proposes to call after its discoverer, with the following characters:—

Astacus Caldwelli, Spence Bate, sp. nov.

The eyes are planted on short peduncles. The first pair of antennæ have the third joint of the peduncle reaching to the extremity of the rostrum. Both branches of the flagellum are slender; and the primary branch, which is half as long again as the secondary, is about half the length of the anterior division of the cephalon. The second pair of antennæ are about three times the length of the first; and the flagellum is minutely articulate, each articulus being, in length, less than half its breadth, and at the basal extremity being about half the breadth of the last joint of the peduncle. The squamigerous process of the third joint is rounded and thickened upon the outside, straight, thin, and ciliated upon the inner, and obtuse at the apex. The rostrum reaches to the extremity of the penultimate joint of the peduncle of the external antennæ, rounded at the extremity, dorsally concave, the margins fringed within and above the actual edge with a rim of short, blunt denticles. The ocular orbit is deeply excavate, and armed posteriorly near the centre by a small denticle, and at the infero-lateral extremity by a short, sharp, curved, and anteriorly directed strong tooth. The lateral walls of the cephalon are thickly covered with numerous, subequally distant, short, spinous protuberances, which gradually lessen in importance towards the dorsal surface of the carapace, which is perfectly smooth, except for the well-defined fissure that distinguishes the anterior portion of the carapace from the posterior—the demarcation between the antennal and mandibular somites. The first or large chelate pair of pereiopoda are subequal in size, but differ in form from those of every other species of the genus with which I am acquainted, and resemble more in general aspect those of the genus *Homarus*. The dactylos is curved inwards, and tipped with a sharp unguis; the dactyloid process of the propodos is similarly formed, and meets the dactylos only at or near the apex; the approximating edges, however, are armed with a few small and one large tubercle opposite to corresponding ones. The inferior and external margin of the propodos, from the extremity of the dactyloid process to the carpal articulation, is convex, and longer than that of the intero-superior margin of the propodos and dactylos together. The carpus is armed with three blunt and one sharp anteriorly directed teeth upon the inner edge, and two sharp strong teeth upon the under surface. The meros is furnished with two rows of teeth, that converge together towards the ischium upon the inner surface. The other pereiopoda have little to attract attention. The second somite of the pleon has a tuberculous ridge just above the lateral margin. The inner scale of the posterior pair of pleopoda is furnished with a central row of short, sharp teeth; and the telson is armed with similar teeth, of which there are a few in the median line and others in two lateral obsolete rows.

The specimen from which the description is taken is a male. Of all the species of this genus, this form approximates the nearest to its marine allies, in the appearance of the great chelate pereiopoda, of any that we are acquainted with. The generally close resemblance of the several species of this genus is certainly very remarkable, when we take into consideration the vast geographical distribution that it has—larger, perhaps, than that of any genus of Crustacea that is not of marine habits. Species have been taken in the frozen waters of North American rivers, in the hot latitudes of Chili, in temperate Europe and Tasmania, and now from the African island of Madagascar. We do not know of any having yet been recorded from the inland rivers of that continent.

MISCELLANEOUS.

On Pristolepis marginatus, *Jerd.*

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,—Some time since, Dr. Günther founded the genus *Catopra* on a freshwater fish from Siam; and he has recently added another species to the genus, from the west coast of India, under the name of *Catopra malabarica.*

In 1849 or 1850 I described that very genus under the name of *Pristolepis*, founding it on the identical species lately described by him from the Malabar coast, which I named *Pristolepis marginatus.* It is very possible that Dr. Günther may not have seen my paper on the freshwater fishes of Southern India, published in the 'Madras Journal of Literature and Science'; but it is quite as likely that he has seen and ignored it; and I therefore beg to call his attention to it, as well as that of other naturalists who may not be disposed to treat so slightingly the labours of fellow-workers in natural science, writing under every disadvantage in a foreign land. It is very possible that the generic name bestowed by me may have been previously applied, in which case Dr. Günther's name will stand. This fish, I may remark, is found in rapid rivers in Malabar, and also in the elevated region of the Toynaad, the waters of which flow into the Cauvery, on the eastern coast of India. It frequents chiefly rapids; and I have taken it with bait. I have not seen it longer than 9 or 10 inches.

Some two or three years ago Dr. Günther contributed a short paper to the Zoological Society, remarking on the extension of several marine genera of fishes to Nepal, apparently on the strength of certain specimens in Mr. Hodgson's collection. I have not the paper now by me to refer to; but among others were *Therapon* and, I think, *Scatophagus.* I need hardly say that the extension of any of those marine and estuary fishes to Nepal is perfectly mythical; and I am sure that Mr. Hodgson himself would not countenance the idea for one moment. He probably purchased the fishes at Calcutta.

I intended at the time I saw this paper to have sent you a note on the subject, and indeed wrote out a short paper; but it was delayed through some cause or other.

I am, Gentlemen, yours obediently,

T. C. Jerdon,
Surgeon-Major.

Srinuggur, Cashmere,
Aug. 7, 1865.

[In answer to the above statements, we have received the following from Dr. Günther.—Ed. Ann. Nat. Hist.]

1. It is scarcely necessary to say that Mr. Jerdon is in error in believing that the genus *Catopra* was founded by me; it was established by Dr. Bleeker in 1851.

2. Mr. Jerdon's paper on Indian Fishes is known to me; the description of *Pristolepis*, however, bears so much the stamp of being written "under every disadvantage in a foreign land," that neither I myself nor Dr. Bleeker were able to recognize *Catopra* in it.

3. Since I wrote my paper on Mr. Hodgson's collection of fishes, I have ascertained that not only all the Indian species of *Therapon* enter fresh waters freely, but that several are exclusively freshwater fish.—A. GÜNTHER.

On the Constitution of the Fruit in the Cruciferæ.
By M. E. FOURNIER.

When a horizontal section is made of a bilocular Cruciferous fruit, especially of a young ovary after the amalgamation of the two parts of the septum, the latter is seen to be bifurcate at each extremity, and to embrace in the angle produced by this bifurcation the elongated column from which the two rows of ovules originate, described by the author as the placenta. This arrangement produces a triangular canal extended longitudinally within each placenta, the horizontal section of which forms a triangle, with its apex at the point of bifurcation of the two lamellæ of the septum, and its base upon the placenta itself.

The placenta presents, passing inwards, the epidermis, a green parenchyma, cortical fibres, ligneous fibres, and tracheæ. The epidermis presents projections formed by the cuticle, which are very common in the Cruciferæ. The green parenchyma completely surrounds the placenta in most genera. It is continuous on each side with the subepidermal parenchyma of the valves, and more internally with the double origin of the septum, which springs directly from it. The cortical fibres exist only on the outer side of the placental column. The woody fibres, which contain chlorophyll at an early period, form around the tracheæ a ring which is thicker exteriorly than interiorly. The trophosperms originate from the placenta, sometimes within, sometimes outside of, the triangular canal; in the former case they perforate one of the lamellæ of the septum, to which they appear to be adnate.

The valves present a double epidermis, the outer one with longitudinally elongate cells, the interior with transverse cells, arranged in two or three series. Within the outer epidermis there is a parenchyma, in which vascular bundles ramify in various ways, according to the genera and species; this is separated from the inner epidermis by a remarkable undescribed fibrous layer. It is formed of very thick fibres, of which the section presents several concentric lines, and strongly refracts light. The form of the section is circular in *Lunaria biennis* and *Psychine*, elliptical in *Sisymbrium*. These fibres, when examined in the middle part of the horizontal section, form a simple row in *Lunaria* and *Sisymbrium*, several rows with parallel elements in *Psychine*, two rows with crossed elements in *Fibigia clypeata*, Med., and several rows with alternately crossed elements in *Raphanus* and *Enarthrocarpus*. Near the placentas they are always approximated, in several rows, and form a thicker tissue than in the middle of the valve. Analogous fibres are met with in many fruits (*Malus, Fraxinus, Nigella, Ervum*); but they are never so frequent in other families as in the Cruciferæ. They are absent from the walls of the ovary in the *Resedaceæ* and *Capparidaceæ*.

Below, these fibres terminate in a point, without attaching themselves to any analogous organ; above they are continuous with a fibrous sheath surrounding the stylar canal; laterally they are in contact with the annular parenchyma which surrounds the placenta, and becomes converted into suberous tissue at maturity, causing the dehiscence of the fruit and the separation of the valves. In the genus *Cardamine*, of which the dehiscence is different, the herbaceous layer of the placenta is interrupted at the level of the line of attachment of the valves.

In certain Cruciferæ, which have a free funiculus and a spherical indehiscent fruit, these fibres do not exist, and the horizontal section of the fruit only shows tracheæ ramifying in a parenchyma.

The anatomical structure of the septum has not yet been thoroughly investigated. Its two lamellæ present at first cells filled with green matter, which in some rare cases is retained until the fruit is mature. The form gradually acquired by these cells, the direction of their elongation, and the thickness of the membranes formed by them may furnish specific and even generic characters for the Cruciferæ. The *Alyssineæ* may even be divided into two sections according to the form of the septal network.

Fibres and vessels are frequently developed between the two lamellæ. Sometimes the cells of the septum acquire the character of fibres upon the median line. In many cases there exists in the middle of the septum a fibrous bundle, which encloses a dotted duct in *Sisymbrium tanacetifolium*. In *Matthiola*, *Malcolmia*, and several *Sisymbria*, of which the author makes a distinct group under the name of *Malcolmiastrum*, there is between the two lamellæ an actual membrane formed of juxtaposed fibres, among which are some tracheæ.

In some genera, especially *Farsetia* (excl. *Fibigia*, Dec.), the fibres of the septum are pierced with holes, by which they communicate, forming a very elegant network unconnected with any fibro-vascular bundle.

In *Psychine stylosa* the septum, which is very transparent and formed of polyhedric cells with delicate and inconspicuous walls, presents long branched tubes of very unequal diameter, with distinct walls and greenish granular contents before the maturity of the fruit. These tubes generally ascend nearly parallel to each other; but they anastomose irregularly, so as to resemble a laticiferous network.

But it is in the triangular canal that these formations, sometimes closely resembling certain varieties of laticiferous vessels, are especially met with, containing, however, only granules of chlorophyll, starch, and fatty matters. They consist of isolated ramose cells, or more frequently of elongated lateral vessels emitting branches at right angles to their direction. Among the various elements of this system we may observe sometimes complete partitions communicating by the ordinary punctures, sometimes walls perforated like sieves, sometimes open canals, probably produced by the disappearance of former partitions.

These anatomical observations throw a new light on the constitution of the fruit in the Cruciferæ. Upon this point some writers have put forward singular opinions, in consequence of the difficulty originating from the position of the stigmata in this family. Now all those who suppose that the ovules originate from the median part of a carpellary leaf reduced to the placenta, or joined to its fellow upon the median line of the valves, are refuted by the fact that the placenta presents a perfectly peculiar structure. The opinion of De Candolle, that the septum was formed by the reentering margins of the carpels, is also invalidated, as the four lines of bilateral origin of this organ are situated upon the parenchymatous circumplacentary ring, and the structure of the septum is quite different from that of the valves. The fruit is therefore to be regarded as formed of two carpels alternate with the placentas, and of two intervalvar placentas, from which the septum issues on each side and by a double origin.—*Comptes Rendus*, September 4, 1865, p. 404.

Male Generative Organs of Phalangium.

To the Editors of the Annals of Natural History.

Chislehurst, Kent, 5th Sept. 1865.

Gentlemen,—The 'Annals and Magazine of Natural History' for this month contains a translation of Dr. Krohn's memoir on the Male Generative Organs of *Phalangium*, in which he points out certain mistakes made by Treviranus and Tulk, and explains the true relation and homologies of those organs.

I had, however, four years ago made the same observations, and given a figure in all essentials identical with that of Dr. Krohn ("On the Generative Organs in the *Annulosa*," 'Philosophical Transactions,' 1861, p. 612).

This memoir appears to have escaped the notice of Dr. Krohn.

I am, Gentlemen, your obedient Servant,

John Lubbock.

On the Mode in which the Long-eared Bat captures its Prey.

Botanic Gardens, Regent's Park,
Sept. 14, 1865.

My dear Sir,—I have lately noticed a curious way in which the Long-eared Bat (*Plecotus auritus*) captures its prey; and although it may be familiar to naturalists, I have not found it mentioned by authors.

The peculiar structure of Bats is well known. The highly developed membrane used as the flying-apparatus or wings is also extended from the hind legs to the tail, forming a large bag or net (the interfemoral membrane), not unlike two segments of an umbrella, the legs and tail being the ribs.

Having caught a lively male specimen of the common Long-eared Bat, and placed the little fellow in a wire-gauze cage, and inserted a few large flies, he was soon attracted by their buzz, and, pricking up his ears (just as a donkey does), he pounced upon his prey; but instead of taking it directly into his mouth, he covered it with his body, and beat it by aid of his arms, &c., into the bag or interfemoral membrane; he then put his head under his body, withdrew the fly from the bag, and devoured it at leisure. This appeared always to be the *modus operandi*, more or less cleverly performed. Several times, when the fly happened to be on the flat surface of the ground, the capture appeared more difficult, and my little friend was by his exertions thrown on his back; the tail could then be seen turned round, with its tip and the margin of the membrane pressed against the stomach, forming a capital trap, holding the fly, the captor remaining on his back till he had withdrawn the fly from the bag.

I had no opportunity of observing the action when the Bat was in full flight; but if the insect was captured a few inches from the side of the cage, the mode was the same. When flying, the interfemoral membrane is not extended to a flat surface (and appears not capable of being so stretched), but always preserves a more or less concave form, highly calculated to serve the purposes of a skim-net to capture insects on the wing. Occasionally, when the Bat was sleepy, sitting at the bottom of the cage, nodding his head, a poor silly "Bluebottle Fly," no doubt of tender age, and not read in the natural history of the Vespertilionidæ, with the greatest confidence walked quietly under his friend, passing nose, ears, and eyes without danger; but immediately he touched the sensitive membrane of the bag it was closed upon him, and there was no retreat except by being helped out of the difficulty by the teeth of the Bat.

On looking through books at hand to see if the above was noticed, I find that most accurate of observers of nature's works, Gilbert White, of Selborne, speaking of a tame Bat, says, "If you gave it anything to eat, it brought its wings round before its mouth, hovering and hiding its head in the manner of birds of prey when they feed" (a capital description of the action of my little friend, only no mention is made of the bag). Also, in Bell's 'British Quadrupeds' is the following:—"Of Bats, the interfemoral membrane is probably intended to act as a sort of rudder in rapidly changing the course of the animal in the pursuit of its insect food." "In a large group of foreign Bats which feed on fruits or other vegetable substances, as well as some of carnivorous habits, but whose prey is of a less active character, this part is either wholly wanting or much circumscribed in extent and power."

May it not also be, that they do not require an entomological bag-net? Believe me yours truly,

To W. Francis, F.L.S. WM. SOWERBY.

On the Habits of the Water-Shrew (Crossopus fodiens). By N. L. AUSTEN, Esq.

I am induced to offer you the following account of the Water-Shrew, as the animal in question, though tolerably abundant in many localities, may not have come under the personal observation of some of my hearers. I have also never seen it mentioned as having been kept with success in confinement, and therefore will attempt to describe as accurately as possible the habits of a pair that lived in my possession for a considerable time, hoping that the details may not prove altogether uninteresting. In form this Shrew closely resembles the common species, the snout being lengthened in the same manner, and the fur having the same velvety softness of texture. In size, however, it is superior, a full-grown male measuring a little more than 5 inches in total length, whereas the Field-Shrew rarely exceeds 4 inches; the feet and tail are fringed with stiff white hairs, which are of great assistance to the creature when swimming. The colour on the head and back is commonly a rich jetty black, on the sides and underparts pure white; the line of demarcation between the two colours very distinctly defined, adding much to the beauty of the fur; a small tuft of white hairs is also noticeable at the corner of the ear.

The Water-Shrew, as its name implies, is usually found in the vicinity of pools and rivulets, where it forms in the banks long and winding burrows, which penetrate for a considerable distance into the loose soil, and end in a small chamber, furnished with a bed of moss and dry grass. In this secluded retreat the young are produced about the middle of May, there being usually from six to ten in the litter. When first born, they are curious pinky-white little animals, with round blunt noses and semitransparent bodies, bearing as little resemblance as possible to their parents. A small colony of these Shrews frequently inhabit the same spot, and towards the cool of the evening may be observed searching for food, and sporting with each other in the water, now hiding behind stones or large leaves to elude their companions, and then darting out to engage in a general skirmishing chase, diving and swimming with the greatest activity, and occasionally taking a plunge into their holes. By constantly traversing the same ground, in going and returning from their burrows, they gradually tread down a path among the grass and herbage, by which their presence may readily be discovered by an experienced eye. When under water their fur is covered with multitudes of tiny air-bubbles, that shine like silver, and have a beautiful effect when seen against the dark surface of the body. Spots where the stream in some bend of its course forms a little pool are the favourite resorts of this pretty little creature; and, although easily startled by the slightest noise, their range of vision seems far from extensive, as, by quietly approaching, I have often succeeded in watching their gambols without causing alarm among the small community. The food of the Water-Shrew includes insects, worms, young frogs, and small fish, which latter it pursues and captures with all the graceful dexterity of the Otter. I am enabled to speak with certainty as to this fact, by observing the mode employed by my own pets in seizing their prey. I obtained them in the following manner:—Having noticed a very fine pair that frequented a small pond, I set several circular wire mouse-traps, baited with small frogs, in what I supposed to be their favourite runs, and secured both male and female by the next morning. I had already had a cage constructed as much as possible in accordance with what I knew of their mode of life. It was shaped like an ordinary arched dormouse-cage, but considerably larger than those used, being 12 inches in height by 18 in length; a zinc tank was also adapted to hook on to the doorway, so that they might enjoy the comfort of a bath. When first introduced into their new dwelling, the Shrews evinced no symptoms of fear, appearing quite at home, and feeding freely on worms, raw meat, and insects. A few days after I procured them, I placed three or four minnows in the bath attached to the main part of the cage. Directly the Shrews caught sight of the fish, they both plunged instantly into the water, and quickly reappeared, each having secured a victim, which they proceeded to discuss with great apparent gusto, having first killed it by a bite through the head. I remarked that while feeding they held the fish firmly between their fore paws, in the same manner as the Otter, and, commencing at the head, ate gradually downwards, by a succession of sharp snapping bites. Their appetites were very good, as they frequently consumed two or three minnows each in one day—a very tolerable amount, considering their size. When running about their cage, these Shrews often uttered a shrill sibilant chirp, resembling the note of the Grasshopper-Lark. They would also play in the water, half rearing up and striking with their fore paws, or rolling over and over each other on the surface. Though appearing perfectly reconciled to captivity, they manifested no attachment, nor especial tameness, biting viciously when touched. They lived with me in this way several months in perfect health, till the cage-door being accidentally left open one day in my absence, the inmates levanted, as a matter of course, and were never seen or heard of afterwards. I hope, however, shortly to obtain more, as when treated properly, and supplied with plenty of water, they thrive, and might probably be induced to breed in confinement. Besides the Common Shrew, which is exclusively terrestrial, another species, the Oared Shrew (*Crossopus remifer*), is found in Britain. For some time this animal was confounded with the Water-Shrew, as its habits are similar, and it frequents the same situations. It differs, however, in colour, the black on the back and sides being flecked with white hairs, the throat and abdomen blackish grey tinged with yellow. Though scarcer than the two other kinds, the Oared Shrew is more abundant than is often supposed by naturalists, as I have several times caught it in different parts of Hertfordshire and Surrey. I must here remark that the ears of both the Oared and Water-Shrew are furnished with a peculiar and beautifully contrived apparatus by which the water is excluded from those organs. It consists of three small valves, which fold together when the animal dives, effectually preventing the entrance of a single drop of moisture. As soon, however, as the pressure is removed, on the Shrew rising to the surface, they reopen spontaneously. Without this provision of nature, the animal would constantly be annoyed by the water filling the cavities and irritating the delicate membranes of the ear.

The dimensions of full-grown individuals of the three species are as follows:—

Common Shrew.	in.	lin.	*Water-Shrew.*	in.	lin.	*Oared Shrew.*	in.	lin.
Total length	4	1	Total length	5	7	Total length	6	1
Head	1	2	Head	1	5	Head	1	7
Tail	1	9	Tail	2	1	Tail	2	4
Hind foot ..	0	3	Hind foot ..	0	5	Hind foot ..	0	7

Proc. Zool. Soc. June 27, 1865.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 95. NOVEMBER 1865.

XXXIII.—*On the Microscopic Structure of the Shell of* Rhynchonella Geinitziana. By William B. Carpenter, M.D., F.R.S., F.L.S., F.G.S.

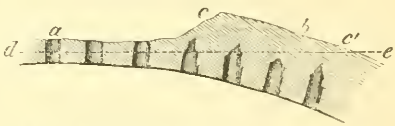
In consequence of my prolonged absence on the Continent, it has been only within the last few days that I have seen Prof. King's "Remarks on the Histology of *Rhynchopora Geinitziana*," contained in the Ann. Nat. Hist. for last August (p. 124). These remarks have led me to subject my preparations of that shell to a renewed microscopic examination, of which I have now to state the results. Before doing so, however, I may say that I have done my best to dismiss from my mind any prejudice in favour of that view of its structure which I might be supposed to derive from the conclusion to which I had been led by my previous researches—that whilst the *perforation* of the shell by canals passing from surface to surface is the family character of the *Terebratulidæ*, the *absence* of such perforation is the family character of the *Rhynchonellidæ*. The progress of natural-history inquiry is continually bringing to light examples in which features essentially characterizing one group appear in particular types belonging to another. Thus, a paper "On Rose-spored Mushrooms," by Mr. Berkeley, now lying before me, commences as follows:—"I have already pointed out that a single species with decidedly rose-coloured spores (*Agaricus euosmos*) occurs in the white-spored series; but its affinities with the common Oyster-Mushroom (*A. ostreatus*) are so intimate that it would be in direct opposition to nature to separate them." It would not in the least surprise me, therefore, to meet with a perforated Rhynchonellid; and I can honestly say that no *wish* to make out *Rhynchonella Geinitziana* imperforate is father to the *belief* that, as regards its outer layer, it really is so.

The preparations in my possession consist (1) of transparent lamellæ, scaled off from the exposed surface of German and

Russian specimens of the fossil shell in question, and therefore passing, more or less exactly, in a direction *parallel* to that surface; and (2) of a transparent *vertical* section of a German specimen. As these specimens were supplied to me by Mr. Davidson, there can be no doubt of their authenticity.

Some of the transparent lamellæ exhibit distinct and regular perforations, filled with black matter, of considerable size; and had these lamellæ been my sole materials of judgment, I should have readily accorded with the description of Prof. King. But, as I stated when the matter was formerly under discussion (Ann. Nat. Hist. March 1857, p. 214), this appearance is presented only by lamellæ taken from abraded surfaces, and therefore belonging to the *internal* layer of the shell. In a transparent fragment in which the *natural surface* of the shell is partially preserved, the large and regular black spots are seen only near one edge; towards the middle they give place to small black dots, so irregular in size and form as scarcely to be distinguishable from others which are obviously due to infiltrating deposit; and towards the other side they are wanting altogether. Now in the whole of this specimen the characteristic structure of the shell is most perfectly preserved, so that the absence of the marks of perforation cannot be ascribed to metamorphic action.

The key to this variety in the appearances presented by parallel lamellæ is afforded by the *vertical* section. In one part (*a*) of this section there is an obvious deficiency of the external layer of the shell, and the perforations are seen to pass continuously through the remaining internal layer.



Vertical section of a portion of the shell of *Rhynchopora Geinitziana.*

But in another part (*b c*), the external layer is preserved in great part, if not the whole, of its thickness; and *this layer is plainly seen not to be perforated at all*, the passages all stopping short of it, sometimes ending abruptly in rounded terminations (*b*), sometimes more pointedly (*c c′*). Hence it is obvious that if the plane of a *parallel* section pass along the line *d e*, it will show at *a* large perforations, at *c* small perforations, and at *b c′* none at all, which is exactly what is seen in the specimen previously described. And further, as the transparence of the shell allows the large black spots with which the inner layer is regularly marked to be plainly seen through the outer layer, even when this is perfectly preserved, it is easy to understand how readily the conclusion might be drawn from incomplete observation, that the perforations extend through the whole thickness of the shell,—a conclusion which I have shown to be negatived by the decisive test of a vertical section.

I feel myself justified, therefore, in reiterating my former statement, that the passages which are visible in the shell of *Rhynchonella Geinitziana* traverse the internal layer only, and are therefore of the nature of *pits*, having no physiological relationship with the *canals* which traverse the whole thickness of the shell of the typical *Terebratulidæ*, and which open out in large trumpet-shaped orifices on its external surface, although presenting such a rudimental approximation to that structure—as might almost be expected in some member of the imperforate series.

The readers of the 'Annals' have now both sides of the case fully before them, and can form their own judgment whether it is more likely that Prof. King or that I have fallen into a "serious mistake" in this matter. But I must ask them to bear in mind that Prof. King's observations upon this shell have been made, by his own showing, only with a Stanhope lens, upon the exposed *surfaces* of his specimens; whilst mine have been made with a Binocular microscope and a magnifying-power of 120 diameters, upon *transparent lamellæ and sections*. Further, I would recall to their recollection that it was by surface-observation with the Stanhope lens that Prof. King was formerly led to commit himself to the conclusion that all Brachiopod shells are perforated; from which conclusion, if true, it would necessarily follow that the elaborate drawings and descriptions which I had given (in the Reports of the British Association for 1844), of the microscopic structure of the non-perforated forms, had no prototypes in nature*.

University of London, Burlington House, W.
October 16th, 1865.

* So far from having ever expressed his regret for this grave imputation, of the fallacy of which he has had ample opportunity of convincing himself, Prof. King has recently pursued the very same course, in asserting that *Eozoon Canadense* is not a fossil, but is a product of chemical and physical agencies. For, if this be true, it necessarily follows, either (1) that my description of its Foraminiferal characters has no foundation in fact, or (2) that I am incompetent to pronounce upon what I assert to be indubitable Foraminiferal structure. As he has not adduced one single fact to justify either of these charges, I have felt myself called upon to repudiate *in toto* his claim to authority in this matter. Whether, under such circumstances, the charge of "personality" is to be laid at my door or at Prof. King's, I leave it to others to decide. Although he may have used no hard words, the imputations conveyed by his assertions would, if true, be more damaging to my personal as well as to my scientific character than any epithets he could employ.

XXXIV.—*Contributions to an Insect Fauna of the Amazons Valley.* COLEOPTERA: LONGICORNES. By H. W. BATES, Esq.

[Continued from p. 182.]

Genus XYLOMIMUS, nov. gen.

Body cylindrical, narrow. Head vertical, or slightly inclined backwards; muzzle moderately elongated; sides rounded; forehead very slightly convex; eyes small, lower lobe nearly circular. Antennæ moderately distant at their bases, with inner side of antenniferous tubercles prominent and angular; basal joint dilated almost from the base, and forming a thick, oblong club, with the lower edge slightly waved; third joint one-third longer than the first, and also thickened nearly from the base, continuing of the same thickness to the apex, furnished on the underside with a fringe of long bristles; fourth joint slender, slightly thickened in the middle, and about one-half the length of the third; fifth to seventh joints each about one-half the length of the fourth, slender (rest wanting). Thorax cylindrical, longer than broad, and deeply wrinkled transversely; lateral tubercles inconspicuous. Elytra linear, obtusely rounded at the apex, surface free from excrescences; pro- and meso-sterna plane. Legs very short, thighs clavate, tibiæ broad; claw-joint of the tarsi as long as the remaining joints taken together.

The species on which this genus is founded presents, from its shape and style of coloration, a striking resemblance to a fragment of a slender decayed branch.

Xylomimus baculus, n. sp.

X. angustatus, cylindricus, thorace transversim crebre ruguloso; elytris stria impressa suturali, apice singulatim obtuse rotundatis; corpore supra brunneo, lateribus obscure ochraceo; elytris pone medium fascia lata flexuosa brunnea ochraceo lineata; antennis brunneis, articulo quarto flavo. Long. $5\frac{1}{4}$ lin. ♂?

Head dingy ochraceous, front uneven, punctured; vertex and occiput ample, brown, streaked with rusty ochreous; antenniferous tubercles slightly prominent on their inner sides, and leaving a small semicircular notch between them. Antennæ with the first and third joints dark brown varied with ochreous, bristly, fringe of the third also dark brown, fourth joint yellow, fifth, sixth, and seventh rusty brown. Thorax cylindrical, surface covered with numerous, irregular, transverse wrinkles; lateral tubercles small, conical, dark brown in the middle, with three indistinct rusty-brown vittæ; sides each with an ochreous vitta, below which is a broader brown vitta. Elytra linear, shoulders not prominent, apex of each obtusely rounded; surface slightly uneven, plane towards the base and more convex beyond the middle, punctured (except near the apex) and marked with an impressed stria near the suture; colour rusty ochreous, with a broad common brown vitta over the suture from the base to beyond the middle, and a broad irregular brown fascia (lineated with rusty brown) at the termination of the vitta, the space near the apex having an irregular ochreous spot followed by a similarly shaped brown spot. Body beneath light brown; sides of prothorax and breast with an ochreous-white vitta; abdomen streaked with ochreous white. Legs clothed with pale tawny-brown pile.

Found on a slender dead branch of a tree in the forests of the Tapajos.

Genus Ecthœa, Pascoe.

Pascoe, Trans. Ent. Soc. n. s. iv. p. 244 (1858).

Syn. *Talasius*, Buquet, Thoms. Arcana Naturæ, p. 99 (1859).

This remarkable genus is distinguished from the allied groups by many well-marked features, which have been well described by the authors above quoted. I myself met with female examples only, and have not been able to examine the opposite sex, which bears one of the chief marks of the genus—namely, four horn-like projections from the forehead. The body is large and cylindrical; the head very broad, and remarkable (besides the horned forehead of the male) for the great convexity of the crown, which rises very much higher than the base of the antennæ, and descends perpendicularly from its front edge towards the tubercles which support those organs. The elytra are broad and square at the apex, and each one is deeply sinuated in the middle, so as to form two projections or lobes. The antennæ are rather slender, in the female as long as the body, with the basal joint tumid on one side at the apex, and the third joint slightly curved.

My specimens differ in colour from the one figured by M. Buquet; but I believe them to be referable to the *E. quadricornis* of Olivier. The *Trachysomus faunus* of Erichson (Consp. Peru. p. 148) seems to be quite a distinct species of this genus.

Ecthœa quadricornis, Olivier.

Cerambyx quadricornis, Oliv. Ent. iv. p. 97, pl. 20. f. 158.

Talasius quadricornis, Buquet, Thoms. Arc. Nat. p. 100, pl. 5. f. 6.

The female example now in my collection, and which I found at Ega, is $9\frac{1}{4}$ lines in length, the head being $2\frac{3}{4}$ lines in width. The upper part of the forehead is yellow, brown near the crown, where it is marked with three black spots; the lower part is of a blackish olive-colour, the line of demarcation between the two colours being a transverse carina, from which in the male rise the two lower frontal horns. The thorax is very uneven on each side, one of the elevations near the anterior part of the disk on each side forming an acute tubercle; the colour above is rusty ochreous, the hind part having two blackish lines, which are severally continuous with the rounded velvety black spots on the elytra, on each side of the scutellum. The elytra are of a light green hue, except on the apical fourth, where there is a large ashy-ochreous spot, streaked with dark brown, very similar to the streaked apical spots in the genus *Eudesmus*. The underside of the prothorax and breast is greenish ashy. The legs are green, varied with greenish ashy. These green and rusty-ochreous hues, combined with the rugged surface of the insect, give it very much the appearance of a mossy fragment of wood, when it is seen clinging close to a dead bough, as is the habit of the creature.

Genus Trestonia, Buquet.

Buquet, in Thomson's 'Arcana Naturæ,' p. 45.

Like many other generic groups of Longicorns, the present one is recognizable rather by a similar general form and coloration than by definite structural characters. The species are cylindrical or linear and depressed in shape, and exhibit a dark-brown or black curved mark towards the apex of the elytra, preceded by a pale-ashy or greenish patch, and succeeded by fulvous strigæ nearer the apex. The possession of this characteristic mark points to a near relationship with *Eudesmus* and *Ecthœa*; but some species answer very well to the definition of the genus *Hesycha*, as far as structure is concerned. All the species, however, are more linear in form than the *Hesychæ*, and the antennæ in nearly all are more nearly approximated at their bases. The head is variable in width, and the forehead is somewhat convex in the middle; the latter is in most species clothed with pale-coloured tomentum. The antenniferous tubercles, in the broader-headed species, have prominent and sometimes cornuted inner angles. The antennæ themselves are slender and setaceous, in the males often twice the length of the body; their basal joint is clavate, and the third joint, with few exceptions, a little curved. The thorax is cylindrical and uneven, never short and broad. The elytra are linear, obtusely rounded at the apex, free from centro-basal elevations and tubercles; the shoulders are prominent and acute, and curved anteriorly. The legs are moderately short, the thighs clavate, the claw-joint robust, as is universal in the Onciderìtæ, and equal in length to the three remaining taken together.

The *Trestoniæ*, like the other genera of the present group, are found on branches of trees, clinging closely and gnawing the bark and surface-wood.

1. *Trestonia Chevrolatii.*

Trestonia Chevrolatii, Buquet, Thoms. Arc. Nat. p. 46.

T. elongata, subdepressa; capite lato, tomento flavescente dense vestito, maculis duabus verticis alterisque frontalibus nigris, genis et gula nigricantibus; antennis basi distantibus, brunneis, tuberculis antenniferis intus modice productis acutis (♀); thorace obscure fusco-grisescente, supra transverse ruguloso sulcis duobus transversis juxta marginem posticum distinctioribus; elytris postice paulo attenuatis, dorso depressis, humeris subconicis, granulatis, disco bicostato lineaque elevata suturali, punctatis, griseis, ante apicem utrinque plaga curvata nigra (antice albo marginata), dein fulvo-brunneis macula subapicali pallida; corpore subtus pedibusque viridi-griseis, abdomine ferrugineo-brunneo, segmentis tribus posterioribus lateribus ochraceis. Long. 10 lin. ♀.

One example, taken at Ega, and named as above, from the typical specimen formerly belonging to M. Chevrolat. It would be impossible to determine the species from the meagre description of M. Buquet.

2. *Trestonia ramuli,* n. sp.

T. elongato-oblonga, postice (♂) angustata, subdepressa, fusca, fulvo variegata; elytris medio macula magna laterali viridi-cinerea postice dentata et fusco marginata, intra apicem macula distinctiore fulva; tuberculis antenniferis distantibus, intus utroque sexo prominulis acutis; antennis corpore paulo longioribus, articulo tertio curvato. Long. 6–6½ lin. ♂ ♀.

Head moderately broad, forehead punctured, dingy brown varied with tawny; antenniferous tubercles with their inner angles in both sexes prominent, acute, conical, and distant from each other somewhat widely. Antennæ very little longer than the body in either sex, dark brown; joints paler at the base; third joint rather strongly bent in the middle. Thorax subcylindrical, widest in the middle, convex, transversely depressed near the hind margin, very uneven above, and obtusely tuberculose on the sides; dark brown, varied with rusty tawny. Elytra with prominent conical shoulders, and gradually narrowed towards the apex (much less so in the female than in the male), surface scarcely convex, simply punctured (except near the apex), dark brown, minutely varied with rusty tawny, and having on each side in the middle a large, oblique, greenish-ashy spot, widest on the margin: this spot is bordered posteriorly by a broadish, flexuous, blackish streak; and close to the apex there is a tawny spot, larger and clearer in colour than the other tawny marks. Body beneath and legs clothed with olivaceous-ashy tomentum.

On dead branches, Ega.

3. *Trestonia albilatera*, Pascoe.

Hesycha albilatera, Pascoe, Trans. Ent. Soc. n. s. v. pt. 1. 25.

T. elongato-oblonga, apicem versus paulo attenuata, subdepressa, fusca, fulvo minute varia; capite latiusculo, fronte ochracea, tuberculis antenniferis intus in lobulos erectos oblongos productis (♂); elytris utrinque plaga maxima laterali (fere ad basin extensa) cana, postice nigro marginata. Long. $6\frac{1}{2}$ lin. ♂.

Similar, in its elongate-oblong subdepressed form of body and general colour, to *T. ramuli*, but differs in the elytra being much less prominent at the shoulders, and not attenuated, except from very near the apex; the pale lateral spot, too, is much larger and whiter, extending from behind the middle to the shoulders. The thorax is cylindrical and very uneven on its surface, as in *T. ramuli*; but it has two transverse impressed lines near the hind margin, and a distinct conical lateral tubercle, much behind the middle. The forehead is clothed with dense tomentum of a pale ochreous hue. The underside of the body is ashy, with a broad rusty-tawny stripe down the middle of the abdomen. The antennæ are very slender and twice the length of the body in the male; the terminal joints are greatly elongated, and the third with a scarcely perceptible bend.

Ega, on branches of trees.

4. *Trestonia coarctata*, n. sp.

Trestonia terminata, Buquet, Thoms. Arc. Nat. p. 47, pl. 5. f. 3?

T. cylindrica, cinereo-fusca, fulvo varia, vertice coarctato; antennis basi valde approximatis, articulo basali elongato, apice abrupte clavato; elytris crebre punctatis, apice nigris, fulvo lituratis. Long. $4\frac{1}{2}$–6 lin. ♂ ♀.

The form of body and situation of the dark apical spot (close to the apex of the elytra) in this species so closely resemble the same features in the figure above quoted of *T. terminata*, that it is not unlikely the specimens here treated of belong to that species. I cannot, however, reconcile the description of the colours given by M. Buquet with my insects; and the figure is as uncertain in this respect as the description. His words are, "Couleur générale d'un gris-verdâtre mélangé de blanc et parfois de jaunâtre sur le devant de la tête, sur les bords latéraux du prothorax et sur la partie inférieure des élytres." The head in all my specimens is of a pale ashy hue, with a dark-brown spot on the upper part of the forehead between the eyes. The elytra as well as the thorax are dark brown, clothed with thinnish ashy pile, and sometimes varied with tawny, and becoming of a paler ashy hue near the dark apical spots. The thorax has a number of large scattered punctures, and the elytra are thickly punctured, except at the extreme apex. The antennæ are closely approximated at the base, the bases of the tubercles being separated only by the impressed line on the vertex; the angles of the tubercles are not produced. The antennæ are more than twice the length of the body in the male, the apical joint being twice the length of the preceding, and of great tenuity; in the female they are but little longer than the body, but the apical joints are very slender and more elongated than is usual in the female sex of Longicorn insects; the basal joint is as long as the third, and clavate at the apex.

Found, rather commonly, on slender branches on the banks of the Tapajos, and also at Ega.

Genus Peritrox, nov. gen.

Body subcylindrical. Head moderately narrow; face plane, inclined obliquely backwards; eyes ample, convex; antenniferous tubercles with their inner angles produced. Antennæ elongated, simple; basal joint gradually thickened from the base; third joint straight, one-fourth longer than the first, fringed beneath with fine hairs. Thorax subcylindrical, uneven, sides armed with prominent, acute lateral tubercles. Elytra cylindrical, free from ridges and tubercles; apex rounded. Legs moderate; thighs clavate; claw-joint of tarsi greatly elongated, longer than the three remaining joints taken together.

This new genus, founded on one species only, is very closely allied to *Trestonia*, differing, in structural characters, chiefly in the gradually thickened basal joint of the antennæ. The characteristic feature in the coloration of the elytra of *Trestonia* is entirely absent, the colours being dull and uniform. In form of body and head, the species described below resembles much *Trestonia terminata* and *T. coarctata*.

Peritrox denticollis, n. sp.

P. subcylindrica, paulo convexa, fuliginosa; elytris maculis tomentosis fulvo-brunneis adspersis; capite inter antennas profunde impresso; thorace transverse ruguloso, lateribus acute tuberculatis. Long. 5 lin. ♂.

Head sooty black, coarsely punctured on the forehead and crown, and deeply grooved between the antenniferous tubercles, which are closely approximated at their bases, and have their inner edges produced into short ear-like lobes. Antennæ blackish, shining. Thorax subcylindrical, surface uneven, and marked with a few sharp transverse wrinkles, besides two impressed lines parallel to the hind margin; lateral tubercles conical, acute; colour sooty brown. Elytra cylindrical, narrowed only very near the apex, the latter rounded; surface thickly punctured, except near the apex, sooty brown, sprinkled with spots formed of dingy-tawny tomentum. Body beneath and legs pitchy, thinly clothed with ashy pile.

Santarem, on a dead branch: one example.

Genus Pachypeza, Serville.

Serville, Ann. Soc. Ent. Fr. (1835) iv.

The forehead, muzzle, and eyes in this genus resemble much the same features in *Oncideres*; but the crown is narrower and more depressed between the antenniferous tubercles. The body is elongate, but narrower than in any species of *Oncideres*. The antennæ have their joints beneath (including the basal joint) clothed more or less densely with longish hairs. The thorax is cylindrical, about as long as broad, and covered above with transverse wrinkles. The pro- and meso-sterna are extremely narrow. The legs are short and stout, the femora clavate, the tibiæ very short and compressed, and the tarsi have the claw-joint, although elongated, much less robust and shorter than in *Oncideres*.

Pachypeza lanuginosa, n. sp.

P. cylindrica, robusta, fusco-cinerea; capite latiore; antennis distantibus, articulis sex basalibus infra pilis tenuibus dense vestitis; elytris prope basin confertim et subtiliter granulato-punctatis. Long. $9\frac{1}{2}$–10 lin. ♂ ♀.

Head rather broad, forehead between the antenniferous tubercles depressed; eyes large, oblong, ashy tawny. Antennæ a little longer than the body in the male, about the same length in the female; terminal joints shorter than the median ones, last joint short and pointed; basal and five succeeding joints densely clothed beneath with very fine hairs; colour ashy brown. Thorax scarcely so long as broad, surface closely wrinkled, many of the wrinkles not continuous; colour ashy brown. Elytra cylindrical, convex; shoulders somewhat prominent; basal fourth of the surface studded with small, regular granulations, accompanied by punctures; finely punctured in the rest of their surface; colour ashy brown, deflexed sides paler. Body beneath and legs tawny brown; base of abdomen on each side, and hind legs, sooty brown.

Ega and S. Paulo, Upper Amazons, on slender woody stems.

XXXV.—*An Examination of the Dejeanian Genus* Cœlomera (Coleoptera Phytophaga) *and its Affinities.* By the Rev. Hamlet Clark, M.A., F.L.S.

[Continued from p. 268.]

Genus Monocesta.

Division B.

Species of smaller size; in form more robust, short, and parallel; elytra not postmedially dilated; thorax with the transverse depression more obsolete; antennæ shorter, more robust, and slightly incrassated. Species 13–26.

Section I.

Elytra black, or fuscous black, or dark green. Species 13–19.

13. *M. obliquenotata.*

M. robusta, lata, satis parallela, rugosa, leviter pubescens, purpureo-fusca, thorace humeris fascia obliqua et corpore subtus rufo-flavis; *caput* leviter punctatum; *thorax* transverse depressus, lateribus mediis angulatis, punctatus, rufo-flavus, macula utrinque insulata magna nigro-fusca; *scutellum* subtriangulare, impunctatum, flavum; *elytra* robusta, subrugosa, purpureo-fusca, humeris et fascia obliqua (a sutura ad margines postmedios tendente) atque etiam sutura et apice (obsolete) rufo-flavis; *antennæ* fuscæ, art. 1° 2° et 3° infra flavescentibus; *corpus subtus* rufo-flavum; *pedes* rufo-fusci.

Long. corp. lin. 6; lat. lin. 3.

Amazons. Collected by Mr. Bates.

14. *M. cincta.*

M. lata, robusta, subparallela, subtilissime pubescens et rugosa, nigro-fusca, thorace elytrorum fascia corpore subtus femoribusque flavo-fuscis; *caput* ad frontem foveolatum; *thorax* lateribus ad medium angulatis, disco depresso, subtiliter punctatus, rufo-flavus, disco medio nigro; *scutellum* subtriangulare, impunctatum, flavum; *elytra* robusta, subparallela, leviter rugosa, opaca, nigro-fusca, fascia media recta marginibus et tenuiter sutura flavis; *antennæ* fuscæ, art. 1° et 2° flavo-fuscis; *pedes* fusci, femoribus flavis; *corpus subtus* rufo-flavum.

Long. corp. lin. 6; lat. lin. 3.

Amazons. Collected by Mr. Bates.

15. *M. spectanda.*

M. robusta, parallela, subtilissime rugosa, rufo-flava, elytris (marginibus exceptis) viridescentibus; *caput* ad basin foveolatum, minute punctatum, rufum, macula triangulari basali fusca; *thorax* transverse depressus sparsim pubescens rufo-flavus, disco medio fusco

adumbrato; *scutellum* rufo-flavum; *elytra* rugosa, viridescentia, marginibus flavis exceptis; *corpus subtus* et *pedes* flava; *antennæ*, art. 1° et 2° exceptis flavis, in exemplo unico desunt.
Long. corp. lin. 6; lat. lin. 4.

Cayenne. Received from the cabinet of M. Chevrolat.

16. *M. flavo-cincta.*

M. parallela, lata, subdepressa, rugosa, opace viridis, corpore subtus thorace anteriore femoribus et elytrorum marginibus flavis; *caput* ad basin foveolatum, impunctatum, rufo-flavum, inter oculos super antennarum margines nigrum; *thorax* vix ad discum medium depressus, sed lævis, planus, subrugosus, rufo-flavus, basi et disco medio nigris; *scutellum* subquadratum, impunctatum; *elytra* lata, rugosa, opace viridia, marginibus tenuiter rufo-fuscis; *antennæ* fuscæ, art. 1°–3^m rufo-flavis; *pedes* fusci, femoribus flavis; *corpus subtus* rufo-flavum.
Long. corp. lin. $4\frac{1}{2}$; lat. lin. $2\frac{1}{2}$.

Relatively broader, and with the thorax differently formed from *M. circumcincta*. The two species are nearly allied.

Amazons. Taken by Mr. Bates.

17. *M. circumcincta*, Dej.

M. satis depressa, subparallela, rugosa, rufo- vel fusco-flava, antennis nigris; elytris nigris vel nigro-cyaneis; *caput* longitudinaliter foveolatum, flavum; *thorax* impunctatus, fortiter transverse depressus, flavus; *scutellum* fuscum; *elytra* thorace paulum latiora et versus apicem subampliata, rugosa, nigro-cyanea, marginibus ab humeris ad apicem rufo-flavis; *antennæ* nigræ, art. 1°–3^m interdum subtus flavescentibus; *pedes* et *corpus subtus* vel flava vel fusco-flava.
Long. corp. lin. $3\frac{1}{2}$–5; lat. lin. 2–3.

Brazil.

18. *M. carbonaria.*

M. subparallela, paulum depressa, leviter rugosa, opaca, flava; elytris antennis tibiis tarsisque nigris; *caput* rugosum, flavum, inter oculos fuscescens; *thorax* ad medium longitudinaliter foveolatus, leviter punctatus, subpubescens; *scutellum* nigrum; *elytra* subparallela, crebre rugosa, opace nigra; *antennæ* filiformes, nigræ; *corpus subtus* fusco-flavum, abdomine flavo; *pedes* flavi, tibiis et tarsis nigris.
Long. corp. lin. 4; lat. lin. 2.

Amazons. Taken by Mr. Bates.

19. *M. nigriventris.*

M. parallela, attenuata, rugosa, flava; antennis elytris abdomine et tibiis nigris; *caput* longitudinaliter foveolatum; *thorax* leviter punctatus; *scutellum* fuscum; *elytra* parallela, rugosa, attenuata,

opace nigra; *antennæ* filiformes, nigræ; *corpus subtus* rufo-fuscum, abdomine nigro; *pedes* rufo-flavi, tibiis et tarsis nigris.
Long. corp. lin. $3\frac{1}{2}$; lat. lin. $1\frac{3}{4}$.

Brazil.

Section II.

Elytra flavous for the most part. Species 20–26.

20. *M. Klugii*, Dej.

M. robusta, parallela, rugosa, opaca, subpubescens, fusco-flava, maculis viridibus ornata; *caput* foveolatum; *thorax* transverse depressus, subrugosus; *scutellum* rufo-flavum; *elytra* robusta, rugosa, fusco-flava, notis quatuor utrinque viridescentibus, 1^a scutellari magna, longitudinali, 2^a marginali antemedia minuta, 3^a marginali postmedia minuta, 4^a suturali postmedia circulari; *pedes* et *corpus subtus* rufo-flava; *antennæ* robustæ, fuscæ, art. 1^o rufo.
Long. corp. lin. 5–6; lat. lin. $2\frac{1}{2}$–3.

Brazil.

21. *M. rubiginosa.*

M. robusta, parallela, crebre rugosa, rubiginosa, vittis duabus viridinigris a basi ad apicem; *caput* rugosum, subpubescens, versus apicem flavescens; *thorax* transversus, nigro-rubiginosus, lateribus pallidioribus; *elytra* thorace latiora, parallela, rugosa, rubiginosa, vittis duabus (subsuturali et marginali) indistinctis indeterminatis nigro-viridibus a basi ad apicem; hæ vittæ aliquando interruptæ vel post medium omnino evanescunt; *antennæ* robustæ, nigræ; *pedes* et *corpus subtus* rufo-flava, tibiis aliquando nigro-fuscescentibus.
Long. corp. lin. $3\frac{1}{2}$–$4\frac{1}{2}$; lat. lin. 2–$2\frac{1}{2}$.

Brazil.

22. *M. glauca*, Dej.

M. robusta, subparallela, crebre punctata vel subrugosa, testaceo-pubescens, vel flava vel rufo-flava vel fusca, antennis nigrescentibus; *caput* leviter rugosum; *thorax* paulum transverse depressus, rugosus; *scutellum* triangulare, apice truncato; *elytra* thorace latiora, leviter pubescentia; *antennæ* satis breves et versus apicem incrassatæ, fuscæ, art. basalibus plerumque testaceo annulatis; *pedes* et *corpus subtus* rufo-fuscescentia.
Long. corp. lin. $4\frac{1}{2}$; lat. lin. $2\frac{1}{2}$.

New Granada; Bolivia.

23. *M. frontalis.*

M. parallela, crebre punctata, flavo-fusca, capitis fronte nigra; *caput* fortiter longitudinaliter foveolatum, flavum; *thorax* leviter punctatus, flavus; *scutellum* fuscum; *elytra* parallela, crebre et minute punctata, subtiliter pubescentia, flavo-fusca; *antennæ* elongatulæ, nigræ, art. 1^o–6^m ab infra præsertim flavescentibus; *pedes* et *corpus subtus* flava.
Long. corp. lin. 4, lat. lin. 2.

Campeche; Central America.

24. *M. fuscescens.*

M. parallela, crebre punctata, fuscescens, antennis et tibiis nigris; *caput* longitudinaliter foveolatum, leviter rugosum; *thorax* transverse evidenter depressus, rugosus; *elytra* subtiliter pubescentia; *antennæ* nigræ; *corpus subtus* et *pedes* flavescentia.
Long. corp. lin. $4\frac{1}{2}$; lat. lin. $2\frac{1}{4}$.

Bolivia.

25. *M. nigricornis.*

M. robusta, parallela, crebre punctata vel rugosa, læte pallide rufa, antennis et tarsis nigris; *caput* rugosum; *thorax* vix transverse sed evidentius juxta latus utrinque depressus, crebre punctatus; *scutellum* subquadratum; *elytra* thorace multum latiora, robusta; *antennæ* robustæ, nigræ; *corpus subtus* rufo-flavum; *pedes* rufo-fusci, tibiis et tarsis nigris.
Long. corp. lin. 4; lat. lin. $2\frac{1}{3}$.

Bogota. Conspicuous by its bright pale-red coloration.

26. *M. atricornis.*

M. robusta, parallela, crebrius punctata, flava vel flavo-fusca; *caput* longitudinaliter foveolatum, punctatum; *thorax* punctatus; *elytra* parallela; *antennæ* robustæ, paulum versus apicem incrassatæ, nigræ, art. 1^{o} rufescente; *corpus subtus* rufum; *pedes* rufi, tibiis et tarsis interdum fusco-nigris.
Long. corp. lin. $3\frac{1}{2}$; lat. lin. $1\frac{1}{2}$.

This species may be easily separated from *M. nigricornis* by its smaller size, its more depressed and more parallel form, and its flavous (not rufous) colour.

Jacquelin du Val has described (in the 'Histoire de l'île de Cuba,' Insectes, p. 304) a "*Cœlomera*" which I am unable to recognize: the description, unfortunately, omits all notice of the antennæ, and otherwise is somewhat imperfect. It is not a *Dircema*. Probably it is a species of *Monocesta*, this genus being the only one which extends northwards as far as the United States:—

"*Cœlomera opacipennis.*

"*C.* oblonga, testacea; elytris brunneis, opacis, pube subtili brevissima sericeis, margine reflexo pectoreque medio nigro-cyaneis; thorace valde transverso, medio transversim impresso, basi sinuato, angulis posticis acutiusculis. Long. $6\frac{1}{2}$ millim. Cuba."

Genus XII. Cœlomera, Erichs.; Chev. Dej. Cat. ed. 3. 399; D'Orbign. Dict. Univ. d'Hist. Natur. iv. 75; Erichson, Conspectus Ins. Peruan. p. 164.

Generi *Monocestæ*, ut hic definito, affinis; differt (ut a Dom. Erichson indicatum est) in antennis; art. 1^{o} elongato, 2^{o} brevi, 3^{o} art. primo multum longiore, 4^{o} primo æquali, 5^{o}–11^{m} velut art. secundus brevibus: differt etiam in forma corporis; in speciebus plurimis corpus parallelum, rarius post medium ampliatum: in reliquis genus *Monocestam* æquat.

The above diagnosis will suffice to point out the peculiarity of the antennæ, which is sufficiently important to constitute a very natural genus: the third joint is more than usually produced, and the fifth and subsequent joints are very short. There is also a general difference in form: while one or two species [and those from the head quarters of *Monocesta*, Cayenne and the Amazons], *C. Cayennensis*, *C. modesta*, resemble *Monocesta* in the post-medial dilatation of the elytra, the majority of species (which are from Brazil) are decidedly more parallel, though robust in form; and several species from New Granada and Columbia are entirely parallel and subattenuate.

Section I.

Species more or less broadly ovate; elytra broadly margined.
Species 1–7.

1. *C. modesta.*

C. depressa, lata, punctata, flavo-fusca, prothorace et antennis flavis; *caput* ad basin longitudinaliter foveolatum, punctatum, rufo-flavum; *thorax* satis latus, punctatus, rufo-flavus; *scutellum* subquadratum, punctatum; *elytra* depressa, lata, versus apicem ampliata, leviter flavo-pubescentia, rugosa, flavo-fusca; *antennæ* rufo-fuscæ, art. 1°–3^{m} flavescentibus; *corpus subtus* et *pedes* rufo-fusca.
Long. corp. lin $7\frac{1}{2}$; lat. lin. 5.

This species differs from *M. rufo-fusca* in the greater breadth of its thorax, its differently formed scutellum, its more depressed form, and its coloration.

Amazons.

2. *C. rufo-fusca.*

C. lata, subpubescens, leviter rugosa, rufo-fusca; *caput* longitudinaliter atque etiam transverse foveolatum, punctatum, rufum, fovea longitudinali iterumque basi nigris; *thorax* vix ut in *C. modesta* latus, sed transversus, punctatus, rufus, macula utrinque nigra insulata; *scutellum* punctatum, rufo-fuscum; *elytra* satis lata, satis robusta, rugosa, subpubescentia, rufo-fusca; *antennæ* art. 1°–4^{m} nigris, reliqui desunt; *pedes* nigri, femoribus fusco-nigris; *corpus subtus* rufum.
Long. corp. lin. $6\frac{1}{2}$; lat. lin. 4.

C. rufo-fusca is certainly nearly related to the Amazonian *C. modesta*. I decide, however, that it must be a distinct species: its coloration is different (this of itself has no value in this group); but, besides coloration, the thorax is relatively much narrower.

Brazil. A single example from the collection of M. Laferté.

3. *C. bajula*, Oliv. Ent. vi. 618. 5, pl. 2. f. 17.

This is a not uncommon Cayenne species; it is subject to a considerable variation in the form of the thorax, the sides of which are sometimes rounded, sometimes rectangular,—and especially in the form of the elytra; some examples in my cabinet have the elytra much compressed. Length 6½ lines, breadth 4½ lines.

4. *C.* (*Galleruca*) *lanio*, Sahlb., Dalm.

C. derasa, Hoffmans. *C. Braziliensis*, Dej. Cat. *C. læta*, Baly, Trans. Ent. Soc. (1865) 344.

C. parallela, ♂ elytris paulum post medium ampliatis, leviter rugosa, elytris nigro-cyaneis; *caput* leviter foveolatum, rufum; *thorax* sparsim punctatus, vel rufus vel flavo-rufus; *scutellum* impunctatum, flavum; *elytra* leviter rugosa, sparsim pubescentia, vel nigra vel nigro-cyanea; *antennæ* nigræ; *pedes* fusci, femoribus rufis; *corpus subtus* rufum.

Long. corp. lin. 5½–6½; lat. lin. 2½–3½.

This species is nearly allied to *C. Cayennensis*, Fab., but is readily separated from it by its larger size and by the black basal joints of the antennæ.

Brazil. A very common species.

5. *C. Cayennensis*, Fab. Syst. El. i. 480. 11; Ent. Syst. ii. 14. Oliv. Ent. vi. 617.

C. Cajennensis, Fab. Mant. i. 74. 93, and in S. Nat. Gmel. i. 4. 1669. 85.

Differs from *C. lanio* of this paper in its smaller size, in the rugose, almost reticulated (not quite so much punctate) surface of the elytra, and in the black coloration of the antennæ and underside. One or two examples have the antennæ rufo-flavous.

The species has a very extended range: I have examples not only from Cayenne, but from Peru, Columbia, and Brazil. It is probably the *C. Columbica* of Schönh. *C. Peruana*, Erichs. (Consp. Ins. Peruan. 165) must be referred to it.

6. *C. ruficollis*, Oliv. Ent. 6. 616; Encycl. Ins. 6. 586 (1790).

C. ruficornis, Baly, Trans. Ent. Soc. (1865), 343.

Very nearly related to *C. Cayennensis*, Fab., of which indeed it may be but a local variety. Both *C. ruficollis*, Oliv., and *C. Cayennensis*, Fab., are subject to some variation, the species before us being distinguished by its rufous antennæ and somewhat more brightly rufous thorax.

Brazil; Campos, Espiritu Santo. I have examples also from Peru, which are identical, with the exception of the colour of the scutellum.

Olivier gives *C. nigripennis* (Fab. Ent. Syst. Em. 2. 14. 9, published 1775; Syst. El. i. 480) as a synonym of this species. *C. nigripennis,* F., is from Surinam. I cannot quite trace the reasons of Olivier's position, but prefer to retain his name without hesitation, as being well established, as well as based on his excellent authority.

7. *C. picta,* Baly, Descript. of New, &c., Trans. Ent. Soc. Lond. 1865, 344.

Length 5–4 lin.; lat. $2\frac{1}{2}$–$2\frac{1}{4}$ lin.

A common species at Ega, Upper Amazons.

Section II.

Species robust, parallel, abbreviated in form. Species 8–10.

8. *C. induta.*

C. robusta, satis parallela, pallide et subtiliter pubescens, testaceo-fusca, thorace medio macula utrinque elytris antemediis et apice elytrorum late fusco-nigris; *caput* subrugosum, obscure testaceum, basi nigra; *thorax* satis magnus, transversus, lateribus antemediis subdilatatis, subpubescens, macula media nigro-fusca; *scutellum* rufo-fuscum; *elytra* robusta, subrugosa, pubescentia, testaceo-fusca, macula basali indeterminata insulata (alteraque minore ad antemedium marginem) et dimidio apicali nigris; *antennæ* nigræ, art. 1^o–3^m fulvescentibus; *pedes* rufo-fulvi, tibiis apicalibus et tarsis fulvis; *corpus subtus* flavo-rufum.
Long. corp. lin. $5\frac{1}{2}$; lat. lin. 3.

Amazons. Taken by Mr. Bates.

9. *C. tibialis,* Dej.

C. robusta, paulum ampliata, flavo-fusca, tibiis tarsis et antennis nigro-fuscis; differt a *C. bajula* Oliv. in corpore robusto, parum depresso, vix ampliato, in antennis gracilioribus, fuscis (vix nigris), in colore quoque corporis subtus, prothoracis et femorum.
Long. corp. lin. 6; lat. lin. $3\frac{1}{4}$.

Probably a distinct species from *C. bajula,* which is very variable in form and size; it may be separated as well by its colour (rufo-flavous prothorax and underside) as by the greater attenuation of the antennæ.

Cayenne.

10. *C. maculicollis.*

C. parallela, robusta, subpubescens, fusco-rufa, tibiis, tarsis, antennis, fronte capitis et maculis thoracis tribus nigris; *caput* longitudinaliter foveolatum, subpunctatum, ad frontem bimaculatum; *thorax* transverse leviter depressus, fortiter punctatus, nigro maculatus, macula basali media et macula laterali insulatis; *scutellum* fusco-rufum; *elytra* thorace latiora, parallela, apice rotundata, subtiliter

pubescentia, crebre punctata; *antennæ* robustæ, nigræ; *corpus subtus* rufo-flavum; *pedes* rufo-flavi, tibiis et tarsis nigro-fuscis.
Long. corp. lin. 5; lat. lin. $2\frac{1}{2}$.

I have received this very distinct species from M. Chevrolat's collection, with a label which I read "Honduras."

11. *C. ærata.*

C. parallela, satis attenuata, punctata, impubescens, nigra, elytris æratis; *caput* haud foveolatum, punctatum; *thorax* vix elytra latitudine æquans, impunctatus, fusco-flavus; *scutellum* apice rotundatum, levissime punctatum; *elytra* parallelo-punctata, lævia, nitida, impubescentia, ærata; *antennæ* nigræ, *corpus subtus* nigrum, abdomine rufo; *pedes* nigri, femoribus rufis.
Long. corp. lin. $6\frac{1}{2}$; lat. lin. 3.

Columbia.

Section III.

Species parallel, attenuate in form. Sp. 11–16.

12. *C. submetallica.*

C. subparallela, leviter pubescens, punctata, rufa, thorace flavo-rufo, elytris metallice rufo-purpureis; *caput* leviter foveolatum, impunctatum, rufum, basi nigra; *thorax* thorace *C. æratæ* latior, in medio transverse depressus, impunctatus, flavo-rufus; *scutellum* leviter punctatum, flavum; *elytra* crebre punctata vel rugosa, metallice purpurea; *antennæ* nigræ; *corpus subtus* rufum; *pedes* nigro-fusci, femoribus rufo-flavis.
Long. corp. lin. $6\frac{1}{2}$; lat. lin. $3\frac{1}{2}$.

Broader both in body and in relative breadth of thorax than *C. ærata*; the coloration also of the whole body is different.

Columbia.

13. *C. parallela.*

C. elongata, parallela, leviter rugosa, subtiliter testaceo pubescens, nigra, thorace et abdomine rufis; *caput* leviter ad medium foveolatum, punctatum; *thorax* impunctatus; *scutellum* impunctatum, nigrum; *elytra* parallela, testaceo pubescentia, rugosa; *antennæ* nigræ; *pedes* nigri, femoribus rufo-fuscis; *corpus subtus* nigrum, abdomine rufo.
Long. corp. lin. $6\frac{1}{2}$; lat. lin. $6\frac{1}{2}$.

C. parallela differs abundantly in form from most of its congeners, being attenuate and parallel; it resembles *C. violaceipennis,* but may be separated from it by its fuscous-black, thickly pubescent, and rugose elytra.

New Granada.

14. *C. violaceipennis.*

C. elongata, parallela, subcylindrica, vix pubescens, punctata, nigra, abdomine pedibus et thorace rufis, elytris nigro-violaceis; *caput* longitudinaliter foveolatum, impunctatum, nigro-fuscum; *thorax* transversus, lateribus antemediis subrotundatis, in medio transverse valde depressus, impunctatus, flavus; *scutellum* impunctatum, rufo-fuscum; *elytra* parallela, impubescentia, punctata, nigro-violacea; *antennæ* rufo-fuscæ; *pedes* rufo-fusci, femoribus rufis; *corpus subtus* nigrum, abdomine rufo.

Long. corp. lin. 7; lat. lin. 3.

Nearly allied to *C. parallela* of this paper, but separable from it by the blue (not fuscous-black) colour of the elytra, which are impubescent, nearly glabrous, and distinctly punctate, not rugose.

Columbia.

15. *C. tenuicornis.*

C. elongata, subparallela, subpubescens, nigra, femoribus et thorace rufis; *caput* longitudinaliter ad medium et transverse inter oculos foveolatum, punctatum, nigrum; *thorax* penitus planus, vix ut in *C. parallela* fortiter transverse depressus, rufus; *scutellum* leviter punctatum, nigrum; *elytra* subparallela, elongata, rugosa, nigra; *antennæ* subgraciles, nigræ; *pedes* nigri, femoribus rufo-fuscis; *corpus subtus* nigrum.

Long. corp. lin. $5\frac{1}{2}$–$6\frac{1}{2}$; lat. lin. $2\frac{1}{2}$–$3\frac{1}{2}$.

Very nearly allied to *C. parallela,* but differing from it in its less parallel form, the transverse fovea on the head, the less marked transverse depression of the thorax, and the colour of the underside; the antennæ, also, are evidently somewhat more attenuate.

Bolivia.

16. *C. binotata,* Dej.

C. parallela, subrugosa, rufo-flava, elytris et maculis duabus thoracis nigro-cyaneis; *caput* leviter punctatum, foveolatum, nigrum; *thorax* sparsim punctatus, flavo-rufus, macula utrinque circulari submedia nigra; *scutellum* impunctatum, flavum; *elytra* leviter rugosa, subpubescentia, nigro-cyanea; *antennæ* nigræ; *corpus subtus* rufo-fuscum; *pedes* nigro-fusci, femoribus rufo-flavescentibus.

Long. corp. lin. 6; lat. lin. 3.

To be distinguished from all its congeners by the two constant black maculations on the thorax; in size not unlike *M. Brasiliensis,* but differing in coloration, a trifle more parallel and narrower, and with the thorax not quite so obviously depressed.

Brazil.

Genus XIII. Coraia.

Satis elongata, parallela et robusta. *Caput* verticale. *Palpi maxillares* elongati. *Thorax* subquadratus, penitus transversus, margine anteriore recto, angulis anticis distinctis (incurvatis, corpus arcte amplectentibus), lateribus atque etiam angulis posticis subrotundatis;

discus plus minus transverse et inæqualiter depressus. *Scutellum* subtriangulare, apice truncato. *Elytra* parallela, pubescentia, punctata, paulum latitudine thoracem superantia. *Antennæ* robustæ, elongatæ, filiformes, longitudine corpus penitus æquantes, art. 1° ad apicem distincte incrassato, art. 3° et 4° subæqualibus et art. primo brevioribus, art. 2° brevi, art. 5^o–10^m æqualibus et penitus art. tertium æquantibus, art. 11° longiore et attenuato. *Pedes* elongati, robusti, tarsorum art. 1° et 2° æqualibus, unguiculis utrinque bifidis.

Coraia is a form which, by its almost quadrate thorax, its long and robust antennæ, and its parallel body, reminds us of a Longicorn. It is allied to *Monocesta*, but differs from all the species composing that genus: it is elongate and very parallel, instead of being (as in many species of *Monocesta*) broad and apically dilated; the antennæ are relatively considerably longer, and the form of the thorax is different. The genus *Coraia* is related to *Cœlomera* and *Monocesta* by the bipectinated unguiculi of the foot, by the relative lengths of the joints of the antennæ, and by the broadly transverse depression on the disk of the thorax. *Coraia* differs from *Galleruca* (*inter alia*) by the greater relative length of the antennæ. It may be separated from *Nestinus* by its much more robust antennæ, the third joint of which is equal to the fourth (in *Nestinus* the fourth being the longer), in its parallel form of body, and in the form of the thorax; the anterior angles closely embrace the sides, being depressed in position, not subporrect.

C. *maculicollis*.

C. elongata, parallela, vix depressa, rufo-fusca, humeris, thoracis maculis, tibiis, tarsis, femoribus maculis antennisque nigro-fuscis; *caput* super antennarum bases bituberculatum, rugosum, rufo-flavum, labro tuberculis et basi late nigris; *thorax* rufus, macula media longitudinali et lateribus mediis (late) nigris; *scutellum* punctatum, rufo-fuscum; *elytra* thorace paulum latiora, parallela, rugosa, humeris et margine tenui elytrorum antemedio nigris; *antennæ* nigræ; *corpus subtus* rufo-fuscum; *pedes* nigri, femoribus rufis, ad medium nigro maculatis.

Long. corp. lin. $5\frac{1}{2}$; lat. lin. $2\frac{1}{2}$.

Not an uncommon species in Mexico. I have received it under the name of *astuta*, Chevr.

Genus XIV. Nestinus.

Parallela. *Caput* subverticale. *Thorax* transversus, margine anteriore subemarginato, angulis anticis modice productis, lateribus atque etiam angulis posticis subrotundatis, marginibus undique leviter marginatis, disco plano vel leviter depresso. *Scutellum* subtriangulare, apice rotundato. *Elytra* thorace paulum latiora, crebre punctata, plerumque submetallescentia. *Antennæ* graciles, elongatæ, filiformes, corpus longitudine penitus æquantes, art. 1° subgloboso, 2° minore, 3° primum æquante, 4° et 5° tertium superantibus et subæqualibus, 6^o–11^m subæqualibus. *Pedes* elongati, tarsorum art. basali longitudine art. 2^m superante, unguiculis utrinque bifidis.

Nestinus approaches *Coraia* in the length of the antennæ and the relative length of the basal joint of the tarsus; it differs from that genus in the slender form of the antennæ, in the fourth joint being longer than the third, and also in the form of the thorax. The known species that represent the genus are three or four in number, and all from Mexico.

1. *N. bimaculatus.*

N. parallelus, rugosus, fusco-flavus; thorace et elytrorum apicibus nigro maculatis; *caput* ad basin leviter foveolatum, punctatum, fusco-flavum, fovea tenuiter nigra; *thorax* crebre punctatus, macula media insulata, alteraque etiam utrinque laterali nigris; *scutellum* impunctatum, nigro-fuscum; *elytra* fortiter et crebre punctata, fusco-flava, macula utrinque apicali circulari insulata nigro-cyanea; *corpus subtus, pedes* et *antennæ* flavo-fusca.

Long. corp. lin. $6\frac{1}{2}$; lat. lin. $2\frac{1}{2}$.

Guatemala.

2. *N. regalis.*

N. elongatus, subparallelus, fortiter punctatus vel rugosus, pallide flavus, elytris vel æneo vel aureo metallescentibus, antennis et tibiis nigris; *caput* leviter foveolatum, punctatum, pallide flavum, macula basali media nigra; *thorax* punctatus, pallide flavus, macula media minuta, et altera utrinque media laterali nigris; *scutellum* impunctatum, rufo-flavum; *elytra* fortiter et crebre punctata vel æneo- vel aureo-metallescentia; *antennæ* nigræ; *pedes* nigri, femoribus flavo-fuscis; *corpus subtus* flavo-fuscum.

Long. corp. lin. $4\frac{1}{2}$–$5\frac{1}{2}$; lat. lin. 2–$2\frac{3}{4}$.

Mexico. I possess an example from California, which presents no variation from the Mexican form.

3. *N. incertus.*

N. subparallelus, punctatus, lævis, flavus; elytris fusco-viridescentibus, thorace fusco-flavo, antennis fuscis; *caput* crebre punctatum, flavum, basi late nigra; *thorax* transversus, latus, subdepressus, planus, lævis, angulis posticis rotundatis, crebre punctatus, fusco-flavus; *scutellum* leviter punctatum, flavum; *elytra* parallela, lævia, crebre punctata; *antennæ* robustæ, nigræ; *pedes* rufo-flavi, tarsis fuscis; *corpus subtus* rufo-flavum.

Long. corp. lin. 6; lat. lin. 3.

A somewhat aberrant form of *Nestinus*, but which agrees in the main with the generic diagnosis. It is possible that hereafter it may constitute a separate genus.

Brazil.

XXXVI.—*On the Muscular Anatomy of the Leg of the Crocodile.* By the Rev. Samuel Haughton, M.D., Fellow of Trinity College, Dublin.

[Plate XVI.]

During the Easter recess of 1864, I had an opportunity of explaining to Professor Gratiolet*, of Paris, the investigations I had made with respect to the mechanism of the leg of the Ostrich, and the theory I had formed to explain it. This distinguished anatomist did me the honour of approving of my explanation, and urged me to procure a Crocodile, in the posterior limb of which he assured me I should find a mechanical problem exceeding in complexity that presented by the leg of the Ostrich, and as yet unsolved by anatomists.

During the month of March last I was furnished with a young Crocodile from Egypt, by Mr. Thomas Moore, of Liverpool, to whom I had communicated my earnest desire to have an opportunity of dissecting such an animal; and the results of my examination fully bear out the anticipation of Prof. Gratiolet, and also furnish a complete confirmation of the principles I made use of in my theory of the leg of the Ostrich.

The interlacing of tendons in the hind leg of the Crocodile is very remarkable, and more complex than in the Ostrich, although in one respect it somewhat resembles it.

* The incalculable loss that science has sustained, in the early part of the present year, by the premature death of this distinguished anatomist is exceeded by the loss experienced by his friends, to whom his genial social qualities endeared him even more than his brilliant scientific attainments. I extract from the 'Journal des Débats' of the 19th of February 1865 the following just tribute to his memory:—

"Les sciences viennent de faire une perte aussi cruelle qu'imprévue: M. Gratiolet, professeur de zoologie à la Faculté des Sciences de Paris, a succombé hier matin à une attaque d'apoplexie.

"M. Gratiolet n'avait pas cinquante ans; avant hier, encore plein de vie et de santé, il travaillait à son laboratoire du Muséum d'Histoire Naturelle, lorsque, à deux heures, frappé d'une congestion subite, il dut être ramené à son domicile; quelques heures plus tard, il avait perdu connaissance; hier matin à quatre heures, il rendait le dernier soupir.

"Nous ne saurions peindre l'émotion profonde qu'a causée dans le monde scientifique l'annonce de cette mort prématurée. M. Gratiolet était aimé de tous; son affabilité, la droiture de son caractère, lui avaient concilié toutes les sympathies. Ses travaux d'anatomie comparée, ses recherches sur le système nerveux et sur le cerveau, etc., l'avaient mis au nombre des naturalistes les plus distingués de notre pays; son merveilleux talent d'élocution l'avait placé au premier rang parmi nos professeurs les plus renommés, et l'aptitude de son esprit pour les études métaphysiques avait imprimé à ses œuvres un caractère d'originalité qu'appréciaient les philosophes aussi bien que les savans.

"La mort est venue le frapper au moment où, après de longues années de lutte, il semblait sur le point de recueillir le fruit de ses laborieux efforts."

On removing the skin and dissecting away the fat, the muscles shown in Pl. XVI. fig. A are exposed.

1. M. glutæus maximus (*b*). Origin: from central half of the ilio-ischiadic line. Insertion: into the fascia outside and above the knee-joint. This is a broad flat muscle, and straps down the tendon of the rectus femoris in its passage over the knee. 0·15 oz.

2. M. rectus femoris (*a*). Origin: from anterior spine of ilium, close to the acetabulum. Insertion: as in leg of Ostrich, into a tendon passing over the knee, outwards, and terminating in a remarkable muscle* (*x*) in the calf of the leg, associated with the gastrocnemius (*u*), and deriving a second origin from the agitator caudæ (*c*), as shown in the figure. 0·08 oz.

3. M. agitator caudæ (*c*). Origin: from the ischiadic line, behind the glutæus maximus. Insertion: by a double tendon. (1) One tendon passes through a pulley on the outside of the knee, formed by the tendon of the biceps (*d*) as it passes to its fibular insertion, and is inserted in the head of the muscle (*x*) in the calf of the leg. (2) The second insertion is by means of a tendon that goes to the top and front of the tibia; this second tendon also serves to strap down the tendon of the rectus femoris (*a*). 0·03 oz.

4. M. biceps femoris (*d*). Origin: from the ilio-ischium, under and behind the origin of the glutæus maximus. Insertion: partly into the top of the fibula, forming a pulley for the agitator caudæ (*c*), and an additional strap for the rectus femoris (*a*), and partly, by means of another tendon, into the head of the peronæus longus (*y*). 0·05 oz.

5. M. semitendinosus (*e*). Origin: from the posterior point of the tuber ischii. Insertion: by a remarkable looped tendon having one end inserted into the back of lower end of femur, and the other end into the os calcis. 0·18 oz.

6. M. semimembranosus (*f*). Origin: tuber ischii. Insertion: into the top of the tibia, by a tendon common to this muscle and the gracilis. 0·11 oz.

The muscles of the calf, shown in the figure, are the following:—

7. M. gastrocnemius (*u*). This muscle, as usual, has an outer and inner head. 0·14 oz. *Outer head*:—Origin: from the tendon of the great caudal extensor of the thigh, half an inch from its insertion into the outer condyle. Insertion: into the under side of the outer tarsal bone (vide *a*, fig. B) and into the plantar fascia. 0·11 oz. *Inner head*:—Origin: from the top of fibula and inner condyle of femur. Insertion: by a tendon, which unites with that of the outer head before reaching the os calcis,

* This muscle may be the plantaris.

under which it passes to be inserted into the outer and under side of the outer tarsal bone. 0·03 oz.

8. M. plantaris ? (x). Origin, double: from rectus femoris and from agitator caudæ. Insertion: having become partially blended with the outer gastrocnemius, it is inserted into the os calcis and under surface of the plantar fascia. 0·04 oz.

9. M. peronæus longus (y). Origin: from the shaft of the fibula and from the tendon of the biceps femoris (d). Insertion: into the outer tarsal bone, uniting with the tendon of the gastrocnemius. 0·03 oz.

10. Mm. tibialis anticus and extensor digitorum communis. Insertion: into the tarsal ends of first, second, and third metatarsal bones. 0·11.

The interlacing of muscles in the thigh and leg of the Crocodile, just described, is very remarkable, and more complicated even than that found in the Ostrich; and at first I was disposed to think that it threw some doubt on the explanation I had given previously of the reason for such an arrangement in the bird's leg. In the case of the Ostrich, the necessity for strict simultaneity of action was made evident by the great force of the muscles employed, and the great delicacy of the bones on which they had to act. What could there be, in the case of the Crocodile, to correspond to such a peculiarity in the case of the Ostrich? After some careful dissection, I found the ready answer to my question in the remarkable muscle which I shall now describe.

On clearing away the superficial muscles of the thigh and tail, I found the enormous mass of muscle, figured at b, fig. B, Pl. XVI., which acts as the chief and powerful extensor of the thigh:—

11. M. extensor femoris caudalis* (b). Origin: from the transverse and inferior spinous processes of the caudal vertebræ, from the third to the fifteenth inclusive. Insertion: into the back of the upper part of the femur, and into a great round

* This remarkable muscle is noticed and accurately described by Meckel in tom. iii. p. 152, 153 of his 'System der vergleichenden Anatomie,' Halle, 1828; but it is very strange that he transposes its origin and insertion, and seems not to have had any idea of its real use. It is regarded from his point of view as a descriptive anatomist, and without the remotest reference to its final cause. He says, "Der zweite, tiefere, weit dickere Muskel ist von dem ersten [the superficial muscle of the tail] wie einer breiten Binde umgeben, entspringt mit zwei ganz getrennten; einer weit kürzern, breiten Sehne oben von den hintern Fläche des Oberschenkelbeines; durch eine weit längere, schlanke, unten zwischen den beiden Gelenkknorren desselben Knochens, und setzt sich an die ganze Seitenfläche der untern Dornen, so wie der Zwischendornenhaut und die untere Fläche der Wurzeln der Querfortsätze."

tendon, which receives, in particular, the anterior fibres of this enormous muscle, and, passing down the back of the femur, is inserted by a strong common aponeurosis into the outer condyle of the femur and into the head of the fibula. This common aponeurosis also gives a partial origin to the gastrocnemius (*a*, fig. B) and to the plantaris (*x*, fig. A). 1·81 oz.

There are two muscles, accessory to this great caudal extensor in their action, which are as follows :—

12. M. extensori femoris caudali accessorius. Origin: from the fascia covering the great caudal extensor, and by a tendinous head from the quadratus femoris, which is also an accessory to the great caudal. Insertion: into the looped tendon of the semimembranosus already described. 0·01 oz.

13. M. quadratus femoris. Origin: posterior, superior, and inner surface of the pubis, near its symphysis. Insertion: into the back of the femur, with the action and position of the quadratus femoris in mammal quadrupeds, and into the tendon of the great caudal extensor. 0·05 oz.

The effect of the interlacing of the tendons of the various muscles already described must be to produce simultaneity of action among them, such as I have already endeavoured to describe in my account of the leg of the Ostrich; and in the present instance of the Crocodile there seems to be a similar principle involved. The Crocodile, resting on mud, progresses chiefly by using his hind feet as paddles; and in this use of them the great caudal extensor of the thigh is the most powerful and important muscle employed. And it seems to me that the simultaneity of action of all parts of the leg, rendered necessary by the employment of so powerful a muscle, is fully secured by the interlacing of the tendons I have described, which renders it impossible for one set of muscles to act without the others being also exerted.

The remaining muscles of the posterior limb are as follows:—

14. M. glutæus medius. Origin: from the central part of the ilio-ischiadic surface. Insertion: its tendon passes over the great trochanter, to be inserted into a line down the upper half of the outside of the femur, between the origins of the two portions of the vastus externus. 0·06 oz.

15. M. glutæus minimus. Origin: from the anterior point of the ilium. Insertion: into the inner side of the knee, under the fascia of the rectus femoris. 0·02 oz.

16. Mm. vastus internus, externus, et cruræus. The vastus externus consists of two distinct muscles, as in the Ostrich. 0·22 oz.

17. M. psoas. This large muscle takes an origin as high as the last rib, and is inserted into the lesser trochanter and the

intertrochanteric line leading to the outer side of the femur. It lies outside the iliacus. 0·57 oz.

18. M. iliacus. Origin: from the anterior transverse surface of the ilium, with a slip from the spine. Insertion: altogether into the lesser trochanter. 0·11 oz.

19. M. sartorius. Origin: behind the origin of the rectus, on the inner side, at the junction of the ilium and marsupial bone. Insertion: into the fascia of the inner side of the thigh, for two-thirds of its length. 0·04 oz.

20. M. gracilis takes an origin from two heads, one at the posterior point of the pubis and the other on the pectineal line. Insertion: into the head of the tibia by a tendon common to it with the semimembranosus. 0·08 oz.

21. M. pectinæus. Origin: between the two heads of gracilis, from the central part of the surface of the pubis and from the pectineal line. Insertion: into the top of the linea aspera. 0·06 oz.

22. Mm. adductores. There are three adductor muscles:—

1st adductor. Origin: anterior pectineal line of pubis. Insertion: into the upper half of the linea aspera. 0·13 oz.

2nd adductor. Origin: from posterior edge of pubis, its middle third. Insertion: into the middle of the linea aspera. 0·03 oz.

3rd adductor. Origin: from the posterior edge of the pubis, close to the symphysis. Insertion: into the back of the top of the fibula, with a fascial union with the tendon of semitendinosus. 0·05 oz.

23. M. obturator externus? Origin: from the tuber ischii, the posterior edge of the ischium, and the obturator membrane. Insertion: an oblique line in the back of the femur, below the insertion of the quadratus femoris. 0·13 oz.

24. M. marsupialis externus. 0·07 oz.

25. M. marsupialis internus. 0·10 oz.

These two muscles take their origin respectively from the outer surface of the marsupial bone, and from its inner surface and the last abdominal rib; and they are inserted by a common tendon into the top of the posterior intertrochanteric line. Their action is to rotate the femur directly inwards.

26. M. flexor proprius hallucis. Origin: from the outer condyle of femur. Insertion: into the first, second, and third toes. 0·02 oz.

27. M. flexor digitorum communis. Origin: from the fibula and tibia. Insertion: into the first, second, and third toes. 0·05 oz.

28. M. tibialis posticus. This muscle is inserted into the tarsal ends of the first, second, and third metatarsal bones. 0·06 oz.

29. M. peronæo-calcaneus. Origin: from lower part of shaft of the fibula. Insertion: into the upper surface of the calcaneum. 0·01 oz.

XXXVII.—*Observations on Raphides and other Crystals in Plants.* By George Gulliver, F.R.S.

[Continued from p. 117.]

Vitaceæ and *Araliaceæ*.—In the last communication ('Annals' for Aug. 1865) it was stated that raphides abound in all the plants, therein specified, which I had examined of the order Vitaceæ, while every species of the allied or related orders, of which comparative examinations were made, proved to be devoid of this raphidian character. I have had an opportunity, through the courtesy of a botanical friend, of dissecting a dried fragment of the receptacle-stalk of that most curious plant, *Pterisanthes* (*Vitis Pterisanthes*, Mic., *β. borneensis*), a bit of the dried leaf-blade and fruit-shell of *Bersama abassynica*, Fresen., and a part of the dried leaf and flower of *Natalia lucens*, Hochst. (*Rhaganus lucens*, E. Meyer). To the same genus, I have been told, *Bersama abassynica* is referred by Hooker and Bentham.

Pterisanthes, like *Vitis*, *Cissus*, and *Leea*, abounds in true raphides and sphæraphides. The raphides of *Pterisanthes* are about $\frac{1}{400}$th of an inch long and $\frac{1}{16000}$ thick; the average diameter of the sphæraphides is $\frac{1}{1600}$th of an inch. The *Bersama* and *Natalia* are destitute of true raphides, but contain numerous crystal-prisms, about $\frac{1}{250}$th of an inch long and $\frac{1}{2286}$th thick. These may be well seen in the leaf and inner membrane of the fruit-shell of *Bersama*, and in the leaf, calyx, petals, and pedicel of *Natalia*. The prisms have four equal faces, and their ends slope off either from angle to angle or from face to face.

Thus species of all the genera adopted by Lindley under the order Vitaceæ—*Cissus*, *Vitis*, *Pterisanthes*, *Leea*, and *Rhaganus*—have now been examined, though too often in imperfect or unsatisfactory fragments; and in every one of these plants true raphides were found, except the *Bersama* and *Natalia* (*Rhaganus*), in which raphides are replaced by crystal-prisms. It may be recollected that a like phenomenon occurs in the last order (Roxburghiaceæ) of the raphidian class Dictyogenæ, as described in the 'Annals' for June 1865.

Of Araliaceæ and Vitaceæ, the comparative structure in the leaves and some other parts has already been described ('Annals' for August 1865). I have lately examined fresh leaves and twigs of *Aralia spinosa*, and a bit of a dried leaf-blade of *A. racemosa*.

These plants, like their congeners of the same order, abound in sphæraphides, but are destitute of raphides. Nothing of the kind can be more beautiful than the sphæraphid tissue ('Annals,' Sept. 1863), extending beneath the cuticle of the whole leaf and in the bark, of *A. spinosa.* These sphæraphides are about $\frac{1}{1777}$th of an inch in diameter; they are somewhat larger in the bark, and larger still in the pith.

"If," says Prof. Lindley, "the Vine is compared with *Aralia racemosa,* the relationship of Vitaceæ to it will be too obvious to be mistaken. Suppose that *Aralia racemosa* had an adherent calyx, erect ovules, with stamens opposite the petals, and it would be a *Vitis.*" But now, while recognizing the similarity or identity of the sphæraphides of Araliaceæ and Vitaceæ, we perceive that *Aralia* would require also the raphidian character to be a *Vitis.* This difference is so remarkable that it may be very easily and quickly seen by a comparison of the cells in the leaves and other parts of the species before named of *Vitis* and *Aralia.* Indeed the contrast in this respect between these plants forms a very pretty microscopic object, and for this purpose the leaves of *Vitis apiifolia* and *Aralia spinosa* answer admirably.

Calleæ, Orontieæ, and *Acoreæ.*—We have already seen, under the head of the raphidian order Araceæ ('Annals,' May 1865, p. 381) how raphides could not be found in *Acorus calamus.* In a fragment of a dried leaf of *Gymnostachys anceps* I found a few raphides or raphis-like objects; but this scarcely affects the fact of the deficiency of raphides in Acoreæ, and their profusion in the members of the two other tribes of Orontiaceæ—a remarkable difference, which may be well seen by a comparison of *Calla, Monstera, Pothos,* and *Orontium* with *Acorus* and *Gymnostachys.*

Hæmodoreæ, Conostyleæ, and *Vellozieæ.*—Besides the species formerly mentioned as affording numerous raphidian cells, my dissections of *Hæmodorum planifolium, Anigosanthus rufus,* and *A. humilis* show a more or less abundance of raphides in all these plants. But *Vellozia* is probably devoid of raphides; for I could not detect them either in the withered leaves or bark of an old dead trunk of this plant. Hence a comparative examination of the cellular structure of the Conostyles of New Holland and the Vellozias, as well as of all the other species now placed by botanists under Hæmodoraceæ, appears to be very needful and likely to increase our knowledge of the natural affinities of this curious order. After describing some analogy between the stems of *Pandanus* and *Vellozia,* Prof. Lindley judiciously says, "Don proposed to make an order of the Vellozias; but, till their structure and that of the Bloodroots shall have been thoroughly investigated, this step would be premature."

Pandanaceæ.—This order, like all the rest of Lindley's Aral Alliance, abounds in raphides. Besides the plants noticed in the 'Annals' for May 1864, I have lately examined a leaf and the bark of *Pandanus odoratissimus* and the root and a leaf of *Freycinetia imbricata.* In the leaf of the former plant raphides swarm, and occur more or less plentifully in the mesophlœum, endophlœum, and alburnum; of the latter plant raphides are very abundant in the root, but less so in the leaf.

Thus, as far as these observations warrant the inference, *Pterisanthes* and *Leea* have the intimate structure of a *Vitis*, while the two species of *Rhaganus* (*Bersama* or *Natalia*) depart from that structure, but agree well together. *Acorus* and *Gymnostachys* are deficient in the raphidian character of their allies; and the Vellozieæ differ in like manner from Hæmodoreæ, Conostyleæ, Pandaneæ, and Cyclantheæ.

Edenbridge, Oct. 14, 1865.

XXXVIII.—*Note on the Cretaceous Deposits of Australia.* By FREDERICK M'COY, Professor of Natural Science in the University of Melbourne, and Director of the National Museum of Victoria.

MESSRS. D. Carson and J. Sutherland, of Collins Street, Melbourne, recently placed in my hands, for our public Museum, a series of specimens which they collected on the western bank of the Flinders River, at the base of Walker's Table Mountain, nearly in the middle of the continent, in lat. 21° 13′ and long. 143° 25′. The examination of these enables me to announce for the first time with certainty the existence of the Cretaceous formations in Australia. Mr. Gregory doubtfully indicated Cretaceous fossils in his last paper to the Geological Society, but without any generic or specific recognition of fossils of that age; and his materials, when referred to by the officers of the Geological Society, were only quoted as Mesozoic. Mr. Selwyn also alluded formerly to a specimen of an Echinide in flint, given to him as found in gravel in sinking a well at Prahran, near Melbourne, having been identified by me as the European Cretaceous *Conulus albogalerus*; and I had a flint *Ananchytes ovatus* of the same age, given to me as found at Richmond, near Melbourne also; but both of those specimens were unsatisfactory, as far as the proof of their having really belonged to any Australian stratum. I can now, however, recognize the Lower Chalk; and this nearly fills up the great series of marine Mesozoic formations supposed to be absent in Australia when I left Europe, but most of which I have recognized from fossil evidence. The most common of the fossils is a species of *Inoceramus* with coarsely fibrous shell, nearly $\frac{1}{4}$ inch thick, agreeing in size and shape almost exactly with the English *Inoceramus mytiloides* (Sow.), from which it differs in having the hinge-line rather longer, the anterior end more pointed, and the superior posterior angle rather more obtuse. This species I have named, in a paper read recently before the Royal Society of Victoria, *I. Carsoni* (M'Coy), in honour of one of the donors. The second most common fossil is a much larger and broader species of the same genus, which I at the same time named *Inoceramus Sutherlandi* (M'Coy), after the other donor of the specimens, which were so painfully carried, from the remote point indicated to the settled districts, on their saddle. This second species, in form, size, and concentric undulations of the surface, nearly agrees with the French and English common Cretaceous *I. Cuvieri*, but is less curved at the ventral margin near the beak.

The next shell is an Ammonite, in size, number and involution of whorls, shape, markings, and septa, so nearly identical with the very common *A. Beudanti* (Br.) of the French Lower Chalk, that, but for being slightly less compressed, and a slight difference in some of the septal lobes, it could scarcely be separated, even as a variety. I have named it *Ammonites Flindersi* (M'Coy), to call attention to the locality. It may be described as follows:—

Ammonites Flindersi.

Discoid, moderately compressed; periphery narrow, obtusely rounded; whorls $4\frac{1}{2}$, about one-fourth of the width of each exposed in an obtusely angular-edged, flat-sided umbilicus; surface crossed by obtuse sigmoid striæ, some of which are more prominent than the more numerous intervening ones. Diameter 6 inches, proportional thickness $\frac{20}{100}$, width of last whorl $\frac{40}{100}$. Seven much divided lobes in the septa of each side, two of which are within the edge of the umbilicus.

With these shells three vertebræ of a large Teleosteous fish occur.

The matrix of these specimens is an olive calcareo-argillaceous marl.

XXXIX.—*On a new Growing Slide for the Microscope.* By H. L. Smith, Kenyon College, U.S.*

In studying the growth and conjugation of the Diatomaceæ, I have felt the want of some means of keeping them alive for a long time under the microscope, and have devised for this pur-

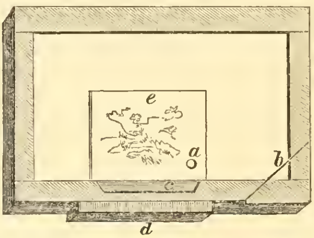
* From Silliman's American Journal of Science, September 1865.

pose the slide to be described, which appears fully to meet all requisitions; and, as it can be readily made by any tolerably expert microscopist, it will, I am certain, be considered a valuable addition to microscopical apparatus.

The whole slide, as I have constructed it, is a trifle more than $\frac{1}{8}$th of an inch in thickness. It consists of two rectangular glass plates, 3×2 inches and about $\frac{1}{25}$th of an inch thick, separated by thin strips of glass of the same thickness, cemented to the interior opposed faces, as shown in the figure.

This closed cell, ultimately destined to be filled with water, is not of such thickness as to prevent the use of the achromatic condenser—a very important requisite. The glass I use is such as is employed for the small cheap looking-glasses, and is easily obtained.

The upper plate has a small hole (*a*) drilled through it. This is effected by means of the ordinary writing-diamond and the sharp edge of a broken steel brooch or small rat-tail file. A hole can be drilled through glass of this thickness in a few minutes. One corner of the upper glass is removed, as at *b*, and a small strip of glass cemented at *c* serves to prevent the thin glass cover placed over the object from sliding. Another slip of glass is cemented on the lower side of the cell at *d*, but not extending as far as the removed part at *b*. The object of this is to prevent the water in the cell from being removed by capillary attraction, in case the slide in the neighbourhood of *b* should be a little wetted. This strip is not, however, absolutely necessary.



To use the slide, fill the space between the two plates with clean water, introduced at *b* by means of a pipette, and also place a drop on *a* to remove the air. The object being put on the top of the slide and wetted, is now to be covered with a large square of thin glass, *e*, at the same time covering the hole *a*. The slide can now be placed upright, or in any position, as no water can escape. It is, in fact, only a new application of the old principle of the bird-fountain. As the water evaporates from under the cover, more is supplied through the hole *a*, and from time to time an air-bubble enters at *b*; thus a constant circulation is maintained. A cell of the size named will need replenishing only about once in three days, and this is readily effected without disturbing the object. I have been enabled to make observations by means of this slide which it would have been very difficult, if not impossible, to have made without it.

XL.—*Descriptions of recently discovered Species, and Characters of a new Genus, of* Araneidea *from the East of Central Africa.* By John Blackwall, F.L.S.

The Spiders described in the following pages were captured in the region through which the river Shiré flows to its confluence with the Zambesi, by Mr. Horace Waller, at the particular request of Mr. Richard Thornton, made shortly before he fell a victim to the climate of Africa. These specimens were comprised in a collection of *Araneidea* forwarded by the relatives of Mr. Thornton to my friend Mr. Meade, who transmitted it to me for the purpose of having its contents examined and descriptions made of such species as might appear to be new to arachnologists, being prevented himself from bestowing the requisite time on the undertaking, for which he is so well qualified, by his numerous professional engagements.

The late Mr. R. Thornton accompanied Dr. Livingstone in his last expedition to South Africa, in the capacity of geologist; and Mr. H. Waller held the appointment of lay superintendent of the mission to the Zambesi.

Tribe Octonoculina.

Family Lycosidæ.

Genus Ctenus, Walck.

Ctenus velox.

Length of the female $\frac{7}{12}$ths of an inch; length of the cephalothorax $\frac{1}{3}$, breadth $\frac{1}{4}$; breadth of the abdomen $\frac{1}{5}$; length of a posterior leg $1\frac{3}{16}$; length of a leg of the third pair $\frac{15}{16}$.

The eyes are disposed on the anterior part of the cephalothorax in three transverse rows; the two anterior ones, with the two intermediate ones of the four constituting the second row, describe a trapezoid whose shortest side is before; and each of the two eyes forming the posterior row, with a lateral one of the second row, is seated on a tubercle; the intermediate eyes of the second row are the largest, and the lateral ones, which are in a line with them, much the smallest of the eight. The cephalothorax is truncated in front, compressed before, and rounded on the sides, which are depressed and marked with furrows converging towards a narrow indentation in the medial line of the posterior region; it is clothed with short, dull-yellowish hairs, and is of a reddish-brown colour, with narrow, dark-brown lateral margins, parallel to which a broad, rather obscure, yellowish-brown band, having its superior margin somewhat dentated, extends along each side; a narrow, pale red-brown band passes from between the posterior pair of eyes to its base, and comprises in its anterior part a fine dark-brown line that terminates at the medial indentation. The falces are powerful, conical, vertical, armed with teeth on the inner surface, provided with long yellowish hairs, and have a dark-brown hue. The maxillæ are long, straight, and truncated obliquely at the extremity on the inner side, which is fringed with reddish hairs; and the lip is short, broad, and somewhat quadrate, but rounded on the sides. These parts are of a reddish-brown colour, the outer side of the maxillæ and the base of the lip being much the darkest. The sternum, which has a broad oval form, is clothed with short greyish hairs, interspersed with long upright ones of a darker hue, and is of a pale red-brown colour. The legs are long, provided with hairs and sessile spines, and of a reddish-brown hue; the fourth pair is the longest, then the first, and the third pair is the shortest; the metatarsi and tarsi have hair-like papillæ on their inferior surface, and the latter are terminated by two curved claws, pectinated at their base. The palpi are long, and resemble the legs in colour (with the exception of the base of the humeral joint, which has a brighter tinge of red), and have a short, curved, pectinated claw at their extremity. The abdomen is oviform, hairy, convex above, and projects a little over the base of the cephalothorax; the upper part and sides are of a brown colour freckled with yellowish grey, and a broad dentated band of a yellower hue, bordered with black, extends along the middle of the former, and comprises a longitudinal yellow band in its anterior half; a broad, triangular, black mark, having its truncated apex directed backwards, and comprising within its base two oval white spots placed transversely, occurs on the under part; it is bounded on each side by a bright orange-red band, and these bands converge to the spinners, where they meet; the sexual organs, which are highly developed, have a large process directed backwards from their anterior margin, and, with the branchial opercula, are of a dark reddish-brown hue, the latter being the paler.

The specimen from which the description was made was the only one of the species in the collection.

Ctenus vividus.

Length of the female $\frac{19}{20}$ths of an inch; length of the cephalothorax $\frac{13}{24}$, breadth $\frac{5}{12}$; breadth of the abdomen $\frac{5}{16}$; length of an anterior leg $1\frac{4}{5}$; length of a leg of the third pair $1\frac{3}{10}$.

The disposition and relative size of the eyes of this species are similar to those of *Ctenus velox*. The legs are long, robust, provided with hairs and sessile spines, and of a yellowish-brown colour; the first pair is the longest, then the fourth, and the third pair is the shortest; the metatarsi and tarsi have hair-like papillæ on their inferior surface, and the latter are terminated by two curved claws, pectinated at their base. The palpi are long, and resemble the legs in colour; and the digital joint, which is strongly tinged with brown, has a short, curved, pectinated claw at its extremity. The cephalothorax is truncated in front, compressed before, and rounded on the sides, which are depressed and marked with furrows converging towards a narrow indentation in the medial line of the posterior region; it is clothed with hairs, and of a brown colour, with a broad yellowish-brown band (whose superior margin is somewhat dentated) extending along each side, and a narrow longitudinal one in the middle, which comprises a fine brown line in its anterior part. The falces are powerful, conical, vertical, and densely clothed with yellow hairs at the base in front; the maxillæ are straight, enlarged at the extremity, which is rounded on the outer side, and obliquely truncated on the inner side, where it is supplied with long hairs; and the lip is short, broad, and somewhat quadrate, but rounded on the sides. These parts have a red-brown hue, the falces being much the darkest. The sternum has a broad oval form, with small eminences on the sides, opposite to the legs; it is thinly clothed with long hairs, and of a dark-brown hue, with a faint tinge of yellow in the medial line. The abdomen is oviform, hairy, convex above, and projects a little over the base of the cephalothorax; it is of a dull pale-yellow colour, streaked and spotted with brown, the under part, which is the yellowest, being marked with the fewest and smallest spots; a broad, dentated, dull-yellow band, bordered with brown, and comprising a longitudinal row of irregular brown spots, extends along the middle of the upper part, and on each side of it there is a series of brownish-black spots; the sexual organs are moderately developed, with a large process directed backwards from their anterior margin, whose extremity is dilated; these organs, with the branchial opercula, are of a brownish-yellow colour, the latter being the paler.

The collection contained six females of this species, five of which were immature.

Genus Pasithea, Blackw.

Pasithea pulchra.

Length of the female $\frac{15}{16}$ths of an inch; length of the cephalothorax $\frac{5}{16}$, breadth $\frac{5}{24}$; breadth of the abdomen $\frac{5}{16}$; length of an anterior leg $1\frac{1}{2}$; length of a leg of the third pair $1\frac{1}{6}$.

The eyes are unequal in size, and disposed in three transverse rows on the anterior part of the cephalothorax, high above its frontal margin; the four posterior ones form a curved row whose convexity is directed backwards, and the other four describe a trapezoid whose shortest side is before; the posterior eyes of the trapezoid are seated on tubercles, and are the largest, and the anterior ones, which are near to each other, are much the smallest of the eight; the entire group describes a sector of a circle, whose radii converge towards the frontal margin. The cephalothorax is convex, glossy, compressed before, vertical in front, rounded on the sides, which are marked with slight furrows converging towards an indentation in the medial line of the posterior region, and has a few black bristles behind and before the eyes; it is of a yellow-brown colour, with a broad, angular, pale-yellowish mark on the posterior part of the cephalic region, whose vertex extends to the medial indentation, and has a small red spot on each side, towards its termination; this angle is bisected by a faint line of the same hue, which originates at the intermediate eyes of the posterior row; the space comprised between the large posterior eyes of the trapezoid and those of the posterior row is of a dark-brown colour; a red-brown line extends from each minute anterior eye to the frontal margin, and there is a parallel one of the same hue on each of its external angles. The falces are long, powerful, subconical, and vertical; they are of a dull-yellow colour, with longitudinal lines of a red-brown hue, corresponding to those in front of the cephalothorax, the exterior ones being the shortest. The maxillæ are long, convex near the base, which is curved towards the lip, but straight and pointed at the extremity; the lip is much shorter than the maxillæ, somewhat triangular, and hollowed at the apex; and the sternum is heart-shaped, with a few black bristles distributed over its surface. These parts are of a pale-yellowish colour tinged with green, the sternum being the palest. The legs are very long, slender, provided with hairs and long spines, and are of a yellow colour, spotted with brownish black, a longitudinal red line, of greater or less extent, occurring on the inferior surface of the femora; the first pair is the longest, then the second, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The palpi resemble the legs in colour, but are without any red line on their inferior surface, and have a curved pectinated claw at their extremity. The abdomen is of an oblong-oviform figure, somewhat pointed at the spinners, convex above, and projects a little over the base of the cephalothorax; it is sparingly supplied with hairs, and of a pale-yellow colour, finely reticulated with dull green; a yellow band, streaked and freckled with red, and strongly dentated on its inner margin, extends from the anterior extremity of the upper part along each side of the medial line to the spinners, where the two meet; and in the anterior part of the space comprised between the two bands there is a short longitudinal one, of a dark dull-greenish colour, which is rather irregular in outline, ramified at its posterior extremity, and has a short transverse bar of the same hue near its anterior extremity; a somewhat obscure yellow band extends along each side of the medial line of the under part, and two nearly parallel, irregular, fine, black lines pass from the sexual organs halfway towards the spinners; the sexual organs are highly developed, with a strong septum in the middle, and are of a very dark greenish colour, tinged with red, that of the spinners being pale green.

Two adult females were comprised in the collection, one of which had deposited its ova.

It is proposed to transfer the Spiders of the genus *Pasithea* from the family *Thomisidæ,* in which they were originally placed, to that of the *Lycosidæ,* as, by the disposition of their eyes and the structure of their legs, they evidently possess a relation of affinity to certain species of the genus *Sphasus*.

Family Thomisidæ.

Genus Selenops, Dufour.

Selenops alacer.

Length of the female $\frac{3}{4}$ths of an inch; length of the cephalothorax $\frac{5}{16}$, breadth $\frac{5}{16}$; breadth of the abdomen $\frac{1}{3}$; length of a leg of the third pair $1\frac{1}{10}$; length of a leg of the first pair 1.

The eyes are disposed on the anterior part of the cephalothorax; four, nearly equal in size, form, immediately above the frontal margin, a slightly curved transverse row, whose convexity is directed forwards; the eyes of each lateral pair are seated obliquely on a tubercle apart, the two anterior ones, which are oval and the smallest and lightest-coloured, being situated a little in advance of the lateral eyes of the transverse row; and this row, if extended, would include in its curve the two posterior eyes, which are the largest of the eight. The cephalothorax is large, depressed, compressed before, slightly rounded in front, and greatly so on the sides, which are strongly marked with furrows converging towards an oblong indentation in the medial line of the posterior region; it is of a red-brown colour, and is supplied with hoary hairs having a yellowish tint. The falces are short, powerful, conical, very convex in front, vertical, and armed with a few teeth on the inner surface; the maxillæ are straight, and increase in breadth towards the extremity, which is obliquely truncated on the inner side; and the lip is semicircular. These parts are of a dark-brown colour, tinged with red; the falces are the darkest, and the extremity of the maxillæ and apex of the lip have a brownish-yellow hue. The sternum is nearly circular; the legs are long, robust, and provided with hairs and spines; their relative length could not be ascertained, as the second pair was missing; but the third pair is a little longer than the fourth, which somewhat surpasses the first pair; each tarsus is terminated by two plain, curved claws, and below them there is a scopula; the palpi are short, and the digital joint, which is provided with spines, has a curved, minutely pectinated claw at its extremity. These parts are of a red-brown colour; the sternum is the palest, and the metatarsal joint of the legs and the digital joint of the palpi are the darkest-coloured. The abdomen is of a depressed oviform figure, and the anterior extremity, which is fringed with fine bristles, and has the appearance of having been cut directly across, projects very little over the base of the cephalothorax; it is clothed with hoary hairs having a yellowish tint, and is of a dull brownish-yellow colour, obscurely freckled with brown, particularly on the upper part and sides; the sexual organs are moderately developed, and have a triangular reddish-brown process connected with each lateral margin, whose vertices nearly meet, a small semicircular one of the same hue directed forwards from the posterior margin, and a larger semicircular process of a reddish-yellow colour, directed backwards from the anterior margin.

The collection contained two adult females of this species.

Family Theridiidæ.

Genus Latrodectus, Walck.

Latrodectus cinctus.

Length of the female $\frac{2}{5}$ths of an inch; length of the cephalothorax $\frac{1}{6}$, breadth $\frac{3}{20}$; breadth of the abdomen $\frac{1}{4}$; length of an anterior leg $\frac{7}{8}$; length of a leg of the third pair $\frac{1}{2}$.

The abdomen is very convex above, thinly clothed with hairs, and projects over the base of the cephalothorax; it is of a brownish-black colour, with an oblong mark extending upwards from the spinners, and three curved transverse bands of a deep orange-colour on the upper part; the first of these bands is the shortest, and is situated in front, the second is longer, and the third, which is much the longest, and curved very obliquely, increases in breadth towards its extremities, whose pointed termination is in contact with the posterior extremity of the oblong orange-coloured mark above the spinners; the sexual organs are well developed, and of a dark-brown hue, tinged with red, that of the branchial opercula being red-brown. Immature females are of a pale-yellow hue where adults are orange-coloured. The eyes are disposed on the anterior part of the cephalothorax, high above the frontal margin, in two transverse, nearly straight rows; the four intermediate ones almost form a square, the two anterior ones, which are seated on a prominence, being rather nearer to each other than the two posterior ones; the lateral eyes of both rows are the largest, and each is placed on a tubercle. The cephalothorax is oval, somewhat convex, hairy, and has a large indentation in the medial line of the posterior region; the maxillæ are short, obliquely truncated at the extremity, on the outer side, and inclined towards the lip, which is broad and semicircular; the sternum is heart-shaped; the legs are robust and hairy; the first pair is the longest, then the fourth, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base; the palpi are moderately long, and have a curved, pectinated claw at their extremity. These parts are of a dark-brown colour, the extremity of the maxillæ having a yellowish-brown tint. The falces are conical, vertical, and of a red-brown hue.

An adult and an immature female of this *Latrodectus* were comprised in the collection.

Family Epeïridæ.

Genus Epeïra, Walck.

Epeïra vigilans.

Length of the female $\frac{9}{10}$ths of an inch; length of the cephalothorax $\frac{1}{4}$, breadth $\frac{1}{5}$; breadth of the abdomen $\frac{3}{8}$; length of an anterior leg $\frac{15}{16}$; length of a leg of the third pair $\frac{7}{16}$.

The cephalothorax is convex, compressed before, rounded in front and on the sides, with an indentation in the medial line of the posterior region; it is thinly clothed with yellowish-grey hairs, and is of a red-brown colour, the sides being much the darkest. The falces are powerful, conical, vertical, and armed with teeth on the inner surface; the maxillæ are short, straight, and enlarged and rounded at the extremity; and the lip is semicircular, but somewhat pointed at the apex. These parts are of a pale red-brown colour, the extremity of the maxillæ and the apex of the lip having a pale-yellow hue. The sternum is heart-shaped, with small eminences on the sides, opposite to the legs, and is of a dull-yellow colour, tinged with brown on the lateral margins. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones are seated on a protuberance, and describe a trapezoid, the two anterior ones, which are the largest of the eight, being wider apart than the posterior ones; the eyes of each lateral pair are placed obliquely on a small tubercle, and are near to each other, but not in contact. The legs are long, provided with hairs and spines, and of a red-brown colour, strongly tinged with brown at the extremity of the joints; the first pair is the longest, then the second, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi are of a red-brown hue, and have a curved, pectinated claw at their extremity. The abdomen is of a depressed oviform figure, and projects over the base of the cephalothorax; it is thinly clothed with short pale hairs, and of a dull-yellow colour, with a large oval brown mark on each side of its anterior extremity; a triangular brown spot, whose vertex extends between the two oval marks, occurs in the medial line of the upper part, and comprises three pairs of short oblique black streaks; this triangular spot, which has a strongly marked streak of the same hue directed obliquely outwards and backwards from each side, is followed by a large, pale-brown, leaf-shaped mark that tapers to the spinners, and has its sinuous margins bordered by a fine black line whose continuity is much interrupted; the middle of this mark is occupied by a longitudinal, taper, yellow band, crossed by lines of the same hue, and comprising some short black streaks in its anterior part, and several fine, long, brown lines in its posterior part; two depressed dark-brown spots, situated on each side of the medial line, nearly form a square, the two posterior ones being larger and rather wider apart than the anterior ones; the sides are marked transversely with numerous fine brown lines, most of which meet at their superior extremities; the under part has longitudinal brown streaks on its sides, and a large dark-brown mark in the middle, whose contracted extremity extends to the spinners; it has an obscure yellowish hue in the medial line, and is bordered anteriorly and laterally with yellow, two spots of the same hue occurring on each side of the brown spinners; the sexual organs, which are not highly developed, have a long process directed backwards from their anterior margin, whose surface is concave and extremity rounded; they are of a red-brown colour, that of the branchial opercula being yellowish-brown.

Three adult females of *Epeïra vigilans* were included in the collection.

Genus Nephila, Leach.

Nephila Keyserlingii.

Length of the female $1\frac{3}{16}$ inch; length of the cephalothorax $\frac{11}{24}$, breadth $\frac{5}{16}$; breadth of the abdomen $\frac{1}{2}$; length of an anterior leg $2\frac{7}{8}$; length of a leg of the third pair $1\frac{1}{4}$.

The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones nearly form a square, the two anterior ones, which are seated on a protuberance, and are rather nearer to each other than the two posterior ones, being the largest of the eight; the eyes of each lateral pair are placed obliquely on a prominent tubercle, and are separated by a considerable interval. The cephalothorax is long, somewhat convex, particularly in the cephalic region, truncated in front, compressed before, moderately rounded on the sides, which are marked with furrows converging towards a transverse pair of indentations in the medial line of the posterior region, and has two conical glossy eminences placed transversely near its middle; it is of a dark-brown colour, which is almost concealed by a covering of short, adpressed, white hairs having a silvery lustre. The falces are powerful, conical, vertical, glossy, convex at the base, in front, and armed with teeth on the inner surface; the maxillæ are short, strong, and greatly enlarged and rounded at the extremity; and the lip is somewhat oval. These parts are of a very dark brown colour, the extremity of the maxillæ, the apex of the lip, and a line extending along the middle of the latter having a dull-yellow hue. The sternum is heart-shaped and glossy, with prominences on the sides, and a somewhat pointed one opposite to the base of the lip; it is of a bright yellow colour, with a large, irregular, transverse dark-brown mark in the middle, and narrow lateral margins of a similar hue. The legs are very long, slender, provided with fine spines and hairs, the latter being the longest and densest on the inferior surface and sides of the tibiæ of all the legs except those of the third pair; they are of a yellow colour; a broad annulus near the middle and a narrow one at the extremity of the femora, the genua, the base, and a broad annulus near the middle of the tibiæ of the first and second pairs, the extremity of the femora, the genua and tibiæ of the third pair, and the extremity of the femora, the genua, and about two-thirds of the tibiæ from the base of the fourth pair, with the metatarsi and tarsi of all the legs, have a dark-brown hue; the first pair is the longest, then the second, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi are short, and of a yellow colour, the digital joint, which has a curved, slightly pectinated claw at its extremity, being strongly tinged with brown. The abdomen is subcylindrical, projecting over the base of the cephalothorax, and is broader at the anterior than at the posterior extremity, which is rounded and extends beyond the spinners; it is thinly clothed with short hoary hairs on the upper part and sides, and is of an olive-brown colour, the under part being the darkest; a broad, yellow, transverse band near the anterior extremity passes along the upper part of each side to the posterior extremity, its posterior half being irregular in outline, particularly on its superior margin; four large yellow spots are disposed longitudinally in the medial line, and a series of four small, depressed, brown spots occurs on each side of it; several fine brown lines extend along the middle, which are most conspicuous on the yellow spots; a yellow band, whose posterior half is broken into spots and streaks, some of which are covered with white hairs, passes along the lower part of each side to the spinners, and above those organs there are six small yellow spots disposed in pairs; on the under part a yellow, curved, transverse band passes immediately below the sexual organs, and midway between those organs and the spinners there is an irregular transverse band of the same hue; the sexual organs are well developed and prominent, the anterior margin being oval, and the posterior one somewhat triangular; these organs, with the spinners and branchial opercula, have a dark-brown hue, that of the inner margin of the opercula being pale-yellow.

The collection contained four females of this large and handsome species of *Nephila*, with which I have connected the name of M. Keyserling, whose researches in this department of arachnology have contributed greatly to extend our knowledge of the *Epeïridæ*.

Nephila venusta.

Length of the female $\frac{4}{5}$ths of an inch; length of the cephalothorax $\frac{3}{10}$, breadth $\frac{5}{24}$; breadth of the abdomen $\frac{3}{10}$; length of an anterior leg $1\frac{2}{3}$; length of a leg of the third pair $\frac{7}{8}$.

The legs are long, slender, provided with fine spines and hairs, the latter being the longest and most abundant on the tibiæ and base of the metatarsi of the first, second, and fourth pairs; they are of a reddish-brown colour, the metatarsi and tarsi being the darkest; the first pair is the longest, then the second, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi are short, and paler than the legs, the extremity of the radial and the whole of the digital joint being strongly tinged with brown; the latter is supplied with long hairs and spines, and has a curved, slightly pectinated claw at its extremity. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones nearly form a square, the two anterior ones, which are seated on a protuberance, and are rather nearer to each other than the two posterior ones, being the largest of the eight; the eyes of each lateral pair are placed obliquely on a prominent tubercle, and are separated by a considerable interval. The cephalothorax is long, somewhat convex, particularly in the cephalic region, truncated in front, compressed before, moderately rounded on the sides, which are marked with furrows converging towards a transverse pair of indentations in the medial line of the posterior region, and has two small, conical, glossy eminences placed transversely near its middle, and numerous very minute ones on its lateral margins; it is of a very dark brown colour, which is almost concealed by a covering of short, adpressed white hairs having a silvery lustre. The falces are powerful, conical, vertical, glossy, and armed with teeth on the inner surface; the maxillæ are short, strong, and greatly enlarged and rounded at the extremity; and the lip is somewhat oval. These parts are of a dark-brown colour, the falces being much the darkest; the maxillæ have a yellow-brown hue at their extremity, on the inner surface, and the lip is marked with a longitudinal yellow band, which is contracted in the middle. The sternum is heart-shaped and glossy, with prominences on the sides and a pointed one opposite to the base of the lip; it is of a bright-yellow colour. The abdomen is subcylindrical, projecting over the base of the cephalothorax, and its posterior extremity, which is rounded, extends a little beyond the spinners; it is of a yellow-brown colour, reticulated and spotted with pale dull-yellow on the upper part and sides, the anterior extremity being the yellowest; many of the spots, which vary in size and form, are covered with white hairs having a silvery lustre; a series of three depressed spots occurs on each side of the medial line, and on its posterior half four fine lines are disposed longitudinally; these spots and lines have a brown hue, and two large irregular spots of a darker brown are situated on the lower part of each side; the under part is of an olive-brown colour, with four slightly curved, pale-yellow lines, which describe a quadrilateral figure in the middle; the spinners and the branchial opercula are of a brown colour, the inner margin of the latter having a dull-yellow hue; the sexual organs are well developed, with a longitudinal septum in the middle, and the anterior margin presents two prominent, glossy convexities; their colour is dark-brown tinged with red.

Two adult females of *Nephila venusta* were included in the collection.

Genus Argyopes, Savigny.

Argyopes caudatus.

Length of the female $1\frac{3}{10}$ inch; length of the cephalothorax $\frac{2}{5}$, breadth $\frac{1}{3}$; breadth of the abdomen $\frac{7}{10}$; length of an anterior leg 2; length of a leg of the third pair $1\frac{1}{10}$.

The abdomen is large, and of a depressed oviform figure; its anterior extremity, which has the appearance of having been cut directly across, projects over the base of the cephalothorax, and its posterior extremity extends greatly beyond the spinners;

three strong conical prominences project from each side; and it is terminated by a membranous caudal appendage, with a minute conical prominence on each side of its base; the upper part is clothed with hoary hairs, and is of a yellow colour, with a broad, semilunar, brown mark at its anterior extremity, whose convexity is directed upwards; to this mark succeed five transverse bands of a darker hue, whose margins are very irregular, the first and last having their continuity interrupted in the middle; there is a series of four depressed brown spots on each side of the medial line, and four fine lines of a similar hue are disposed longitudinally on the posterior part; the colour of the caudal appendage is brown, and above it there is an oblong yellow spot; the sides and under part have a brown hue; the former are corrugated and marked with brownish-yellow spots and streaks, which are almost concealed by hoary hairs, and the yellow lateral tubercles are marked transversely with brown in the middle; a series of large, irregular, yellow spots extends along each side of the medial line of the under part, and minute spots of a similar hue occur in the interval between the two; the sexual organs, which are moderately developed, have a long, pale reddish-brown process in connexion with their anterior margin that is directed backwards, and their predominant colour, with that of the branchial opercula, is dark-brown faintly tinged with red, the latter being the paler. The eyes are disposed on the anterior part of the cephalothorax in two transverse rows; the four intermediate ones nearly form a square, the two anterior ones, which are seated on a small protuberance, being the largest of the eight; the eyes of each lateral pair are placed obliquely on a tubercle, and are near to each other, but not in contact, the anterior ones being much the smallest. The cephalothorax is compressed before, rounded in front and on the sides, slightly convex, with a broad, shallow indentation in the medial line of the posterior region; it is of a dark-brown colour, with a broad pale reddish-brown band extending from the front to the medial indentation, and brownish-yellow lateral margins; these colours are concealed, except at the base, by a dense covering of white adpressed hairs. The falces are powerful, conical, vertical, armed with teeth on the inner surface, and of a red-brown colour. The maxillæ are short, strong, and greatly enlarged and rounded at the extremity; the lip is semicircular, but somewhat pointed at the apex; and the sternum is heart-shaped, hairy, and has eminences on the sides opposite to the legs. These parts are of a dark-brown colour; the extremity of the maxillæ and the apex of the lip have a brownish-yellow hue; and a band extending along the middle of the sternum, from each side of which a streak is directed obliquely backwards and outwards, and two minute spots on each side of its anterior part are of a yellow colour. The legs are long, provided with hairs and spines, and are of a dark-brown colour, the inferior surface of the coxæ and of the femora, especially at their base, being strongly tinged with dull-yellow; the first pair is the longest, then the second, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi are of a dull-yellow colour, the digital joint (which is supplied with spines and terminated by a curved, pectinated claw) being tinged with brown at its extremity.

The collection contained four adult females of this species.

Genus Eurysoma, Koch.

Eurysoma Thorntoni.

Length of the female $\frac{13}{24}$ths of an inch; length of the cephalothorax $\frac{5}{24}$, breadth $\frac{1}{5}$; breadth of the abdomen $\frac{7}{12}$; length of a posterior leg $\frac{1}{2}$; length of a leg of the third pair $\frac{1}{4}$.

The eyes are situated near the frontal margin of the cephalothorax; the four intermediate ones are seated on a protuberance and form a square, the two anterior ones being the largest and darkest-coloured of the eight; the eyes of each lateral pair are placed a little apart on a tubercle, and are distant from the four intermediate ones. The cephalothorax is convex, glossy, depressed towards the extremities, compressed before, broadly truncated in front, rounded on the sides, which are marked with furrows converging towards an indentation in the medial line of the posterior region, and is of a yellow-red colour. The falces are short, powerful, conical, armed with teeth on the inner surface, inclined towards the sternum, and of a brown colour, faintly tinged with red. The maxillæ are straight, and enlarged and rounded at the extremity; the lip is semicircular; and the sternum is heart-shaped, with eminences on the sides, opposite to the legs. These parts are of a yellow colour, the maxillæ and lip having a tinge of brown. The legs are short, provided with hairs, and are of a dark-brown colour, with the exception of the coxæ and about two-thirds of the femora from the base, which have a yellow hue; the fourth pair is the longest, then the first, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi, which are short, resemble the legs in colour, and have a curved, pectinated claw at their extremity. The abdomen is nearly circular, rather broader than long, without spines, glossy, moderately convex above, and projects greatly over the base of the cephalothorax; the upper part is of a deep-black hue, marked with numerous circular depressions, and with twenty-two bright-yellow spots, of various shapes and sizes; sixteen occur on the margins, two in the medial line, and two on each side; the two smallest are situated on the frontal margin, and between them there are two others of an oval form; these latter spots are followed by a circular one in the medial line, to which succeeds a large one of an oblong heart-shape, veined with pale-brown; the anterior spot on the side is large and reniform, and the posterior spot is connected with a marginal one; the under part is much corrugated, and of a brownish-black colour, that of the spinners, which are encircled by a rim, being dark-brown; a large semicircular band behind the spinners, and the space surrounding the pedicle by which the cephalothorax is attached to the abdomen, including the branchial opercula, are of a yellow hue, with transverse, forked, soot-coloured lines; the sexual organs are moderately developed, and of a dark-brown colour, tinged with red, that of the anterior margin, which is semicircular and rather prominent, being brownish-yellow.

This elegantly marked *Eurysoma*, two specimens of which were comprised in the collection, is dedicated to the memory of of the late Richard Thornton, Esq., whose premature death, deeply deplored by his friends, has removed from his sphere of usefulness here an intelligent and zealous votary of natural science.

Eurysoma Walleri.

Length of the female $\frac{11}{24}$ths of an inch; length of the cephalothorax $\frac{5}{24}$, breadth $\frac{3}{16}$; breadth of the abdomen $\frac{13}{24}$; length of a posterior leg $\frac{11}{24}$; length of a leg of the third pair $\frac{7}{24}$.

The cephalothorax is convex, depressed towards the extremities, glossy, compressed before, broadly truncated in front, rounded on the sides, which are marked with slight furrows converging towards an indentation in the medial line of the posterior region, and is of a brownish-yellow colour. The falces are short, powerful, conical, armed with teeth on the inner surface, inclined towards the sternum, and of a brown hue, tinged with yellow on the sides and at the base. The maxillæ are straight, and enlarged and rounded at the extremity; the lip is semicircular; and the sternum is heart-shaped, with eminences on the sides, opposite to the legs. These parts have a yellow hue, the maxillæ and lip being tinged with brown. The eyes are situated near the frontal margin of the cephalothorax; the four intermediate ones are seated on a protuberance, and form a square, the two anterior ones being the largest and darkest-coloured of the eight; the eyes of each lateral pair are placed apart on a tubercle, and are distant from the four intermediate ones. The legs are short, provided with hairs, and are of a yellow colour, with brownish-black annuli, each femur having a single annulus at its extremity; the fourth pair is the longest, then the first, and the third pair is the shortest; the tarsi are terminated by claws of the usual number and structure. The palpi are short, somewhat darker-coloured than the legs, and have a curved, pectinated claw at their extremity. The abdomen is nearly circular, rather broader than long, without spines, glossy, moderately convex above, and projects greatly over the base of the cephalothorax; it is of a yellow colour, with five depressed brownish-black spots, forming, near the frontal margin, a transverse curved row whose convexity is directed backwards, the two exterior spots being the smallest of the five; four similar spots occur on each side, parallel to the margin; four smaller ones form a transverse, slightly curved row near the posterior margin, whose convexity is directed forwards; and there are three similar spots on each side of the medial line, those constituting the intermediate pair being the largest and widest apart; the under part is much corrugated, and has a large, triangular, dark-brown mark in the middle, comprising within its vertex the spinners, which are encircled by a rim; the whole is encompassed by a broad yellow margin marked with depressed brownish-black spots, from which lines of the same hue pass towards the centre; the sexual organs are moderately developed, with a small, oval, brownish-yellow process in connexion with their anterior margin, and are of a dark-brown hue, tinged with red, that of the branchial opercula being yellow.

I have conferred upon this species the name of Horace Waller, Esq., an ardent naturalist, and the friend and fellow-traveller of Mr. Thornton.

Eurysoma Walleri bears a strong resemblance to the *Gasteracantha hemisphærica* of M. Koch (Die Arachniden, Band xi. p. 49, tab. 373. fig. 874), but differs from it in the number, distribution, and relative size of the depressed brownish-black spots on the abdomen, and also in some other particulars. The generic name *Gasteracantha* being quite inapplicable to a spider absolutely devoid of spines, I have placed this species, notwithstanding the numerous depressed dark-coloured spots with which its carapace is marked, in the genus *Eurysoma*, to which, for the same reason, I think it would be expedient to transfer *Gasteracantha hemisphærica*.

Genus Pycnacantha, Blackw.

Eyes small, disposed on the anterior part of the cephalothorax; the four intermediate ones are seated on a narrow, prominent protuberance directed obliquely upwards and forwards, and nearly describe a square; the two superior ones are placed on the summit of the protuberance, and the two inferior ones, which are rather wider apart and the largest of the eight, are situated near its middle, in front; the lateral eyes are the smallest; those of each pair are seated obliquely on the outer side of a slender, elevated, upright tuoercle, a little below its somewhat pointed extremity, and are separated by a moderately wide interval.

Maxillæ short, straight, and enlarged and rounded at the extremity.

Lip semicircular, but slightly pointed at the apex.

Legs moderately robust; the first and second pairs are much longer than the third and fourth pairs, the first pair being the longest and the third the shortest.

Abdomen subglobose, provided on the upper part and sides with numerous, close-set, sharp-pointed spines, varying greatly in their dimensions.

Pycnacantha Meadii.

Length of the female $\frac{1}{2}$ an inch; length of the cephalothorax $\frac{1}{5}$, breadth $\frac{1}{6}$; breadth of the abdomen $\frac{1}{3}$; length of an anterior leg $\frac{7}{10}$; length of a leg of the third pair $\frac{3}{8}$.

The cephalothorax is compressed before, truncated in front, with prominent lateral angles, broadly rounded on the sides, somewhat convex, and has a shallow indentation in the medial line of the posterior region; it is thinly clothed with short, whitish hairs, and of a dull-yellow colour, the base being much the palest; a narrow brown band passes from between the lateral tubercles to the medial indentation; a longitudinal one, of a similar hue, but somewhat paler, whose posterior part is much the broadest, occurs on each side, and small black prominences, which are most numerous on the medial band, are distributed over its surface. The falces are conical, vertical, armed with teeth on the inner surface, and of a pale-yellow colour in front, the outer side and extremity having a reddish-brown hue. The maxillæ and lip are of a dark reddish-brown colour, the extremity of the former and the apex of the latter having a yellowish-white hue. The sternum is heart-shaped, with small eminences on the sides, opposite to the legs, and is of a yellow colour, with dark-brown margins. The legs are provided with hairs and spines, two parallel rows of the latter occurring on the inferior surface of the metatarsi and tarsi of the first and second pairs; they have a pale dull-yellow hue, and the tarsi are terminated by claws of the usual number and structure. The palpi resemble the legs in colour, and have a short, curved, pectinated claw at their extremity. The abdomen, which is clothed with short, pale hairs, is of a subglobose form, very convex above, projecting over the base of the cephalothorax, and is armed on the upper part and sides with about fifty sharp-pointed yellow spines; two, much larger than the rest, are unequally forked, having a short spine on their outer side, and are of a red-brown colour, the anterior surface of the prongs and a broad annulus at their base being much the darkest; these spines are placed transversely on the most elevated part of the abdomen; it is of a pale dull-yellow hue, and has small black prominences distributed over its upper part and sides; the former has a narrow brown band extending from its anterior extremity to the spinners, near the middle of which there are two short brown lines curved towards each other, comprising in the interval between them a pair of spines; and the latter are marked with dark-brown transverse lines, bordered anteriorly with pale yellow; the under part is corrugated, and minute, depressed, brown spots are disposed in rows in the curved transverse furrows; the sexual organs present a narrow transverse orifice, and have a reddish-brown hue, that of the branchial opercula being yellowish-brown.

I have much pleasure in associating the name of my valued friend and correspondent, R. H. Meade, Esq., with this very remarkable Spider, which forms a connecting link between the species of the genera *Epeïra* and *Acrosoma.*

XLI.—*On two new Plesiosaurs, from the Lias.* By Harry Seeley, F.G.S., of the Woodwardian Museum, Cambridge.

[Plates XIV. & XV.]

Thomas Hawkins, Esquire, to whose zeal English science owes many exquisitely wrought-out Reptiles of the Liassic seas, presented to the University of Cambridge a series of Saurians which grace the walls of the Woodwardian Museum. Two are Plesiosaurs, both of new species: one of them, already famous for having the unanchylosed bones described by the late Lucas Barrett in his paper on the Plesiosaurian atlas and axis, displays limbs, ribs, all the dorsal vertebræ, and much of the neck; the other and smaller fragment has a part only of the neck and back, ribs, episternum, coracoid, scapula, and clavicle.

The larger fossil seems to have been imbedded laying on its back, with the neck swayed laterally; but all the vertebræ now rest on the left side, so that the neck is curved, as though the head had been drawn back. Except the first four caudal vertebræ, the tail is wanting, and many vertebræ are absent from the middle of the neck. Mr. Barrett considered the remains to indicate a young animal; but, though probably not aged, there is no evidence that it was immature.

The species hitherto undetermined, indicated by twenty-four vertebræ between the last of the neck and the first of the tail, and by eight carpal bones and five bones in the tarsus, is different from every other yet characterized. So it will now be described as

Plesiosaurus eleutheraxon *.

The atlas and axis are contrasted with the same bones in *Plesiosaurus Etheridgii*, and well figured in the 'Annals of Natural History' for November 1858. To these succeed eleven vertebræ, which with their interspaces occupy $9\frac{5}{8}$ inches. The parapophyses for the hatchet bones occupy at first all the width between the epiphyses, but at the thirteenth they are found only on the hinder half of the side of the vertebræ. The neurapophyses soon extend to the whole length of the vertebræ; the zygapophyses are long, the neural spine compressed, wide, and not very high. The sides of these cervical vertebræ are flattened, but the under surface between the hatchet bones is excavated.

The third vertebra is $\frac{9}{16}$ inch long, and $\frac{3}{4}$ of an inch wide over the articular end, which is $\frac{9}{16}$ of an inch high. Subsemicircular in outline in front, being flattened above, it is moderately concave, and, like all the cervical vertebræ, has a bevelled border, which is always of the same width. The articular surface is oval in the sixth, which is nearly $\frac{7}{8}$ of an inch wide and $\frac{5}{8}$ high. The thirteenth is $\frac{7}{8}$ of an inch long.

Two inches' interspace here separates the next three vertebræ, which are noticeably larger, have long narrow venous foramina between the small ploughshare bones, and extend over $3\frac{1}{2}$ inches. The last of these vertebræ measures $2\frac{1}{2}$ inches from base to top of the neural spine, which is much less high in front than behind, and from front to back nearly as long as the vertebra.

After these there is a vacant interspace of 11 inches; and then the remainder of the spinal column is continuous to the end, the thirty-five vertebræ maintaining a nearly uniform size.

In the first seven the circular parapophysis rapidly ascends the side, becoming elliptical, and at the eighth the articulation for the rib, which there becomes very much larger, is entirely supported on the neural arch. The sides are concave, so that the epiphyses form a broad rim, and inferiorly they meet in a sharp angle, which disappears with the first dorsal. The seven vertebræ measure 10 inches. The neural spine is now much longer, and makes the height of the first of these seven cervicals $3\frac{1}{2}$ inches.

* ἐλεύθερος, Lat. *liber*; ἄξων, Lat. *axis*.

Each centrum is much higher than long. Thus there are, with two scattered on the slab, twenty-seven cervical vertebræ preserved; and if the interspaces represent the number missing, there must have been originally about thirty-six. The hinder cervical ribs are 2 inches long.

In a former paper on *Plesiosaurus macropterus*, I adopted as the first dorsal that vertebra in which the rib rises entirely on the neural arch—a view since sanctioned by Professor Owen in his Monograph of Plesiosaurs.

The length of the dorsal and sacral region in this specimen is 2 feet 5 inches, and it includes twenty-four vertebræ, twenty-one of which, measuring 2 feet $1\frac{1}{2}$ inch, have the ribs entirely supported on diapophyses. The remaining three, with large articular facets, may be considered pelvic. The first dorsal is an inch and a quarter long; but these vertebræ gradually become a little shorter, and the last dorsal measures only $1\frac{1}{16}$ inch. The venous foramina rise to the middle of the side, which is much more concave than it was in the neck. The diapophysial articulation is vertical, looks behind, is subelliptical, and in the first few vertebræ more than an inch deep; but it soon becomes smaller, and more circular. The caudal vertebræ are shorter than those of the back, have flatter sides, and are marked by large hæmapophysial pits. The ribs are very short, and, like those of the hinder part of the neck, taper to an end in about 2 inches. The four caudal vertebræ with their interspaces measure $4\frac{1}{2}$ inches.

As in the typical specimens of all the species with which this one presents any affinity, it is the under surface of the limbs which is displayed: those of the right side are *in situ*; but on the other side only the femur and humerus remain, the latter showing the upper surface. The fore limb is slightly the shorter, measuring $23\frac{1}{4}$ inches, while the hind limb is 24 inches long.

The humerus measures $8\frac{3}{4}$ inches long, is $3\frac{7}{8}$ inches over the radial end, and $1\frac{3}{4}$ inch over the greater part of the shaft. The proximal end is a little contracted and bent backward, and the rough condyle is moderately convex. The under surface is flattened and rounded, and displays at an inch below the condyle a slight oblique rough process, probably for attachment of the latissimus dorsi. The anterior border is somewhat straight, being slightly concave below and slightly convex above; but the posterior border is more deeply and regularly cupped. The superior is rather flatter than the inferior surface, except at the proximal end, which becomes elevated to a trochanteroid thickening for the deltoid, subscapularis, and pectoralis muscles, and makes the bone concave in length. The ulna is flattened, and slightly reniform, and a little shorter than the radius, being $3\frac{1}{8}$ inches long and $2\frac{1}{8}$ inches wide, and $2\frac{9}{16}$ inches long in front; the radius, more convex than the ulna, is contracted below. It measures $2\frac{1}{4}$ inches over the top, $1\frac{3}{8}$ inch in the middle, $1\frac{3}{4}$ inch at bottom, and is $3\frac{1}{2}$ inches long. There are 8 carpal bones—5 in the upper row, 3 in the lower row; they add $2\frac{3}{4}$ inches to the length of the limb.

The phalanges and metacarpal bones, which are gracefully curved backward, are in five rows, and measure $10\frac{1}{4}$ inches. There are 3 bones in the first row, 6 in the second, 9 in the third, 8 in the fourth, and 4 in the fifth row: they have the usual flattened hour-glass form, and vary much in length, the row usually named metacarpal being the longest. The metacarpal of the first digit is subquadrate, and not quite an inch long; the metacarpal of the fourth digit is $1\frac{3}{4}$ inch long. The most massive metacarpal is that of the fifth digit. The terminal phalange is always narrow at the distal end.

The extreme length of the femur is $8\frac{1}{4}$ inches: it has a large hemispherical condyle, $1\frac{1}{8}$ inch deep and $1\frac{7}{8}$ inch wide. The smallest diameter of the shaft is $1\frac{1}{2}$ inch, and the diameter of the distal end of the bone is $3\frac{1}{2}$ inches. The anterior side is longer than the posterior side, but is less deeply cupped. The under surface is more rounded than the under side of the humerus, and has a stronger rugose thickening below the condyle for the psoas muscle.

The tibia and fibula are much like the ulna and radius, except that the fibula is more reniform.

The fibula is 2 inches wide, $2\frac{7}{8}$ inch long, and $2\frac{1}{8}$ inches long in front. The tibia is $2\frac{1}{4}$ inches at top, $1\frac{1}{2}$ inch in the middle and $1\frac{3}{4}$ inch at the base, and $2\frac{1}{8}$ inches long. The tarsus adds $2\frac{1}{2}$ inches to the limb. There are 5 bones—3 large ones under the fibula and 2 small ones under the tibia, two large ones being in the upper row, and the others in the lower row.

The phalanges and metatarsals are straighter than the corresponding bones in the fore limb; they are 11 inches long. There are 3 bones in the first digit, 7 in the second, 9 in the third, 8 in the fourth, and 5 in the fifth. As in the wrist of the fore limb, the metatarsals progressively get longer to the fourth; and, as in that limb, the fifth digit articulates with a tarsal of the first row.

The ilium is near the proximal end of the femur, 4 inches long, $1\frac{1}{4}$ inch wide at the compressed spathulate end, and $\frac{3}{4}$ of an inch wide in the shaft. The proximal end is large, and has two articular facets—one for the femur, the other probably with the pubes.

Midway between the limbs is a triradiate bone, shaped somewhat like a Greek letter *ν*, and probably showing the upper surface. It resembles the ischium, but corresponds exactly with

Professor Owen's account of the scapula. It is deeply cupped for the pectoral vacuity, and measures $4\frac{1}{2}$ inches along the perpendicular and flexuous exterior side, which is elevated to a ridge as usual, interior to which the inferior side is narrow, oblique, and concave. Its anterior margin is convex, and measures $5\frac{1}{4}$ inches. This anterior limb is much wider than the lateral limb, which contracts in the middle. Both terminate in an articular end, in each measuring $1\frac{1}{4}$ inch; the distance over articulation to articulation is $3\frac{5}{8}$ inch. Where the two limbs meet, they become prolonged into a short spur directed forward and outward. I cannot regard either this spur or the broad flat limb as representing the clavicle. All analogy would indicate that, if this species had such a bone, it was applied to the exterior flat side of the scapula. Nor can I believe that the scapula had in the animal the wonderful position which it has in Prof. Owen's restoration, fig. 93, 'Palæontology,' where the left scapula appears to me to be applied to the right side of the animal. Certainly in this species the broad limb, which is there free and directed backward, was directed forward and downward towards the other scapula. Similar bones are figured in the scapular region of a Plesiosaur by Mr. Hawkins in pl. 25 of the 'Great Sea-Dragons.'

This species nearly resembles *P. dolichodeirus* (Conyb.), and is but little smaller than the example recently figured by Prof. Owen in the Palæontographical monograph.

The distinctive characters are, (1) that in this species the atlas and axis are short and separate, instead of being long and united; (2) there are 24 vertebræ between the neck and the tail, instead of 23; (3) the humerus is more slender, being longer; (4) the bones of the forearm are wider; (5) there are 8 carpal bones instead of 7; (6) there but 4 bones in the fifth digit, instead of 8.

The more marked differences of the hind limb may be estimated from the figure. From *P. Etheridgii* it is well distinguished by the more numerous cervical vertebræ, the 21 dorsals, and larger size.

Nor does it approach any other species so near as to need a minute comparison.

Plesiosaurus cliduchus.*

Professor Owen founded the *Plesiosaurus rugosus* on a character which is by no means limited to that species; for the Plesiosaur just described shows in the cervical region, only in a less degree, roughnesses round the epiphyses; and the cervical vertebræ of that which is now to be described have the same character. But Mr. Wm. Davies, of the British Museum, assures me that in the typical specimen of *Plesiosaurus rugosus* the characteristic

* κλεὶς, Lat. *jugulum*; and ἔχω, Lat. *habeo*.

rugose border is present in the whole series of vertebræ; and adds that the whole of the limb-bones, including the phalanges, as well as other parts of the skeleton, are more or less rugose.

Our animal appears to have been mature, though not aged: what remains of it rests on the right side.

In *P. rugosus* there are said to be about 35 or 36 cervical vertebræ: but the only one described is supposed to be the 15th; and plate xiv. of the Monograph of Lias Plesiosaurs shows it to be about two-thirds the size of those at the base of the neck. Now, as the vertebræ from the base of the neck in our specimen are shorter than that from the middle of the neck in *P. rugosus*, and as the lower dorsal vertebræ want the rugose margins, there is strong probability that the species is new.

It would naturally seem a portion of a vertebral theory that, just as certain vertebræ between the back and tail are reckoned pelvic or sacral, so there might be some between the neck and back similarly modified by relations to the fore limbs, which could only be reckoned pectoral. At present there is no possible means recognized for determining in *Plesiosaurus* the limits of dorsal and cervical vertebræ. Prof. Owen's dictum in 1839 is different from Prof. Huxley's in 1858; and Prof. Owen, in 1861, lays down a different law to that given by him in 1865. Indeed the conditions seem to be different in nearly every species, the difficulty being to know what to do with those vertebræ where the costal surface is passing from the centrum to the neural arch, in which the ribs are extremely variable. The confusion which has hitherto marked descriptions of this region might be easily avoided by reckoning such vertebræ *pectoral*, and counting them separately, while it would introduce a new character whereby to distinguish species.

There is the usual difficulty in this species in determining the first dorsal. As in *P. eleutheraxon*, the costal surface in the last few cervicals enlarges, becoming more elliptical, and then in those vertebræ where it is partly formed by the neurapophysis becomes smaller, and enlarges again in the back.

The first three vertebræ are clearly cervical, and the first of them measures—

From base of centrum to top of neural spine. . $4\frac{1}{2}$ inches.
The height of the centrum is . . . . $1\frac{5}{8}$ inch.
The length of the centrum is . . . . $1\frac{3}{8}$ „
but it is longer at the top and at the bottom.
Length through the centre . . . . 1 „
From præzygapophysis to postzygapophysis is $2\frac{3}{8}$ inches.

The articular surfaces of the centrum are flat at the outer part, and rather deeply cupped in the centre, where there is a prominent mamillate eminence, as in *P. Neocomiensis.* The sides are flat, and margined by wide, elevated, rugose borders; they meet beneath in a sharp mesial ridge. The subquadrate neural spine is rounded at the top, and from front to back measures $1\frac{1}{4}$ inch. The costal surface is circular. The limit of the neurapophyses on the sides of the centra may be clearly seen in the figure. The last cervical has the costal surface divided by a horizontal groove.

Then follow three pectoral vertebræ. The costal surface has now become narrow, elongated, slightly elevated, and marked by a depression on the centrum, immediately under it: it is not so near the anterior border of the vertebra. The neural spine of the last of these is a little broader and higher than in the succeeding vertebræ.

The seventh centrum is unquestionably the first dorsal. The costal surface is now entirely on the neural arch, is greatly elevated and enlarged, oblique, and looks backward. The centrum is $1\frac{5}{16}$ inch long. There are eleven consecutive dorsal vertebræ, and three more indicated by continuous ribs *in situ.* The rib of the second dorsal is $10\frac{1}{2}$ inches long; but towards the end of the series the ribs rapidly become short, and the fourteenth is only 4 inches long. The tenth and eleventh (which are the only centra seen) show pinched-in sides, sharp articular margins, and the outer part of the articular surface flat. The eleventh is $1\frac{1}{2}$ inch long, and about 2 inches high.

The episternum is a large bone with broad wings which taper to a sharp point behind, and between which, in front, there is a deep crescentic cup. It is flat and thin, measuring mesially—from middle of cup in front to end of wedge behind $2\frac{7}{8}$ inches; from horn of crescentic cup to end of wedge $4\frac{1}{4}$ inch; from middle of cup to end of lateral wing $3\frac{1}{2}$ inches.

What remains of the coracoid conforms to the usual type; but the scapula and clavicle are remarkable.

Two inches of the coracoid go to form, with $1\frac{1}{2}$ inch of the scapula, the deep glenoid cavity for the left humerus, measuring $2\frac{1}{2}$ inches across.

On its under side the scapula sends down a sharp ridge, which extends all along the straight, flat, and perpendicular anterior side. The side interior to the ridge is narrow, oblique, and concave, and, with the coracoid, forms the pectoral foramen. What is preserved of it measures 5 inches along the exterior ridge. From centre of the glenoid cavity to the pectoral foramen is $1\frac{1}{2}$ inch. Least distance from ridge to pectoral foramen is $1\frac{1}{2}$ inch. The pectoral foramen seems to have been elliptical, $2\frac{3}{8}$ inches long and $1\frac{5}{8}$ inch wide.

But the clavicle, which does not appear to have been detected before, resembles nothing so much as the spine of a Mammalian scapula. It is a V-shaped bone, placed exteriorly on the perpendicular side of the scapula, to which it is attached for nearly 4 inches, widening from nothing in front to $1\frac{5}{8}$ inch where the attachment ends behind. The exterior border is produced backward till the bone is $6\frac{1}{4}$ inches long; but the inner border contracts in a curve so as to produce a free spine $2\frac{5}{8}$ inches long, which overhangs the glenoid cavity.

The clavicle holds the same relative position that it has in *Ichthyosaurus*.

My thanks are due to Mr. W. Farran for the interest taken in producing the beautiful photographs from which the plates are taken.

EXPLANATION OF PLATES.

Plate XIV.

P. eleutheraxon (Seeley): α, ilium; β, scapula; α', distal end of left ilium; γ, analogue of lesser trochanter on the under side of left femur; δ, great trochanter, on the upper side of left humerus; ϵ, large hæmapophysial pit of first caudal vertebra; I. cervical and pectoral vertebræ; II. dorsal vertebræ; III. pelvic; IV. caudal.

Plate XV.

P. cliduchus (Seeley): α, episternum; β, coracoid; γ, scapula; δ, clavicle; ϵ, pectoral foramen; ζ, glenoid cavity for humerus; I. last three cervical vertebræ; II. pectoral vertebræ; III. dorsal.

BIBLIOGRAPHICAL NOTICES.

A History of British Ferns. By Edw. Newman. The Fourth or School Edition. London: Van Voorst.

This does not pretend to be a scientific work, and, in that respect as well as many others, differs from the author's former books upon Ferns; but why it is called a "school edition" we cannot understand. A work for schools ought to possess something of an educational character; but the total omission of scientific arrangement is not the most fitting mode of teaching. We should rather say that this book is intended for the purely unscientific collector and cultivator of these beautiful and now popular plants. Even for such a purpose we much doubt if it is desirable to neglect the chance of conveying some knowledge of science, and transforming the mere collector into something, however little, of a botanist. Doubtless many who commence as collectors do really in time learn to desire some scientific knowledge of the objects in which they take an interest; and therefore the book placed in their hands should give the information that they at first require.

Mr. Newman brings forward the difference of opinion that exists amongst botanists upon the division of Ferns into genera as a sufficient reason for neglecting all generic names and characters. This may be convenient for the mere collector, but effectually excludes him from the knowledge of the structure of the fructification acquired by the study of the generic characters as given by any one of the botanists to whom he refers. Because A. Gray, Roth, Babington, and Hooker have been led to call the "same group of species" by different names is no reason for not pointing out the characteristics of the group, about which we believe that these authors do not materially differ.

It may be that the genera as at present accepted are to some extent artificial,—that is, if British Ferns are alone considered; but are they quite so artificial if all Ferns are taken into account? And as they are founded upon structure, is it not better, in a "school edition," that even they, as the best that our present knowledge supplies, should be placed before the reader? We certainly think so; for there is much education for the observing faculties in determining these genera from a study of structure. The effect of neglecting the generic names has caused only the specific terms to be used in this book—a step, as it seems to us, in the wrong direction. Mr. Newman says that "authors plume themselves on the number and length of the Latin appellations they bestow on each species: no less than 86 Latin names have been assigned to *filix-fœmina* and its varieties, and 47 to *Scolopendrium* and its varieties." We think that this is rather misrepresenting the matter. No botanist does so, although gardeners do give useless names to an infinite number of forms. What botanist cares for the 47 forms of *Scolopendrium*? If we look at the books published by the above-named authors, we shall probably find not a single one of these ever-varying forms noticed by name, but only the collective species characterized. Under the the *filix-fœmina* some two or three of the more marked and constant forms are usually distinguished. These botanists certainly do not "plume themselves" on the length or number of the names given to the plants.

The author takes credit to himself for going back to the very oldest names in all cases—a very good thing, doubtless, if done with judgment; but where is the advantage of hunting-up some obsolete name when all the best botanists have agreed to accept one uniform nomenclature? Why should we add to the confusion caused by synonymy, by using *Polypodium myrrhidifolium* (Villars) for the *Cystopteris montana* (Link), even if Villars really meant that plant by that name? And why defend it by finding and using another obsolete name, *Polypodium montanum* (Vogl), for the *Polypodium* (or *Aspidium* or *Lastrea*) *Oreopteris* of all the best botanical authorities of all countries? He says that as "the principle of restoring prior names is now universal in zoology, I can only regret it is so frequently disregarded in the sister science." We thought that zoologists were very generally protesting against the attempt to change the recognized names for the uncertain and ill-defined ones of old authors. They think, and with much reason, that we are only confusing the nomenclature, and unnecessarily adding to the difficulties of science, by so doing. We believed that it was generally allowed that the nomenclature of botany was in a better state than that of zoology. Many changes have been made recently; but they have been rendered necessary by an endeavour to bring the nomenclature of different countries into harmony, not by an attempt to rake up and use obsolete terms which may be detected by a careful search into ancient or obscure writers. Hooker has not acted in the latter way, neither has Fries or any of the great authorities on botanical nomenclature.

But enough of this. Under each species the author has given a fairly good popular description of the plant, and some useful hints concerning its best mode of cultivation, and also, occasionally, other remarks of more or less interest. The *Cystopteris dentata* is apparently combined with the *C. fragilis* (we say, apparently, for the name is not mentioned); but the *C. Dickieana* is kept distinct. It does not seem to us to be more constant or more distinct than several of the 86 forms of *Athyrium filix-fœmina*. The difference stated to exist in their spores, however, is undoubtedly a point in Mr. Newman's favour. *Recurvum* is retained as the specific name of the *Lastrea æmula* or *fœnisecii* of authors. If the oldest name is adopted, it should be *æmula*, which is much older than Lowe's *fœnisecii* or Newman's *recurva*. We do not find that Bree ever called the *species* by that name; and even if he had done so, the 'Hortus Kewensis' is of much earlier date. In this case no name has been universally adopted, and we are therefore fully justified in reverting to the oldest. *Multiflorum* and *spinosum* are still retained for the *L. dilatata* and *L. spinulosa* of nearly all other authors. Mr. Newman's own *glandulosum* is kept distinct. He also separates *uliginosum* from the *Aspidium cristatum* of Smith. *A. remotum* is likewise retained as a species. Mr. Newman considers the *Aspidium* (or *Polypodium*) *alpestre* "very closely allied to the common Lady Fern." Superficially considered, it seems so; but we think that they are far from being closely allied in reality. *Asplenium acutum* is separated from *A. adiantum-nigrum*. We give no opinion upon this, although inclined to consider them forms of one species. *Asplenium Petrarchæ* is stated to be a real native of Ireland. We hope that it may prove to be so. Mr. Newman adheres to the name of *Hymenophyllum unilaterale* for the *H. Wilsoni*, although, if we mistake not, it has been shown that they are not the same plant. *Ophioglossum lusitanicum* is said to grow near the Land's End in Cornwall. Is it not the *O. vulgatum β. ambiguum* which is found there, as it certainly is in the Scilly Isles?

Mr. Newman takes credit to himself for having done much towards causing the present popularity of Ferns. It may be a questionable point if he has done good or harm thereby. The result is that all our most interesting Ferns are being uselessly extirpated in all tolerably accessible places,—uselessly; for a very small number of those pulled up are ever kept alive, or preserved as specimens, or studied botanically. Those who visit Wales after some few years of interval cannot fail to notice and deplore the result. The plants which they used to look at, not gather, on the mountains are hopelessly eradicated; and they have to go to spots more fitted for the Alpine Club than the botanist, to see the rarer or more interesting species. Happily there are a few such spots to which no "tourist" is likely to attain, where our rare Ferns may perhaps be preserved for the gratification of a future generation, and from which, when the present fashion has passed away, they may spread to more accessible places on the hills.

Chart of Fossil Crustacea. By J. W. SALTER and H. WOODWARD. *With Descriptive Catalogue.* Lowry & Tennant: London, 1865.

This is a large chart (2 feet 2 inches by 2 feet 9 inches) of the genera of fossil Crustacea, showing the range in time of the several orders, together with some recent Crustacean types analogous to the extinct forms. The Chart is divided transversely into fifteen zones of varying thickness, alternately dark and light, and corresponding to geological stages; and vertically, across these bands, are represented eight streams, varying in width and length, of Crustacean forms,—some (as the Trilobites and Eurypterids) beginning early and dying out in palæozoic times, others (as the Decapods, Tetradecapods, and Xiphosures) beginning either in the Devonian or the Carboniferous period and still flourishing; whilst the Brachyurous Decapods are first found in the Jurassic rocks. Among the lower groups of Crustacea, the little Bivalved Entomostraca seem to have had representatives for almost as long as fossiliferous strata take us back in time; for their "stream of history" ranges upwards from the chart's lowest band ("Cambrian" or "Lingula-flags"). The Cirripeds also are included in this conspectus of Crustacean life; and the Catalogue explains that though in the Chart they range only from the Rhætic strata upwards, yet good specimens of a trustworthy representative (*Turrilepas*) have of late been recognized by Mr. H. Woodward among Upper Silurian fossils; and woodcut figures are given at page 26.

The Chart fully answers the purpose proposed—supplying the carcinologist with an eye-sketch of the Crustacean types and subtypes, and enabling the palæontologist to see the coexistent forms at any epoch, and to trace at a glance the range of each group, whether occupying the stage at once in force, as in the case of the Trilobites and Eurypterids, or beginning with obscure traces or uncertain forms, and whether giving place to incoming allies or continuing in true succession to the present day. We need not wonder that the Chart is good, well-devised, and conscientiously worked out; for Mr. Salter is devoted to Trilobites, Palæocarids, *et hoc genus omne,* whilst Mr. H. Woodward is as fond as anybody of Crabs and Lobsters, Prawns, Shrimps, and "such small deer," not only in the fresh but in the fossil state; both also have made a study of the Eurypterids, and both have command of the goodwill and help of their brother palæontologists; while Mr. Lowry, the engraver, has long been known for the successful application of his art to geology and fossils, prompted by a genuine love of the science in all its branches.

To show the use of the Chart to the student, we cannot do better than adopt Mr. Salter's explanation, as given in the Introduction to the Catalogue:—

"This Chart is intended to show at a glance the development in geological time of the different orders of the class Crustacea. Pictorial representations of the different groups of fossils, in their geological order, have been often before attempted, and the 'Tabular View of British Fossils,' compiled and engraved by Mr. Lowry (published by the Society for Promoting Christian Knowledge), has been conspicuously useful in this way. But we do not know of any published Chart in which the relations of the different members of a family or group are preserved in an unbroken series, so as to show the course taken by that family or order of animals in the successive geologic periods, from their first appearance to the present time. It has been found practicable (due regard being had to size and shape of the sections of the Chart) to arrange the species nearly in their right natural-history order. This could not always be done, inasmuch as there are often members of the same genus in two geological divisions. It has been thought best, therefore, in the Catalogue, to follow the same order as that of the plate, that the student may the more easily, in studying each group, follow it from its commencement to its close. The rule followed is to take each group in ascending order, from its commencement in the lower strata to its close, or to modern times. The Chart shows through what length of time any genus existed; and it will be observed that comparatively few genera (except among the small Bivalve Crustacea) range through more than one or two formations. When it is otherwise, the student has only to look in the Chart, at the next overlying formation, for the members of the genus he is occupied with (and they are arranged as nearly together as the space and other circumstances will allow), and then, turning to the Catalogue, he will be conducted by it over all the genera peculiarly characteristic of the lower formation before proceeding to those of a higher one. Thus, for instance, in the group *Eurypterida* he will find, in the Lower Silurian, that only footmarks of a gigantic species are known; in the Upper Silurian, the *Hemiaspis* and *Bunodes* are confined to that formation, while the great *Pterygotus* and *Eurypterus* are figured as reaching through two formations. Consulting the Catalogue, he will find that *Pterygotus problematicus* is an Upper Silurian species, and that *P. anglicus*, a very similar form, belongs to the Devonian formation. Again, *Eurypterus tetragonophthalmus* is a Lower Devonian form; but the gigantic *E. Hibberti* belongs to the Carboniferous formation. One or two in the Coal close the series. Here, then, the range of each genus is extended through the formations to which it belongs. But, in this particular case only, the size of the animals is so great that, instead of figuring *P. anglicus* and *P. problematicus* one exactly over the other, a single large figure is made to do duty for both. In all other cases, as in the genus *Limulus* on the right hand of the chart, or the genus *Homalonotus* or *Calymene* among the Trilobites, the successive species are placed one over the other, and the range of the whole genus in time is thus made evident. The student is recommended to take each group of animals as indicated by the curved or vertical lines of separation* by itself, as the object of the Chart is to show him how each tribe or order has been gradually developed and perfected, or otherwise, in its course. By taking, then, the genera and species belonging to the lowest formation first, he will the more readily see what changes have been introduced among a particular set of animals; and having made himself thus master of the separate groups, he will be able afterwards better to see their mutual relations."

Genera Plantarum: auctoribus G. Bentham et J. D. Hooker. Vol. i. Pars 2. London, 1865.

We have much pleasure in announcing the publication of another Part of this admirable work. It consists of 293 pages, and contains the genera included in the orders Leguminosæ, Rosaceæ, Saxifrageæ, Crassulaceæ, Droseraceæ, Hamamelideæ, Bruniaceæ, Halorageæ, Rhizophoreæ, Combretaceæ, and Myrtaceæ; and we are informed that a third Part will complete the Polypetalous orders and the first volume. It is much to be desired that no great delay may attend its publication.

It is scarcely possible to give any idea of the amount of labour which has been expended upon this work, which must form a necessary part of the library of every botanist. We have looked rather hastily through the present part, and observe very few points requiring notice. In Leguminosæ the Genisteæ, Trifolieæ, and Loteæ are regarded as tribes of the Papilionaceæ, and of equal rank with Vicieæ and Hedyraceæ; and, amongst the genera, *Sarothamnus* is combined with *Cytisus*, *Arthrolobium* with *Ornithopus*, *Ervum* is joined to *Vicia*, and *Orobus* to *Lathyrus*. The order Rosaceæ is retained entire, notwithstanding the apparently epigynous structure of the Pomeæ. Amongst its genera, *Potentilla* includes *Sibbaldia*, *Agrimonia* includes *Aremonia*, *Poterium* includes *Sanguisorba*, *Pyrus* includes *Mespilus*. The Grossulariaceæ are combined with the Saxifrageæ, and also the genus *Parnassia*. The genus *Callitriche* is placed in Halorageæ, but *Ceratophyllum* is considered to constitute a Monochlamydeous order.

There are many other alterations made in the usual mode of grouping, but we do not think it necessary to mention them. Those enumerated are of the most interest to the British botanist, as relating to the flora of his own country.

We have only to add that all botanists must feel anxious for the early continuation of this very useful work, and express our hope that its sale may be such as to encourage the learned authors to proceed as rapidly with its publication as they properly can.

* The groups may be made more distinct by colouring the lines by different paints or crayons.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

May 23, 1865.—John Gould, Esq., F.R.S., in the Chair.

A Revision of the Genera and Species of Amphisbænians, with the Descriptions of some New Species now in the Collection of the British Museum. By Dr. John Edward Gray, F.R.S., F.L.S., V.P.Z.S., etc.

Sir Andrew Smith having kindly presented to the British Museum, along with a number of other reptiles which he has described, the types of his genus *Monotrophis*, which I had not before seen, and two Amphisbænians from Africa having been received from Mr. Welwitsch and from the collection of my late excellent and lamented friend Dr. Balfour Baikie, and from Mr. Bates a species from the Amazons which I believed had not hitherto been recorded in the Catalogue, I proceeded to examine them; and, for the purpose of making the comparison the more complete, I was led on to study all the specimens of this tribe which we have in the Museum.

The natural result of such an investigation was, that I was dissatisfied with the manner in which the species had hitherto been arranged and described, and, after repeated examination, I have reduced my observations to the following results:—

The determination of the species themselves, and the means which a paper resulting from the re-examination and comparison of all the species in a large collection afford to a student, are much more important than any isolated description of the species regarded as new, however detailed and particular the description may be; and in a comparative review of the species of a group or order the distinctions may be stated in a more condensed form.

The Amphisbænians are very rarely collected; hence few species are found in museums and noticed in systematic catalogues. This is explained by their living almost exclusively in the nests of ants, and being seldom seen by the casual observer. There is reason to believe that every warm country which has ants has some form of Amphisbænians. Until lately they were thought to be confined to Tropical America, though one was described by Vandeli as occurring in Spain as long ago as 1780; but his essay and the animal itself were alike so little known to naturalists, that Professors Hemprich (in 1820) and Wagler each described Vandeli's species as new, the latter as a South-American species. Professor Kaup described a species from North Africa in 1830, and M. Gervais redescribed it as new in 1835. MM. Duméril and Bibron have described a specimen in the Leyden Museum from Guinea, Dr. Andrew Smith one as occurring at the Cape, and Dr. Peters has added another from the east coast of Africa. The number of African species is in this essay raised to seven. As yet none have been received from Asia Proper; but Sir Charles Fellows brought from Xanthus the same species that is found in Spain, Portugal, and North Africa.

The following table shows the geographical distribution of the species here recorded :—

EASTERN HEMISPHERE.

Fam. *Trogonophidæ.*

1. *Trogonophis Wiegmanni.* North Africa.

Fam. *Amphisbænidæ.*

2. *Blanus cinereus.* Spain, North Africa, Asia Minor.
3. *Amphisbæna? violacea.* East Africa.
4. *Cynisca leucura.* Guinea.
5. *Baikia africana.* West Africa.

Tribe *Cephalopeltinæ.*

6. *Monotrophis capensis.* South Africa.
7. *Dalophia Welwitschii.* West Africa.

WESTERN HEMISPHERE.

Fam. *Chirotidæ.*

1. *Chirotes lumbricoides.* Mexico.

Fam. *Amphisbænidæ.*

2. *Amphisbæna alba.* Brazil.
3. *A. americana.* British Guiana.
4. *A. Petræi.* Brazil.
5. *A. vermicularis.* Brazil.
6. *A. Darwinii.* Monte Video, Buenos Ayres.
7. *Bronia brasiliana.* Brazil.
8. *Sarea cæca.* West Indies.
9. *Cadea punctata.* Cuba.
10. *Anops Kingii.* Buenos Ayres.

Fam. *Lepidosternidæ.*

11. *Lepidosternon microcephalum.* Brazils.
12. *L. Grayii.* Tropical America.
13. *L. phocæna.* Buenos Ayres.

Tribe *Cepholopeltinæ.*

14. *Cephalopeltis lepidosterna.* Brazils.

The rings of oblong scutella on the skin are in most species interrupted on the sides, and in some species also on the vertebral line; these interruptions form a more or less wide depressed groove on the surface of the body, and are called the lateral and dorsal lines.

The skin at this interruption is usually marked at each transverse ring with two oblique grooves, which form a cross and divide the space into four minute triangular shields; in some cases, where the line is wider and less sunken, the transverse ring of shields is only divided at the sunken line by a single oblique groove caused by the tapering end of one of the oblong shields going before the end of the other. Sometimes this is the case with the dorsal line, and not with the lateral one. In some species, instead of only the four triangular shields in the lateral line, the shield between the cross groove is divided into several minute scale-like shields.

In some of the larger species, as *Amphisbæna alba*, some of the rings of shields are marked with an oblique groove crossing several shields, dividing each of them into two parts; but these seem to be mere individual variations occurring on several parts of the back of some specimens, and not present in others.

Duméril and Bibron give the number of the teeth as one of the specific characters. I have not been able to verify their observations; they give the following as the number. There seems to be always an odd number of intermaxillary teeth, the middle one being usually large.

Trogonophis Wiegmanni	$\frac{4 . 5 . 4}{9 . 9}=\frac{13}{18}$
Chirotes caniculatus	$\frac{3 . 7 . 3}{6 . 6}=\frac{13}{12}$
Amphisbæna americana et *A. alba*......	$\frac{5 . 5 . 5}{8 . 8}=\frac{15}{16}$
—— *Petræi*........................	$\frac{5 . 7 . 5}{8 . 8}=\ 16$
—— *Darwinii*	$\frac{4 . 7 . 4}{7 . 7}=\frac{15}{14}$
Sarea cæca	$\frac{5 . 5 . 5}{7 . 7}=\frac{15}{14}$
Cadea punctata	$\frac{4 . 7 . 4}{8 . 8}=\frac{15}{16}$
Anops Kingii .. } *Blanus cinereus* }	$\frac{4 . 7 . 4}{7 . 7}=\frac{15}{14}$

Fam. 1. TROGONOPHIDÆ.

Head oblong, depressed, rounded below; nostrils lateral, in large nasal shields; teeth conical, on the edge of the maxilla. Body cylindrical, covered with rings of uniform, elongate, oblong, four-sided shields, without any sternal disk; lateral line sunken, narrow, covered with a few minute scales; preanal pores none; tail conical, acute.

Glyphodermes acrodontes, Dum. et Bibr. Erp. Gén. v. 467.

TROGONOPHIS, Kaup, Isis, 1830, p. 880.

Head oblong, depressed; nasal shields large, united by a short straight edge, behind the large triangular convex rostral; crown with two pairs of shields; temple with many small shields; upper labial plate moderate; lower labial shield larger, with a series of large chin-shields on each side, and a central gular one. Tail conical, acute; preanal pores none.

The skull of this genus has been figured by Dr. Kaup in his paper in the 'Isis' quoted below.

TROGONOPHIS WIEGMANNI, Kaup, Isis, 1830, p. 880, t. 861; Féruss. Bull. Sci. Nat. xxv. 203, 1831; Dum. et Bibr. Erp. Gén. v. 470.

Amphisbæna elegans, Gervais, Bull. Sci. Nat. de France, 1855, p. 135; Mag. Zool. 1835, class 3. t. 11 (details not good).

Hab. Tangier (*Fraser*, B.M. 1848); North Africa (B.M. 1846); Algeria (*Duméril*, B.M.).

This animal was first described by Dr. Kaup, who showed that the teeth of it were placed on the edge of the jaw, as in the genera of the family *Agamidæ*, which are all confined to the eastern hemisphere and Australia; while all the other genera of the order that have been examined have the teeth on the inner side of the jaw, as in the family *Iguanidæ*, which is restricted to the New World.

It was afterwards described by M. Gervais; and even when Dr. Kaup had informed him, after inspecting the specimen, that it was the same as he had previously described, he still regarded it as new, because he said the skull did not agree with Dr. Kaup's figure: but this was a mistake. Dr. Kaup figured the skull of *Trogonophis* and of an *Amphisbæna* for the sake of showing the difference between them; and M. Gervais must have compared his animal with the wrong figure.

Fam. 2. CHIROTIDÆ, Gray, Cat. Tortoises, &c., B. M. 74.

Head depressed, rounded on the sides; nostrils on sides; teeth on the inner side of the maxillæ. Body cylindrical, covered with rings of uniform oblong four-sided shields, and with two short weak front limbs, provided with five subequal clawless toes; lateral line sunken, covered with scales; preanal pores distinct. Tail cylindrical.

CHIROTES, Duméril; *Bimanus*, Oppel; *Chamæsaura*, Schneid.

Characters those of the family.

CHIROTES CANICULATUS, Cuvier.

Chirotes lumbricoides, Gray, Cat. Tortoises, &c., B. M. 74.

Hab. Tropical America, Mexico (B. M.).

Professor J. Müller has figured the skeleton and skull of this animal.

Fam. 3. AMPHISBÆNIDÆ.

Head oblong, rounded below; nostrils lateral, in nasal shields; teeth conical, on the inner edge of the maxillæ. Body cylindrical, covered with rings of uniform, elongate, four-sided shields, without any sternal disk; preanal pores distinct; lateral line linear, sunken, with a few small scales. Legs none. Tail cylindrical, rounded at the end.

Tribe 1. AMPHISBÆNINA. The head depressed, rounded on the sides in front; nostrils on the upper part of the sides of the head.

A. *Lateral and dorsal lines distinct, sunken, covered with small triangular scales; nasal shields large, square, lateral, forming part of the edge of the upper lip, and separated in front by a broad, square, convex rostral shield.*

Blanus.

The rostral square, convex; the nasal shields large, forming part of the edge of the upper lip; the crown with a large pentagonal frontal shield and two pairs of square shields behind it; eye-shield triangular, between upper edge of the front labial shield and the frontal. Temples covered with a series of squarish shields; labial shields large, the hinder smallest; the lower shields without any chin-shield between them and the gular one. Tail rather tapering, blunt; preanal pores distinct.

Blanus cinereus, Gray, *l. c.* 72.

Amphisbæna cinerea, Vandeli, Mem. Acad. Lisbon, i. 1780.
A. oxyura, Wagler.
A. rufus, Hempr.
Blanus rufus, Wiegm.
Hab. N. Africa, Tangier (*Fraser*, B. M.); S.W. Europe, Spain (*Vandeli*, 1780); Oporto (*Allen*).

M. Gervais (Mag. Zool. 1837, class 3. t. 10) gives a figure of *A. cinerea*; but the details of the head do not perfectly agree with our specimens; perhaps this may be from want of care in the artist. The number of pairs of plates on the occiput varies from two to four.

B. *Lateral lines linear, distinct, sunken; dorsal none, or very indistinct; nasal shields not forming part of the upper lip.*

a. *Nasal plates large, extending across the muzzle, united by a long straight suture, or united into one cross band; the rostral triangular, under front edge of nasals; crown with two pairs of broad shields.*

Amphisbæna.

Head depressed, broad, and rounded in front; frontal plates with one or two pairs of rather smaller similar plates behind them; preanal pores eight.

* *Head depressed, broad; occiput covered with square shields, like the body; preanal plates numerous.*

1. Amphisbæna alba, Linn.; Gray, Cat. Tort., &c., B.M. 70.

Body thick, one-coloured, with only one pair of plates behind the frontal plates; occiput shielded like the body.
Hab. Brazil.

Varies in the size and form of the hinder pair of frontal plates; preanal pores eight, often seven.

There is a specimen in the British Museum sent by Mr. Brandt under the name of *A. Darwinii.*

2. AMPHISBÆNA AMERICANA, Schreb.; Gray, Cat. Tort., &c., B. M. 70.

Body rather thick, black, varied; two or more pairs of plates behind the frontal plates.

Amphisbæna fuliginosa, Linn.

A. vulgaris, Laur.

Hab. Tropical America: British Guiana; Berbice; Demerara (B. M.).

The labial shields vary in number and shape; the shields behind the frontal vary in number and size, but they are generally in pairs and subsymmetrical.

Gervais figures the skull of the species (Ann. Sci. Nat. 1854, xx. t. 14. f. 4).

** *Head rounded, narrow; preanal pores and preanal shields ten or twelve.*

3. AMPHISBÆNA PETRÆI, Dum. et Bib. Erp. Gén. v. 487; Gray, *l. c.* 80.

Hab. Brazils (*Mus. Paris*).

*** *Head rounded, narrow, rather produced in front; crown-shields large; occipital shields polygonal. Body slender, one-coloured; preanal pores two or four; preanal plates six, middle ones elongate.*

4. AMPHISBÆNA VERMICULARIS, Dum. et Bibr. Erp. Gén. v. 489; Gray, *l. c.* 71.

Hab. Brazil (*Dr. Gardner*, B. M.; *Mus. Paris*); Porto Bello (*Capt. Austin, R.N.*, B. M.: head in a very bad state).

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5. AMPHISBÆNA ? DARWINII, Dum. et Bib. Erp. Gén. v. 491; Gray, *l. c.* 71.

Hab. Monte Video (*Mr. Darwin; Mus. Paris*).

6. AMPHISBÆNA ? VIOLACEA, Peters, Berlin Monatsb. 1854, p. 620; Wiegmann, Arch. 1855, p. 49.

Hab. East Africa, Inhambane (*Peters*).

This species is unknown to me; it is without a single frontal shield, and has four preanal pores and visible eyes.

CYNISCA, Gray, Cat. Tort., &c., B. M. 71, 1844.

Head flat, narrow; nose conical, four-sided, rounded at the end; rostral triangular; nasal plates very large, soldered together, covering the front of the head; crown with a small frontal and a pair of parietal shields; eyes distinct; temples and occiput with large shields. Body very slender; lateral line distinct. Tail cylindrical, elongate, truncated; preanal pores numerous.

Cynisca leucura, Gray, *l. c.* 71.

Amphisbæna leucura, Dum. et Bibr. Erp. Gén. v. 498.
A. macrura, Schlegel, Mus. Leyden.

Brown ; end of tail white.

Hab. Guinea (*Mus. Leyden*) (not Guiana, as stated by mistake in the Catalogue).

b. *Nasal shields small, separate above, on the side of a large swollen rostral shield.*

Bronia.

Head ovate, rather convex ; rostral shield very large, hemispherical, with the small nasal shields inserted in notches on its hinder edge, which is placed over the front labial ; crown convex, rounded on the side, covered with two pairs of shields ; the front pair square, the hinder smaller, triangular, with a small triangular occipital shield on its outer side ; eye-shield triangular ; labial shields $\frac{3-3}{2-2}$, the second upper and front lower large ; gular shield single, square, with a cross series of shields behind it. Body cylindrical ; lateral line well marked ; the dorsal shields elongate, narrow ; the ventral ones rather broader, smooth ; preanal pores four ; the preanal shields six or eight, the central pair largest, the lateral ones very small. Tail blunt.

Bronia brasiliana.

Pale brown ; dorsal shields with a dark central spot.

Hab. Tropical America ; Santarem, on the Amazons (*Bates*, B.M.).

Fig. 2.

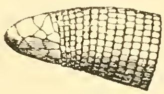


Fig. 1.

Bronia braziliana.

C. *Lateral and dorsal lines not defined, or the lateral line only visible on the hinder part of the body ; rostral shield small ; nasal shields far apart, small, placed on the side of the high rostral.*

Sarea, Gray, Cat. Tort., &c., B. M. 71, 1844.

Head conical ; rostral narrow, higher than broad, rounded in front, placed behind the triangular nasal ; crown with two pairs of shields, the front largest, elongate, the hinder trigonal ; eye-shield triangular ; the labial shields $\frac{3-3}{3-3}$; the second upper and lower labial shields very large, the others smaller ; with one large gular plate.

Body slender; the dorsal scutella square, as long as broad, with a dark central dot; two central longitudinal series of ventral scutella broader than long, smooth, white; the lateral line very indistinct, scarcely visible except on the hinder part of the body; preanal pores four; preanal shields six, square. The eyes are slightly visible through the shields.

SAREA CÆCA, Gray, Cat. Tort. &c., B. M. 71.

Amphisbæna cæca, Cuvier, R. A. 773; Dum. et Bibr. Erp. Gén. v. 492.

Hab. West Indies, St. Thomas's (*A. H. Riise*, B. M.).

The specific name is not characteristic, as the eyes are as much seen through the shield as in many Amphisbænians.

CADEA, Gray, Cat. Tort., &c., B. M. 71, 1844.

Head conical; rostral narrow, higher than broad, truncated at the tip, convex in front; nasals ovate, lateral; crown with two large, triangular shields; frontal with a small linear shield on each side of it; and two pairs of square occipital shields, the hinder pair smaller; eye-shield rhombic; eyes hidden; labial shields $\frac{3-3}{3-3}$, subequal, middle one in each lip largest; temples covered with square shields; gular plate single, elongate. Body cylindrical; lateral line very indistinct, scarcely to be distinguished except on the hinder part of the body; shields of the back square, of the under surface rather wider, but scarcely wider than long; preanal pores four; the preanal shields six, central ones elongate.

CADEA PUNCTATA, Gray, *l. c.* 71.

Amphisbæna punctata, Bell, Zool. Journ. ii. 236, t. 20. f. 2.
A. cæca, La Sagra, Cuba, 195, t. 21.

Pale brown, dotted and varied with deeper brown.

Hab. Cuba (*W. S. Macleay*, B. M.): the specimen described by Mr. Bell.

Tribe 2. ANOPININA. Head compressed, keeled on the sides in front; the nostrils lateral, on the under side of the keel.

A. *Lateral line distinct and impressed.*

ANOPS, Bell, Proc. Zool. Soc. 1833, p. 99; Zool. Journ. v. 391, t. 16. f. 1; Gray, Cat. Tortoises, &c., B. M. 72, 1844.

Lateral line distinct, sunken; preanal pores "none" (*Bell*); "four" (*Dum. & Bibron*).

ANOPS KINGII, Bell, Proc. Zool. Soc. 1833, p. 99; Zool. Journ. v. 391, t. 16. f. 1; Gray, Cat. Tortoises, &c., B. M. 72.

Amphisbæna Kingii, Dum. et Bibr. Erp. Gén. v. 497.

Hab. S. America (*P. P. King*; *Charles Darwin*); Buenos Ayres (*D'Orbigny*, Mus. Paris).

I have not been able to examine this genus, which was described by Mr. Bell from a specimen brought from South America by Capt. P. P. King, R.N.; it is described in more detail by MM. Duméril and Bibron from specimens obtained by Mr. Charles Darwin.

The existence of the lateral line, which, according to Mr. Bell, "is more distinct than in *Amphisbæna*, though less so than in *Chirotes*," and the account of the plates of the head as described by MM. Duméril and Bibron, show that it must be distinct from the following, which comes from Africa.

B. *Lateral line none, or only very slightly visible on the hinder part of the body.*

BAIKIA.

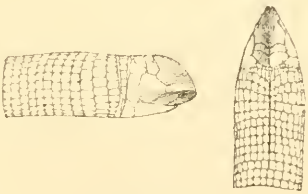
The head compressed, elevated; rostral plate very large, compressed, forming an arched crest from the mouth to the forehead, with a groove on the hinder part over the nostrils; crown with two pairs of band-like shields behind the upper edge of the rostral, the front pair narrow; eye-shield very minute; eye invisible; temples with two small shields; the upper labial shields 3—3; the second upper large, produced, keeled on the side; the hinder, under the temporal shield, larger, square; lower lip covered with a single large shield on each side, separated by a square inferior rostral shield and by two small gular plates placed one behind the other; nostrils large, lateral, under the edge of the keel of the frontals. Body and chest covered with rings of similar oblong square shields; preanal pores 2—2, separated by a central shield. Tail cylindrical, rather conical at the tip.

In spirits the skin is loose and inclined to form a fin-like fold, sometimes on one and sometimes on another part of the body, with a central longitudinal ventral groove, without any appearance of a lateral line.

BAIKIA AFRICANA.

Hab. West Africa (*Dr. Balfour Baikie*). B.M.

Fig. 4. Fig. 3.



Baikia africana.

Fam. 4. LEPIDOSTERNIDÆ.

Lepidosternidæ, Gray, Cat. Tortoises, &c., B. M. 73, 1844.

Head oblong, depressed, with a short horizontal keel in front;

nostrils in shields, under the keel of the rostral shield; teeth conical, on the inner side of the maxilla. Body cylindrical, covered with rings of oblong four-sided shields; the sternum with a disk formed of differently shaped shields; preanal pores distinct.

Tribe 1. Lepidosternina. Head conical, covered with symmetrical polygonal shields; the pectoral disk covered with many polygonal shields placed in oblique lines; the dorsal and lateral lines well marked, broad, smooth, formed by the overlapping of the narrow ends of the sections of the rings. *America.*

Lepidosternon.

Head conical, covered with three pairs of symmetrical and a vertebral shield; rostral shield large, broad, rounded in front; the pectoral shield formed of regular, nearly equal, symmetrical rhombic or six-sided shields, sometimes united into long shields which are not symmetrical.

* *Sternal plates of central series united into elongated bands.*
Lepidosternon.

1. Lepidosternon microcephalum, Wagler, Serp. Bras. 70, t. 26; Müller, Tiedem. Zeitsch. 1832, iv. t. 22. f. 4; Dum. et Bibr. Erp. Gén. v. 505; Gray, Cat. Tortoises, &c., B. M. 73.
"*L. macrocephalum*, Müller" (*fide* A. Smith).
Amphisbæna punctata, Neuwied, Abh.
Lepidosternon maximilianus, Wiegmann.

Head short, broad; the vertebral plate broader than long, six-sided; frontal short, broad, band-like; parietal small, square; ocular higher than broad.

Hab. Brazil, Rio (*Dr. Gardner*, B. M.).

The specimen in the British Museum has the shields on each side of the central line of the sternal disk united into an elongate shield, which is not symmetrical on the two sides, and appears like an accidental peculiarity.

In the Free Museum at Liverpool there are two specimens of this species, obtained by Mr. Jobert in Brazil. They are similar, but show that the sternal plates are liable to coalesce and form larger plates in an unsymmetrical manner.

In the larger specimens the first series of sternal plates on each side of the central line are united into longitudinal shields, which are not of equal length. The series of plates on the outer side of them are separate, but not quite symmetrical.

In the other specimen, which is rather smaller, the first series of sternal plates on the sides of the central line, and the second series on the outside of it on the right side, and second and third series on the left side, are united into longitudinal parallel plates, which are of unequal length, the two central ones being the longest, and the two outer plates on the left side much longer than the outer one on the right side.

The head-shields in both these specimens are exactly alike, the central crown-shield being much broader than long; the hinder pair of frontal shields rather shorter than the front pair, and narrower on the central edge by the angular front edge of the crown-shield; the two pairs of occipital shields are shorter than broad, the hinder pair being the smaller, and in one instance coalesced on one side with the plate of the front pair.

They all have a brown spot on the centre of each of the dorsal scutella.

** *Sternal plates all separate, symmetrical.* Sphenocephalus.

2. Lepidosternon Grayii, A. Smith, MS. Brit. Mus.

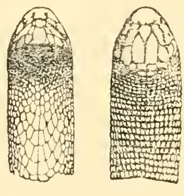
Head rather short, broad; the vertebral plate hexagonal, elongate, as long as broad; the frontal plate very short and broad; the parietal shields oblique; the occipital much longer than broad; temporal shields larger on the side of the occipital; plates of the sternal disk symmetrical, in oblique diverging lines.

Hab. South America? (*Brit. Mus.*).

Sternal disk formed of four diverging lines of uniform, similar-sized, symmetrical shields; the shields on the central line smaller, being divided down the centre by a straight suture.

In 1848, Dr. (now Sir Andrew) Smith sent to the British Museum this specimen, with the name of *Lepidosternon Grayii*, informing me that he had described (or intended to describe) it in the 'Proceedings of the Zoological Society' under that name. I cannot find that it has been so described, nor can I find any notice of it in any other work, though it is very like, but evidently distinct from, the *Lepidosternon phocæna* of Duméril and Bibron, figured by M. d'Orbigny (Voy. Amér. Mérid.).

Fig. 6. Fig. 5.



Lepidosternon Grayii.

3. Lepidosternon phocæna, Dum. et Bibr. Erp. Gén. v. 507; Gray, Cat. Tortoises, &c., B. M. 73; D'Orbigny, Voy. Amér. Mérid. Rept. t. 6. f. 7–10.

Head broad; the vertebral plate elongate, small, larger than broad, acute at each end; the frontal and occipital plates large, shorter than broad, the frontal the largest; the parietal plates short, broad, band-like; the plates of the sternal disk uniform, symmetrical, oblique.

Hab. Buenos Ayres (*Bridges*, B. M.: stuffed).

M. d'Orbigny's figure is very like the preceding species; but the head is represented shorter, the frontal plates are rather larger. The long occipital shield of that species is here represented by two pairs of square shields, as if the large plate of the former species were divided across; it also appears to be a shorter, thicker species.

The stuffed specimen which we received from Mr. Bridges agrees with the figure in all these particulars; but the head appears rather larger, perhaps from its being rather distorted in the preparation.

Both the figure and the specimen belong to a species evidently very distinct from *L. Grayii*, and much thicker.

Tribe 2. CEPHALOPELTINA. The head depressed, covered above with a single simple or transversely divided, flat, horny, nail-like shield; pectoral disk formed of elongated, symmetrical shields; the dorsal and lateral lines very narrow, indistinct, except near the hinder part of the body.

A. *The pectoral disk formed of large, diverging, unequal, polygonal, symmetrical shields; crown-shield divided into two by a transverse suture.* America.

CEPHALOPELTIS, J. Müller, Tied. Zeitsch. für Phys. 1831, iv. 269.

Head covered with two large shields, the front one smaller; the sternal disk of eight or ten large shields, the two central pairs parallel, one in front of the other; the lateral pairs diverging.

CEPHALOPELTIS SCUTIGERA, Gray, Cat. Tort., &c., B. M. 73.

Cephalopeltis lepidosternon, Müller, *l. c.* t. 21. f. 6 (skull), t. 22. f. 5 (head).

Amphisbæna scutigera, Hempr. Naturf. Freund. zu Berlin, 1820, p. 127.

Lepidosternon scutigerum, Dum. et Bib. Erp. Gén. v. 509.

Cephalopeltis Cuvieri, Müller (*fide* Dum.).

Coleopeltis Cuvieri, J. Müller (*fide* A. Smith).

Hab. Brazils (*Müller*).

B. *The pectoral disk formed of six or eight elongate, longitudinal, parallel shields; head shield single.* Africa.

MONOTROPHIS, A. Smith.

The head covered with a single nail-like shield, without any slits on the hinder part of its side edge; the rostral plate between the nasal plates, transverse, four-sided, broader than high; the shields of the sternal disk regular, broad, and truncated in front; the rings of shields in front of the sternal disk formed of regular square shields, like those of the rest of the body.

MONOTROPHIS CAPENSIS, A. Smith, Zool. S. Africa. Rept. t. 47 (white; pink when alive).

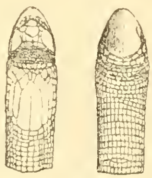
Hab. S. Africa (B. M.). The type specimen of Sir Andrew Smith.

Dr. Peters records *Monotrophis capensis* as found in Mozambique; but on comparison it may prove a distinct species. In my notes I have a reference to *Lepidosternon sphenorhynchum*, Peters, MS., as an East-African species, but I cannot find it described or noticed anywhere. Can it be the name Dr. Peters gave to his *Monotrophis* before he discovered it had been described by Sir Andrew Smith?

Dalophia.

The head covered with a single nail-like shield, with a linear slit on the hinder part of its side edges; the rostral plate small, triangular, with the point upwards between the nasal plates; the shields of the sternal disk rather irregular, but symmetrical, each with an

Fig. 8. Fig. 7.



Dalophia Welwitschii.

acute front edge; the rings of shields in front of the sternal disk formed of unequal but symmetrical polygonal shields.

Dalophia Welwitschii.

Monotrophis capensis, Günther, MS. B.M. (not A. Smith).

Pale brown.

Hab. Angola; Pungo Andongo (*Welwitsch*). B.M.

MISCELLANEOUS.

Dr. Sturm's *Collection of Objects of Natural History in Nuremberg.*

The families of the late brothers Dr. J. H. C. F. and Dr. J. W. Sturm wish to dispose of the above collection, which consists of the undermentioned four divisions:—

I. *Birds.*—Of these there are 1700 species, with 2700 specimens: 1600 of these specimens were stuffed by the master hand of the late Dr. Fr. Sturm, and set up by him in 557 glass-cases; the remainder consists of well-preserved skins.

A specimen of almost every species of bird is to be found, and of several species there are numerous specimens. It would be hardly possible to meet with another collection of specimens so well preserved or so artistically prepared. The 100 species with 253 specimens of Humming-Birds, as well as the 26 species with 62 specimens of *Rhamphastides,* deserve especial notice. The latter served Dr. Sturm as a basis for the monograph in which he has described them. Of other groups, as, for instance, of Pigeons, Parrots, and Owls, the specimens are scarcely less numerous.

II. *Birds' Nests and Eggs.*—Seventy-seven nests of European Birds, with 1597 eggs; seventy-five nests of non-European Birds, with 769 eggs.

III. *Insects.*—This division contains nearly 23,000 species, with 70,000 specimens, and is perhaps the largest private collection in Germany. The order of Beetles, of which there are 16,640 specimens, is the most richly represented. Besides the Beetles there are also numerous specimens of the following orders, viz.:

Hymenoptera	2193	in number.
Neuroptera	186	,,
Lepidoptera (non-European)	413	,,
Lepidoptera (European)	800	,,
Diptera	1038	,,
Hemiptera	1439	,,
Spiders	368	,,
Scorpions	68	,,
Myriapoda	40	,,

IV. *Terrestrial, Fluviatile, and Marine Shells.*—Land and Fresh-water Shells, 13,000 specimens; Marine Shells, 2500 specimens.

This division may be also considered to be one of the richest of its kind, and it contains many original specimens discovered by Say, Adams, and other scientific men. A large number of wax models of Land-Snails, prepared from nature by the late Dr. Fr. Sturm, deserves particular mention, as no similar collection of models is perhaps to be found elsewhere. Of almost all classes of the animal kingdom there are specimens enough to form a good nucleus for anyone wishing to commence a collection.

This collection has been made use of for a long time in the compilation of several works, and it has enjoyed a high degree of favour because it contains the new and rare specimens described and illustrated in the works of Dr. Sturm himself. On this account, as well as on account of its extent, Prof. Burmeister has pronounced it to be "*a very first-rate scientific collection.*" Prof. Leiblein in Wurzburg, Prof. von Siebold in Munich, and Dr. Will in Erlangen, may be quoted as University Professors who have also expressed themselves in the very highest terms of the worth of the collection.

Should there be no purchaser for the whole collection, each division of the same will be sold separately.

On the Existence of Liquid and Solid Matters in the Trachean Vessels of Plants. By M. T. Lestiboudois.

As facts in opposition to the arguments adduced in support of the opinion that the trachean vessels of plants are aëriferous, the author indicates that vessels may appear empty because the liquids contained in them are perfectly limpid, or they may lose their fluids by age, and will then emit bubbles of air; finally, the experiments cannot be regarded as conclusive if made upon branches separated from the trunk, as then the air would easily find its way into the vessels. Nothing can be concluded from the circumstance that the walls of these organs are not thickened by deposits, as many originally succulent organic elements are in the same case.

If liquids circulate in non-vascular plants, this only proves that the vessels are not the sole organs of circulation; and although water charged with nutritive substances enters by spongioles which contain no vessels, this does not prove that it does not penetrate subsequently into the latter organs.

As regards the course followed by the pollinic granules, no conclusion can be drawn from it, as there is not the least relation between the materials of fecundation and the sap.

If we have no demonstration that the trachean vessels are exclusively destined to the transport of gases, we find nothing more conclusive in the arguments advanced by Mirbel and Schultz, and other authors, who hold the opinion that these vessels serve for the circulation of liquids. They say that we see in them bubbles of air, which would not be visible if they were not circumscribed by a liquid—that the absorbed water diffuses itself so rapidly in plants that it cannot but follow the direct courses presented by these conduits—that when the branch of a tree is placed in a coloured liquid, the latter ascends in the vessels, into which it also penetrates even when absorbed by the roots—lastly, that as the elaborated sap circulates in the laticiferous vessels, the ascending sap must ascend by analogous ducts, &c.

But the liquids which surround the air-bubbles may have penetrated into the vessels when the observed tissues were cut into thin sections; those which ascend into the branches may be introduced by the gaping orifices of section; the colouring-matters which tinge the vessels may only impregnate their walls externally; lastly, if it be true that the proper juices of certain plants move in true vessels, it does not follow that there is anything analogous for the ascending sap, or that it is the office of the trachean vessels to transport it.

Direct observation shows that at the earliest period of the formation of the tissues the trachean vessels are full of juices, like the other organic elements, and that they are only deprived of these at a later period. But even then they may be traversed by liquids of considerable density.

The wood of certain plants, such as *Ulmus campestris*, *Robinia pseudo-Acacia*, and *Quercus Ilex* contains large vessels, the interior of which is occupied by a more or less consistent reticular tissue. This tissue evidently could not have been produced unless the vascular tubes had been filled with a liquid containing organic materials in solution.

Another observation proves that trachean vessels may contain substances which become thickened so as to obstruct their cavity. In a section of the stem of *Calamus Rotang* the author found, in most of the fibres, the enormous vessel occupying their centre filled with a solid white substance, forming continuous or interrupted cylinders of variable length. This substance, when detached and put into water, breaks up into granules; and, singularly enough, the suspended grains were sometimes agitated by a very lively movement, although the cane from which they were derived had long been dry. This substance was contained in well-marked porous vessels.

In proof that the solid substances are deposited in the vessels during the life of the plant, the author cites an example to show that the solid matter, far from penetrating into the vessels after section, has a tendency at that time to escape from them. An old vine-stem, 6 centimètres in diameter, had been cut into pieces from 1 to 2 mètres in length. In a short time the cut surfaces were covered with an abundant, transparent, gummy layer. Having made new and very smooth sections, the author found on the following day that filaments of gummy matter 5 or 6 millimètres in length had issued from the large vessels. Hence it appears certain that, even at an advanced age, the trachean vessels may contain, not only gaseous bodies, but also substances which sometimes acquire a great density.—*Comptes Rendus*, Oct. 2, 1865, p. 544.

On the Organization of the Cypridinæ. By Professor Claus.

During a residence at Messina, Prof. Claus turned his attention to the little Crustacea which swarm in the waters of the sea. He was particularly struck by a small Ostracode of the genus *Cypridina*, in which he detected, even with a low power of the microscope, an accessory single eye in addition to the large, paired, compound eye, and a heart beating with regular pulsations. This latter discovery naturally surprised him, as in the other two families of Ostracoda (the *Cypridæ* and the *Cytheridæ*) the heart is entirely deficient. A more attentive examination of these Crustacea soon showed, however, that the *Cypridinæ* differ much more from the other Ostracoda than the *Cypridæ* and *Cytheridæ* from each other.

The fact that an organ so important as the heart may sometimes exist and sometimes be deficient in animals so nearly allied to each other is doubtless surprising, but by no means without precedent. Thus it has been demonstrated that the Copepoda are in the same case. M. Claus himself has shown that if the *Cyclopidæ, Harpactidæ,* and *Corycæidæ* are always destitute of a heart, the allied *Pontellidæ* and *Calanidæ* are always furnished with one. Moreover the author is not the only person who has observed the heart in the *Cypridinæ,* as M. Fritz Müller mentions it in a recent work (Für Darwin, 1864).

The sole visual organs hitherto known in the *Cypridinæ* were the paired eyes, in which M. Lilljeborg has detected a complication of organization very similar to that of the eyes of the Cladocera, although the latter are fused into a single mass, forming as it were a median eye. Nevertheless traces of a primitive division into two halves in the *Sidæ*, the *Lyncei*, and the *Estheriæ* enable us to establish unhesitatingly the homology of this apparently single eye of the Cladocera with the paired eyes of the *Cypridinæ*. A further homology is presented when we find in the *Cypridinæ*, besides the large compound eyes, a small, simple, median eye, perfectly similar to that which exists, in addition to the compound eye, in the *Daphniæ*.

The *Cypridinæ* present other peculiarities worthy of mention. As a general rule, the Ostracoda are characterized by the small number of their appendages, as there exist only two, or at most three, pairs of locomotive appendages behind the gigantic maxillæ. In fact, the last pair of feet disappears completely, and the others are converted into organs of manducation. On the other hand, the mandibles are converted into locomotive appendages. The antennæ also serving for locomotion, we find that throughout their whole life the *Cypridinæ* employ the three anterior pairs of appendages as locomotive organs. Now this is exactly the case in all Entomostraca during the *Nauplius*-phase, and furnishes a new argument to be added to those adduced by Fritz Müller in favour of the derivation of all Crustacea from the *Nauplius*-form.—*Siebold & Kölliker's Zeitschrift*, 1865, p. 143.

Remarks on the Anatomy of Tridacna elongata. By M. Léon Vaillant.

Tridacna elongata, Lam., occurs very abundantly in the Bay of Suez, where it is often employed as food; the author has accordingly been able to examine a great number of individuals of this animal.

The retractor muscle of the foot, which is of considerable size in proportion to the protractor, serves in part for the closure of the valves; hence it may be that in those Monomyary Acephala which have an adductor muscle distinctly divided into two parts, the upper portion is to be regarded as representing the retractor of the foot diverted from its normal functions. The byssus of the *Tridacna*, already described by Müller, consists of two parts—one adhering to the bottom of a cavity of the foot, the other uniting this with external bodies; each of these is secreted by a distinct organ,—the former by the bottom of its cavity, the latter by a collection of racemose glands lining a circular groove in the wall of the cavity.

The large notches of the margins of the shells enabled the author to ascertain the force which the mollusk is capable of exerting. He fixed an individual by one of its valves, and suspended a weight to the other. In this way he found that a specimen 21 centimètres in length, of which the valves weighed 1·264 kil., could support a weight of 4·914 kil.; so that it may be supposed that an individual weighing 250 kilogrammes (and these are not uncommon) might at a given moment put out a force of more than 900 kilogrammes.

In the nervous system the branchial ganglia, forming a single mass with no trace of longitudinal division, exhibit transverse furrows bounding two false circumvolutions. A sort of inelastic tendon accompanies the connective extended from the branchial ganglion to one of the buccal ganglia during its passage through the gastro-genital mass; the object of this arrangement appears to be the prevention of the dragging (*tiraillement*) of the nerve when the organ is distended with eggs.

Another remarkable arrangement is to be seen in the passage of the last portion of the intestine through the heart. At the entrance of the intestine into the ventricle there are muscular bundles starting from the wall of the latter and inserted perpendicularly into the wall of the digestive tube; at the moment of contraction these bundles must, by their shortening, tend to draw apart the walls of the intestine, which would otherwise be compressed during the systole, and thus the course of the fæcal matters will not be interrupted.

In these large mollusks the difference between the arteries and veins is very easily seen: the former have a very distinct double epithelial and fibrous wall, whilst the latter are simple sinuses hollowed out in the tissues. All the blood is compelled to traverse an organ of hæmatosis (branchiæ or mantle) before returning to the heart.

The proper temperature of the animal, compared with that of the bottom at which it lives, appeared to be rather high. The temperature registered by thermometers sunk at the point inhabited by the animals was about 63°·5 F. (17°·5 C.); the average temperature of the *Tridacnæ* was 68°·5 F. (20° C.).—*Comptes Rendus*, Oct. 9, 1865, p. 601.

Remarks on the Protective Sheath and on the Formation of the Stem of the Root. By M. R. Caspary.

In preceding memoirs M. Caspary has indicated a layer of very closely approximated cells, placed in a single series in thickness, which exists in stems, roots, and leaves, the vascular system of which it envelopes and protects. He has given it the name of the *protective sheath*, although in certain cases (in *Berberis*, for example) this layer is ruptured during growth, and consequently does not serve to protect the organs which it envelopes. In describing this protective sheath, M. Caspary indicated upon the lateral walls of its cells some darker spots or streaks, which he thought were formed by very small pores. He now again maintains the existence of these spots or streaks; but he has ascertained that they are due to foldings of the walls of the cells, and not to pores. He has observed these folds in the protective sheath of *Ficaria ranunculoides*, Roth, *Elodea canadensis*, Mich., *Brasena peltata*, Peret, and *Charlwoodia rubra*, Planch. When the cells of the protective sheath become thickened, the folds gradually disappear. M. Caspary attributes this change to the elongation of the walls of the cells—an elongation of which he has convinced himself by direct measurements.

Several authors (especially M. Karsten) have regarded this protective sheath as a lignified residue of the layer of cambium which has produced the other parts of the stem; but M. Caspary combats this opinion. He declares himself also against the opinion which derives all the parts of the stem from a single layer of cambium existing in the terminal bud. According to him, the entire terminal bud is formed of cambium, and already contains the mother cells of all the kinds of tissue which will subsequently form the various parts of the stem.—*Jahrb. für Wiss. Bot.* 1864; *Bibl. Univ.* 1865, *Bull. Sci.* p. 87.

Graduation from "Individual Peculiarities" to Species in Insects.

The following are the concluding paragraphs of a paper by Dr. B. D. Walsh "*On Phytophagic Varieties and Phytophagic Species.*" The name *phytophagic* is given to those otherwise identical insects which differ, as varieties or species, according to the species of plant they feed upon. "When certain unimportant characters in the insect are correlated with the food-plant, while at the same time there is no sufficient reason to doubt that the two varieties freely intercross," the forms are called *phytophagic varieties.* When, from the lack of intermediate forms, intercrossing may be inferred not to take place, they are called *phytophagic species.* Dr. Walsh sums up his conclusions thus:—

"From the facts referred to above, and those recorded by me elsewhere, we may construct the following almost unbroken series, from the first dawnings of the Phytophagic Variety to the full development of the Phytophagic Species:—

"1st. Difference of food, even when the food-plant belongs to widely distinct botanical families, is accompanied by no difference whatever either in the larva, pupa, or imago state: *Attacus Cecropia*, Linn.; *Dryocampa imperialis*, Drury; *Lachnus Caryæ*, Harris (Proc. Ent. Soc. Phil. vol. i. p. 303); and hundreds of other species.

"2nd. Difference of food is accompanied by a marked difference in the colour of the silk-producing secretions: *Bombyx Mori*, Linn., the common silkworm.

"3rd. Difference of food is accompanied by a tendency toward the obliteration of the normal dark markings in the imago: *Haltica alternata*, Illig.

"4th. Difference of food is accompanied by marked, but not perfectly constant, colorational differences in the larva, but none whatever in the ♂ ♀ imago: *Datana Ministra*, Drury.

"5th. Difference of food is accompanied by a marked and perfectly constant difference in the size of the imago: *Chrysomela scalaris*, Lec.

"6th. Difference of food is accompanied by a marked difference in the chemical properties of gall-producing secretions, the external characters of the ♂ ♀ imago remaining identical: *Cynips q. spongifica*, O. S., and *C. q. inanis*, O. S.

"7th. Difference of food is accompanied by a slight but constant change in the coloration of the abdomen of the ♂ ♀ imago, and by a very slight change in the chemical properties of the gall-producing secretions, the galls of the two insects, though typically somewhat distinct, being connected by intermediate grades in the case of the latter: *Cynips q. punctata*, Basset, and *C. q. Podagræ*, Walsh.

"8th. Difference of food is accompanied by one marked and perfectly constant colorational difference, and others which are not perfectly constant, in the larva, but none whatever in the ♂ ♀ imago: *Halesidota tessellaris*, Sm. Abb., and *H. Antiphola*, Walsh.

"9th. Difference of food is accompanied by several slight but constant structural differences in the ♂ imago, but none whatever in the ♀ imago: *Clytus Robiniæ*, Forst., and *Cl. pictus*, Drury.

"10th. Difference of food is accompanied by a slight but constant structural difference in both ♂ and ♀ imago: 1. *Tingis Tiliæ*, n. sp., and *T. amorphæ*, n. sp.; 2 (doubtful). *Diapheromera femorata*, Say, and *D. Velii*, n. sp.

"11th (doubtful). Difference of food is accompanied by very strong structural and colorational differences in the larva and in all probability by a constant structural difference of generic value in the ♀ imago, the ♂ imagos being to all external appearances identical, and the two insects belonging to different genera: *Sphingicampa distigma* ♂ ♀, Walsh, and *Dryocampa bicolor* ♂, Harris.

"12th. Difference of food is accompanied by marked and constant differences, either colorational or structural, or both, in the larva, pupa, and imago states: *Halesidota tesellaris*, Sm. Abb., and *H. Caryæ*, Harris, and hundreds of species belonging to the same genus, and commonly considered as distinct species.

"The constitution of the human mind is such, that the same evidence carries with it very different degrees of weight when presented to different intellects. Others will no doubt draw different conclusions from the facts catalogued above; but for my own part, as on the most careful consideration I am unable to draw any definite line in the above series, and to say with certainty that here end the Varieties and here begin the Species, I am therefore irresistibly led to believe that the former gradually strengthen and become developed into the latter, and that the difference between them is merely one of mode and degree."—Silliman's *American Journal*, September 1865.

Note on the Cultivation of Eels. By M. L. Soubeiran.

The author states that for several years past considerable quantities of young eels have been taken at the mouths of the French rivers and distributed in the inland waters; but he adds that, from his own experience, this course is not always judicious, and is frequently unprofitable. He mentions that in 1856 certain landed proprietors in the neighbourhood of Caen transported great quantities of young eels to the ponds and other waters on their estates, and after feeding them at great expense obtained nothing but loss from their undertaking, the produce being only 150 francs against an expenditure of 2220 francs. Besides this, the waters into which the eels were introduced, and those into which they subsequently penetrated, were entirely depopulated of other species of fish; so that the multiplication of eels must be regarded as in every respect a losing speculation.—*Comptes Rendus*, 4th September, 1865, p. 424.

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XLII.—*On the Systematic Value of the Organs which have been employed as Fundamental Characters in the Classification of Mollusca.* By Dr. O. A. L. Mörch.

Whether classes, orders, and genera are founded in nature, or are only artificial divisions, is a question rarely disputed. It is, however, still a matter of discussion whether now-existing species are direct descendants of extinct forms from remote geological periods, which have been gradually changed in the course of natural selection or in consequence of physical changes of the globe, or are entirely new creations of any one geological era. The habits of an animal often cause a considerable modification of the external form, size, or colour, which are often improperly considered of specific value; but it must be admitted that such differences are subject to limits which cannot be passed, and do not become hereditary. For instance, the corns of the human foot are, like the nails, a thickening of the epidermis; but the former are produced by accidental pressure on the foot, while the latter originate in the fœtal structure of the animal. There is the same distinction between false and genuine species.

Linné divided all creation into three kingdoms—animal, vegetable, and mineral. The last-named division is less logical, because minerals can only be considered as parts of the great celestial bodies, which may be regarded as inorganic beings with involuntary motion impressed upon them, corresponding with that of the heart or stomach of animals. Geoffroy St.-Hilaire has more correctly made the division into phanerobiotic and cryptobiotic kingdoms. A predestined scheme is shown in the chronology of our planet as well as in the development of organic beings. Thus the oceans with their lower types are regularly in course of time changed to islands and continents with their higher terrestrial types. Even the form of the now-existing continents seems to be subject to a certain definite plan. The three main continents (1. Europe and Africa, 2. North and South America, 3. Asia and Australia) extending from north to south, nearly forming a continuous range, show a remarkable resemblance in their configuration—towards the south a large triangular mass of land without considerable gulfs (Africa, South America, Australia) united by an isthmus (Suez, Panama, Malacca and Sunda islands) to a larger land with numerous gulfs and peninsulas, forming a large median gulf (the Mediterranean Sea, the Gulf of Mexico, Mindoro Sea) with numerous archipelagos at the entrance (Canarian and Cape de Verde Islands, West-India Islands, Philippine and Molucca Pacific islands); close to each of the southern parts is a satellite island with a most remarkable aberrant fauna—Madagascar, New Zealand, and Galapagos Islands. These three continents would geologically be considered three different formations. Australia, probably the youngest continent, representing the Liassic period of the Old World, is characterized by the lowest Mammalia, viz. the abortive Marsupialia. America has only a few Marsupialia, frequently without pouch (marsupium), but the greatest number of the lowest Placentalia (Microsthena), the Edentata. Africa has no Marsupialia, but a few Edentata, and abundance of the higher Mammalia (Macrosthena). If an order is common to the Old and New Worlds, there is always a marked difference according to the continent, the species of the Old World belonging to groups of a superior stamp. Thus the Quadrumana and Scansores (Parrots, among birds, corresponding with Monkeys) are divided into those of the Old and those of the New World —the latter being chiefly long-tailed, a character considered inferior.

The *Ampullariæ* of the New World are nearly all provided with a siphon, which is wanting in those of the Old World. The same is the case with the genus *Polymesodon* in the *Cyrenidæ*, and *Leila* among the *Unionidæ*. The difference between the faunæ of the three continents diminishes towards the north, where the faunæ are fused into one circumpolar fauna, like the three continents themselves. The land-faunæ are limited by thermal differences or mountain-ranges. Species living in or or close to water (e. g. *Succinea*) are very similar all over the world.

The three continents above mentioned divide the ocean into three parts geographically, but not zoologically—the Atlantic, the Pacific, and the Indian oceans. These are limited by the following coast-lines:—

1. From Behring's Straits, Norway, Spain, Guinea, Cape.

2. From Behring's Straits, Greenland, Florida, Brazil, Cape Horn.
3. „ Oregon, California, Peru, Cape Horn.
4. „ Kamtschatka, Japan, China, Tasmania.
5. Cape, Arabia, India, Sumatra, Tasmania.

The three first-named coast-lines may zoologically be considered the boundaries of the Atlantic Ocean, in the same way that America is considered an island in the Atlantic Ocean, separated from the Pacific Ocean by the western edges of the polar streams and the great abyss between the Galapagos Islands and the Sandwich Islands. The coast-lines are divided into analogous faunæ according to the climate: 1. Polar; 2. Subpolar (North Sea); 3. Subtropical (Mediterranean); 4. Tropical (Guinea). The southern polar and subpolar are not sufficiently known (Kerguelen Island, St. Paul's, &c.).

It would seem easy for most animals, even for Mollusca, the young of which generally are natatory, to move or to be carried by currents from one end of these coast-lines to the other; but in reality this is not the case. The temperature of the sea seems to put a nearly insurmountable barrier to the distribution or migration of species, and even of genera. A general view of those faunæ shows that they are composed of animals of all subkingdoms, classes, orders, families of the animal kingdom (Gulls, Seals, &c). The genera are often different, although allied; and the species are nearly always different in each fauna. The question now arises, Are these species and genera originally different, or changed by various physical causes, such as climate, light, the saltness of the sea, &c.? The influence of these causes on the form and size of shells is chiefly seen by comparing the faunæ of the Baltic and Mediterranean with that of the ocean.

It would be a very slow process to compare the species of all these faunæ, chiefly because no museum possesses a sufficient collection of animals in spirits for investigation of the teeth, even of European species. The specific importance of the teeth is evident, chiefly from the researches of Troschel; many species which were considered slight varieties are now proved to be distinct—e. g., *Natica millepunctata* and *N. maculosa*, *Natica clausa* and *N. consolidata*, &c., &c., *Viviparus contectus* and *V. fasciatus*, *Bithinia ventricosa* and *B. tentaculata*.

The genus *Aporrhais*, which was abundant in former geological periods, from the Oolitic formation upwards, is now restricted to five or six recent species inhabiting the Atlantic only. *Aporrhais occidentalis* is found on the coast of Canada and Greenland. *A. pes-pelecani* and a variety, perhaps specifically distinct, are found from the north of Norway to the Mediterranean. In Shetland a second species is added, the *A. pes-carbonis,* which in the Mediterranean is represented by *A. Serresiana,* Phil. In Senegal is found *A. senegalensis,* Gray. The most northern species is the largest of the genus, as is generally the case; the outside of the outer lip is smooth, as in all other arctic univalves. In *A. pes-pelecani* and the following southern species the inside lip is plaited, as is generally the case in species of warmer climes (e. g. *Nassa* and other univalves). The *A. senegalensis,* living in the hottest water, is the smallest. Unfortunately it will be very difficult to get the tongues of these species. The teeth of *Aporrhais pes-pelecani* as represented by Lovén, Troschel, and Wilton differ considerably from one another, making it probable that two species are confounded.

A monographic research, chiefly based on the teeth of the genera *Nassa, Fusus,* and *Buccinum,* found on the coast-lines from the arctic regions to the equator, would probably be sufficient to prove whether species in each fauna are created originally or are only varieties dependent on different climates, and would at the same time prove the relations between the species of succeeding geological periods.

Large suites of specimens, from various depths and localities, are in most cases sufficient to prove the difference or identity of so-called species, without a knowledge of the animals; but the affinity of the genera and families can only be safely understood by anatomical researches: the anatomical as well as the zoological characters are, however, generally either misunderstood or overvalued. I will therefore endeavour to show the relative systematic value of the various organs of the Mollusca. Until these questions are quite cleared up, it will not be possible to solve the problem in regard to the origin of species among the Mollusca.

Cuvier founded his primary divisions (classes) of the Mollusca on the locomotive organs, viz. Cephalopoda, Pteropoda, Gasteropoda, Acephala (this last changed by Oken to Pelecypoda), Brachiopoda, and Cirrhopoda. The group Heteropoda, correctly considered by Cuvier only a family, was by most subsequent naturalists considered of the same value as the above-mentioned divisions. The study of the homology of the parts of the Mollusca, commenced by Professors Lovén and Huxley, has shown that the Pteropoda are true Gasteropoda, and that the funnel of the Cephalopoda is homologous with the foot of the Gymnosomata. Such a system seems to me to correspond with that classification, by the old authors, of the Vertebrata (Quadrupeda, Bipeda, Pinnata, and Apoda), maintained so pertinaciously by Klein in opposition to the Linnæan system founded chiefly on the anatomical researches of Ray. The Cetacea, but chiefly the Reptiles (*Anguis, Bipes,* &c.), afford striking examples of the insignificance of the locomotive organs as a base for the primary divisions.

The secondary divisions (orders) of Cuvier were founded on the respiratory organs. Respiration is indispensable for the life of all organic beings; but special organs for this purpose are not always necessary. Respiration of some importance takes place through the skin, even in the higher Vertebrata, and can, in the lower Vertebrata (*e. g.* Batrachians), temporarily replace that through the lungs: it is quite sufficient for many Mollusca.

The Vertebrata have two kinds of respiratory organs—lungs, and gills—which, according to J. Müller, are not homologous, as they can be found together in the same individual, although not always exactly performing the same function—for instance, the Batrachians and the fœtus of the higher Vertebrata. In fishes the lungs are reduced to a swimming-bladder, the walls of which are provided with some bloodvessels, making it serve as a secondary, but very imperfect, respiratory organ comparable to the lung-sac of the Pulmonata. That this organ, even among the Mollusca, cannot be homologous with the gills, as advanced by Prof. Agassiz *, is proved in *Ampullaria* and perhaps *Onchis,* each of which has lung-sacs simultaneously with true gills. Many Mollusca (as *Cyclostoma, Neritina,* and *Littorina*), which are undoubtedly provided with gills, live always or nearly always in the air, probably having the power of keeping their gills moist, like the Land-crabs and several fishes (e. g. *Anabas scandens*). Whether the vena branchialis and vena pulmonalis are identical is at least not yet proved. In Mollusca not requiring a hard covering for their protection, respiration takes place through the skin; but when the skin is thickened, or a shell developed, a respiratory organ becomes necessary. The use of the gills is to produce, by the complication of a part of the skin, a surface corresponding with the area made impenetrable to the oxygen of the surrounding medium (air or water). The effect of this dermal gland is increased by vibratile cilia, producing a swifter circulation of the oxygeniferous medium. If the branchial sac is very deep, the circulation of the water is effected by a siphon acting like a chimney-pipe, often assisted by muscular contractions (Cephalopoda, Acephala). The larger the shell is in proportion to the uncovered parts of the animal, the more complicated and compressed are the gills.

Several of the internal glands are subject to the same change.

* "On the Circulation of Fluids in Insects," Proc. Bost. Soc. 1850, p. 237.

Thus the liver is strongly arborescent in animals having a dermal respiration (Pellibranchiata, Gymnobranchiata), and becomes more and more compressed in proportion as the gills are developed (*Scyllæa, Pleurophyllida*); but it is most complicated in Mollusca covered with a shell. The same is the case with the renal organ, which becomes rounded and spongy, as is to be seen in the plates of Mr. Hancock's excellent paper* on the renal organ of nudibranchiate Mollusca, and in the work of Gegenbaur† on the Heteropoda and Pteropoda. The compact structure of this organ in the testaceous Mollusca may be seen in many of the plates to the 'Voyage de l'Astrolabe.'

In the Pellibranchiata the generative glands partake of the arborescent form of the liver and kidney: thus in *Elysia*‡, &c., the albuminous gland, the hermaphrodite gland, and "la glande en trèfle" of Moquin§ are strongly arborescent.

The dorsal plates of *Placobranchus* and the arborescent tufts of *Dendronotus* and *Onchis* may be considered the most imperfect forms of gills. The hepatic papillæ of the *Æolididæ* are probably not homologous with the branchial leaves of Gasteropoda (e. g. *Ianthina, Pterotrachæa, Doris*), as these organs in *Bornella* are found simultaneously with arborescent tufts of the skin, which may be considered homologous with the branchiæ of the *Dorididæ*. There appears to be a gradual transition in the respiratory organs of *Tritonia, Heptabranchus, Hexabranchus*, and *Lamellidoris*. It must, however, be remembered that, according to Dr. Hancock, the gills of *Doris* receive hepatic blood. The gills in symmetrical animals are generally situated on each side of the body, *e. g.* Acephala, Cyclobranchia, Inferobranchia. In asymmetric spiral testaceous Mollusca the single gill becomes smaller, and is said to be reduced to a filiform undulated vessel, as in *Vermetus* and *Onustus* ||. I have observed, however, in a specimen of *O. trochiformis*, that this vessel opens through a pore on the outer side of the mantle opposite to the shell; it may perhaps be in some relation with the renal organ.

The insignificance of the gills as a systematic character is evident by comparing the Heteropoda, from the entirely gill-less *Firoloides* and *Pterotrachæa* with external gills, to *Atlanta* exhibiting perfectly internal gills. The same fact is to be seen in the following series of allied genera:—*Stylochilus, Notarchus, Aplysia, Bulla*, &c., *Actæon, Odostomia*, and *Obeliscus*.

* Trans. Linn. Soc. 1864.

† Untersuchungen über die Pteropoden u. Heteropoden, 1854.

‡ Journal de Conchyliologie, vol. i.

§ "Le talon" (St. Simon) = "petite glande sécréteur" (Souleyet, *l. c.* t. 6. f. 5).

|| Mörch, Journal de Conchyliogie, vi. p. 308.

These two series prove not only that the size and form of the gills stand in connexion with the development of the shell, but that the divisions Opisthobranchiata and Prosobranchiata, as originally proposed, are not natural; this has been indicated by Messrs. Huxley and Macdonald.

The two kinds of respiratory organs indicate only relative superiority and inferiority, but not limits of systematic divisions. Thus, among Vertebrata, lungs and gills meet in a family of the Batrachians. Among the Mollusca, it is probably in *Auricula* and *Obeliscus* that the two kinds of respiratory organs are found to meet.

It has been generally understood that neither the locomotive nor the respiratory organs offer characters for the primary divisions; most authors have therefore divided the Mollusca, according to the presence or absence of a distinct head, into Cephalophora and Acephala. As several Gasteropoda (*e.g.* Thecosomata) properly have not a distinct head, Prof. Lovén has changed the names to Glossophora and Aglossa. Cephalization, as explained by Prof. Dana, is, no doubt, of importance as a character indicating relative superiority and inferiority, but is not sufficient for natural divisions. Thus, according to this principle, the Vertebrata would only be divided into two classes, 1. Cephalophora with a distinct head—Mammalia, Birds, and Reptiles; 2. Acephala, with the head united to the thorax, containing the Fishes only.

My study of the Mollusca for about twenty years enables me to state that the heart and generative organs offer characters of a much higher systematic value than is generally believed. It is perhaps somewhat hazardous to compare the organs of the lower animals with those of the higher; but it does not seem probable that organs which have no systematic value in the higher can have it in the lower animals.

The accompanying synopsis of the Mollusca is chiefly founded on the intromittent male organ, which seems to me to be the best indicator of the sensibility of the nervous system, and consequently of the relative systematic rank of the animal. Thus the lowest class of Vertebrata (the Fishes) wants an intromittent male organ, although the sexes, with few exceptions, are separate; there exists, consequently, no copulation, but impregnation takes place as among plants. In the Plagiostoms the posterior locomotive organs of the male are changed into conduits for the sperm*, like the hectocotylized arm of the Cephalopods. In the Batrachians the anterior locomotive organs are used as prehensile organs during the pseudo-copulation; but a true

* Steenstrup, Om Hectacotyldannelsen, p. 26, Kgl. Danske Videnskabernes Selskabs Skrifter, 5. Række, 4. Bind.

male intromittent organ is first found among the Reptiles, and becomes more and more developed among the higher Vertebrata.

That this fact is not in consequence of aquatic habits is evident by comparing the Cetacea and Sea-serpents, which are provided with a true male organ.

A similar fact may be observed among the Articulata, of which the Insects only may have a true male organ.

Among the Mollusca the Androgyna are provided with the most developed male organ, and which seems to be the most sensitive. The male organ of the Exophallia is always external, not retractile, sometimes concealed in a furrow of the right tentacle (e. g. *Viviparus*). The Pseudophallia have no male organ*. The copulation is probably effected in the same way as among Batrachians; but direct observations are wanting. The male Acephala disperse their sperm, which is taken up by the females like the pollen by flowers. The few observations on the copulation of Acephala are very problematical. My synopsis confirms the rule of Prof. Agassiz that land-animals are more perfect than marine; but this rule may be explained in the sense that the divisions with the largest number of terrestrial forms always are the superior. Thus, among the Vertebrata, the Thermalia† are higher than the Psychræmia, containing the greatest number of aquatic forms. The lowest class, Acephala, is entirely aquatic and chiefly marine. Among the Pseudophallia, *Helicinæ* are the only terrestrial, and *Neritinæ* fluviatile. The number of terrestrial genera is considerably increased among the Exophallia; thus *Cyclostomaceæ* are truly terrestrial, *Ampullariæ, Paludinæ, Melaniæ,* and *Potamidæ* fluviatile. Among Androgyna are the greatest number of terrestrial genera.

There is the same concordance with the law of Prof. Owen, "that the multiplicity of organs indicates inferiority in organization." As was shown in a former paper, the duplicity of the organs of Acephala descends as the system ascends.

The development of the young is of less systematic value than is generally believed: this is proved in the Crustaceans, the marine species having a larval form very different from the fluviatile species (*Astacus fluviatilis* and *A. marinus*). All larvæ of marine Mollusca swim by means of a velum, which in the marine Acephala, *Chiton* and *Dentalium* is changed to a flagellum. In the melicertigene Gasteropoda (Rhachiglossata) the larva loses the velum before it leaves the egg-case. The larva

* In the 'Voyage de l'Uranie' is represented a *Neritina* with something like a short male organ between the mouth and right tentacle, but which seems not to have been observed in the European species.

† The difference between hot- and cool-blooded animals seems not to be sufficiently insisted upon in the modern systems.

of *Auricula* agrees with that of marine Mollusca, according to Dr. C. Semper, although the most allied forms (*Limnæa*) are not subject to this kind of metamorphosis.

All the terrestrial forms leave the egg in a perfect state. The Cephalopoda may be considered Gasteropoda stopped in the larval stage, reminding one of *Macgillivrayia*. The number of the eggs may also be of some importance for the determination of superiority and inferiority, as nature seems to compensate want of intelligence, or power to provide for the offspring, by great fertility: thus plants are more fertile than animals; the Helicea produce but few eggs compared with the Acephala. Since the time of Cuvier nearly all naturalists have considered the Cephalopoda the highest type of Mollusca, chiefly on account of a presumed affinity with the Fishes, their great size, great muscular power, as well as the apparent superiority of the nervous system and organs of circulation. Naturalists are not yet agreed which families may be considered the highest in each class, except in the Mammalia. Among the Birds, the Parrots are considered the highest by the best authors; the Serpents may perhaps be the highest Reptiles, although such an authority as Prof. Agassiz considers the Chelonians the highest, on account of the completeness of the ossification. According to this principle, the Edentata would be the highest Mammalia! The largest and strongest Arthropods, the Lobsters, have a similar claim to be considered the highest of that subkingdom. Marine animals are always larger than their kindred on the land, but not the most perfect, as Prof. Agassiz has proved.

The systematic place of the Cephalopoda may depend on the structure of the heart and the explanation of the hectocotylized arm as a male organ. If the branchiocardiac veins of Cephalopoda may be considered auricles, as stated by Milne-Edwards, Kölliker, Huxley *, and Gegenbaur †, the place of the Cephalopoda must be between *Dentalium* and Acephala ‡—a place not more strange than that of the *Cæciliæ* standing before the Plagiostomes, or the *Linguatula* before the Decapod Crustacea.

The hectocotylized arm of the male indicates a kind of copulation between two individuals, giving the Cephalopoda claim to a higher place than the Acephala; but it must be remembered that the manner of copulation of the Pseudophallia is entirely unknown at present.

If the cardiac auricles only prove to be tumefactions of the

* On Morphology, &c. p. 57—"the *presumed* highest Mollusca."

† Vergleichende Anatomie, p. 375.

‡ *Solen* swims, according to Prof. Deshayes, like the Cephalopoda, by driving water out of the respiratory cavity.

branchiocardiac veins, the Cephalopoda must then be removed, according to the septiserial teeth of the tongue, to the Tænioglossata, the larvæ of which (*Macgillivrayidæ*) are not unlike the Cephalopoda. This position would answer to that of Cetacea being united by the Sirenians to Pachydermata.

The pelagic Cephalopoda are certainly the most powerful and ferocious of all Mollusca, like the Sharks and Cachalots among Vertebrata; but in the same divisions are found large animals living on small animals (*e. g.* the Whalebone-Whale and the *Squalus glacialis*). The same is probably the case with the largest of all Cephalopoda, *Architeuthis dux*, Stp. The two mandibles of the Cephalopoda are generally very powerful and very conspicuous; but their little value as a character for a class is best seen by the two divisions of mandibulated Echinodermata and the Helicea. The eyes offer the same differences as in other parts of the animal kingdom, being small in the diurnal species and larger in the nocturnal. The size of the lens cannot be considered a character of perfection of the visual organs, because the fishes would in such case have the most perfect eyes among Vertebrata. *Nautilus* wants a lens, according to Prof. Keferstein. The exterior form of Cephalopoda is a combination of the form of the Fishes and Radiata*, depending on their manner of locomotion. *Cirroteuthis* has thus a striking resemblance to a *Medusa*. The Cephalopoda seem to me not to have more just claims to be considered a distinct class in relation to the other Mollusca than Pteropoda or the Cetacea among Vertebrata. They exhibit a remarkable analogy with the Plagiostomes in their habits, in the male organ, the manner of depositing their eggs, and in the yolk-bearing young.

Subkingdom III. MOLLUSCA.

Series I. *MONOTOCARDIA.*

The heart with a single auricle. Copulation between two individuals.

Class I. ANDROGYNA (Musivoglossata *olim*).

All individuals alike in respect of the sexual organs, having the two sexes united. Always provided with a receptaculum seminis (petiolate bladder). Male organ retractile. Teeth of the tongue generally multiserial. Predominantly mandibulated.

PULMONATA.

GEOPHILA: Phyllovora, Agnatha†.

HYGROPHILA: *Planorbis, Physa, Limnæa, Siphonaria, Ancylus, Auricula.*

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* Owen, Proceedings of the Zool. Society, 1836, p. 19.

† Journal de Conchyliologie, July 1865.

TECTIBRANCHIA: *Pyramidella, Obeliscus, Odostomia, Chemnitzia, Actæon, Bulla, Aplysia, Notarchus.*

PTEROPODA: Gymnosomata,—*Clione, Pneumodermon* (*Ianthina*?); Thecosomata,—*Clio, Hyalæa,* &c.

GYMNOBRANCHIA.

1. Pygobranchia: *Doridæ,* &c.
2. Pleurognatha: *Pleurophyllidia, Dendronotus, Tritonia, Bornella, Æolis, Glaucus,* &c.
3. Pellibranchia: *Tethys, Chionera, Hermæa, Elysia, Limapontia, Pelta,* &c.

Class II. EXOPHALLIA (Arthroglossata *olim*).

Sexes distinct; male organ not retractile (often concealed in the branchial cavity or in the tentacle). Mouth predominantly suctorial. Lingual strap not having more than seven rows of teeth.

TÆNIOGLOSSATA. Tongue with seven rows of teeth, with reflected edge. Larva of the marine species swimming.

A. *Rostrifera.* With a short muzzle, not retractile.

α. terrestria. Cyclostomacea (*Truncatella*).

β. fluviatilia. *Ampullaria, Paludina, Melania, Potamides, Cerithium, Turritella* (with nine? rows of teeth), *Littorina, Lacuna, Velutina, Onchidiopsis.*

γ. parasitica. The eggs hatched in pouches attached to the inside of the shell. *Vermetus, Crepidula, Hipponyx, Capulus.*

δ. Pelagica Heteropoda. *Firoloides, Pterotrachæa, Cardiapoda, Peltaria**, *Carinaria, Helicophlegma, Atlanta, Bellerophon, Onustus.*

ε. *Strombi.*

B. *Proboscidifera.* Rostrum retractile. *Natica, Ovula, Pedicularia, Trivia, Cypræa, Cassis, Dolium, Pyrula, Triton, Trichotropis, Aporrhais.*

RHACHIGLOSSATA. Tongue not having more than three rows of teeth, which are not reflected at the edge. Rostrum long, retractile (without cheek-plates?). Eggs deposited in cartilaginous capsules, which the young leave when the metamorphosis is complete. *Marginella, Voluta* (lateral teeth absent), *Harpa, Oliva, Ancillaria, Bullia, Nassa, Buccinum, Fusus, Fasciolaria, Turbinella, Murex, Purpura* (*Magilus*?), *Mitra.*

TOXOGLOSSATA. Mouth with a suctorial veil. Tongue (?) with subulate teeth provided with an internal or external veniferous canal. *Conus* (*Borsonia*?), *Pleurotoma, Clionella,* making a transition to *Terebra, Cancellaria.* The egg-cases of this division are probably like the preceding; but direct observation is wanting.

Series II. *DIOTOCARDIA.*

Heart with two auricles. (That this character has no relation to the position of the gills, as Prof. Huxley suggested, is evident in the case of *Pleurophyllidia,* which, according to Messrs. Hancock and Bergh, have

* *Carinaria depressa,* Rang, Man. t. 3. f. 1.

a single auricle, although the gills are lateral—and because *Turbo marmoreus,* with a single gill, has two auricles, according to Quoy and Gaimard.) Sexes distinct, but without male organ.

Class III. PSEUDOPHALLIA (Aspidobranchia *olim*).

Tongue with the lateral teeth of two different forms. Male organ rudimentary? Development only known in *Chiton* and *Dentalium.*

RHIPIDOGLOSSATA. Median teeth broad, with reflected edge, generally 5.1.5; marginal teeth compressed; these are very numerous, with inflected tips.

Terrestria. *Helicina.* (Eyes sessile.)

Fluviatilia. *Neritina.* (Eyes petiolate.)

Marina. *Nerita, Turbo, Trochus, Haliotis, Fissurella, Emarginula.* (Eyes sessile.)

HETEROGLOSSATA. (Dochoglossata, *Troschel*). Tips of the teeth (always?) having a black pigment. The marginal teeth of the preceding division are absent.

Cyclobranchia. *Patella, Tectura.*

Polyplacophora. *Chiton, Chitonellus.*

Cirrobranchia. *Dentalium, Siphonodentalium.*

CEPHALOPODA.

1. *Dibranchiata.*
   A. *Octopoda.*
   B. *Decapoda.*
      Oigopsidæ.
      Myopsidæ.
2. *Tetrabranchiata. Nautilus.*

Class IV. ACEPHALA (Dithyra).

Dimyaria.
Heteromyaria. *Mytilacea* et *Ostreacea*?
Monomyaria. *Pecten, Spondylus, Lima, Tridacna.*

Observations.

Ianthina has perhaps the same relation to *Pneumodermon* as *Carinaria* to *Pterotrachæa. Ianthina* has a pair of epipodial fins. Dr. Gould has represented (American Exploring Expedition) some aciculate bodies, probably homologous with the hooks on the arms of *Pneumodermon.* The latter genus has, according to D'Orbigny, a small hump on the back, probably a rudimentary mantle; but intermediate genera are yet unknown.

The Thecosomata differ considerably from the Gymnosomata. I find it at least very doubtful whether *Eurybia* makes a true transition between the two divisions. The Thecosomata have 3–5 band-like lateral mandibles, and a triseriate lingual dentition, quite different from that of the Gymnosomata. According to Souleyet, they have a petiolate bladder, and are consequently androgynous; but they are perhaps more nearly allied to *Gasteropteron* or the *Bullidæ*. The systematic position seems to me not sufficiently clear.

The relation between the pulmoniferous *Auricula* with a marine larva and the marine branchiferous *Pyramidella* requires further observation. Quoy and Gaimard have pointed out their affinity.

The relation between a rostrum (not retractile) and a proboscis or haustellum (retractile) is not yet sufficiently understood. Perhaps there is no other difference than between a long and short siphon. *Strombus* appears to make a transition between the two, and seems to approach most to *Cypræa*.

XLIII.—*Description of four new Species of Butterflies in the Collection of the British Museum.* By A. G. Butler, F.Z.S., Assistant, Zoological Department, British Museum.

1. *Anthocharis Leo.*

Upperside—*front wings* snowy-white, with a pale orange patch on the inner margin, bounded above by the third median nervule; base greyish; apex and a subapical line grey; nervures black: *hind wings* snowy white, suffused with orange on the front margin.

Body grey; head and prothorax yellowish.

Underside white, tinted with ochreous, darker at the apex of front wings and front margin of hind wings; a curved line of small indistinct brown spots crosses the hind wings just below the middle.

Expanse of wings 1 inch 9 lines.

Hab. White Nile.

2. *Danais Mariana.*

Upperside—*front wings,* basal half, an irregular subapical band, a small spot on the costa just beyond the middle, and two marginal spots between the median nervules sap-green; apical half and nervures rich brown, its inner outline angularly and irregularly notched: *hind wings,* basal half sap-green, tapering towards the termination of the upper disco-cellular nervule, with an angular and irregular outline; apical half and inner marginal nervures rich brown; other nervures reddish.

Body brown; head reddish, spotted with white; antennæ black.

Underside—*front wings* as above, but with three additional small marginal green spots and paler-coloured nervures; *hind wings* as above, but with two submarginal rows of pale-green spots placed in fours between the nervures along the hind margin, and the nervures margined with brown.

Body: thorax brown, spotted with green; palpi green; abdomen olivaceous brown.

Expanse of wings 1 inch 11 lines.

Hab. New Caledonia.

3. *Diadema Mena.*

Hestina Mena, Moore, MS.

Upperside—*front wings* pale greenish; nervures, end of cell, and a submarginal band along the hind margin broadly rich brown; two indistinct inner submarginal bands of brown scales: *hind wings* pale ochreous, nervures rich brown; a submarginal row of brown lunules between the nervures along the hind margin.

Body brown above; head and thorax streaked with ochreous; antennæ black.

Underside—*front wings* pale greenish; end of cell, base of nervures, an indistinct band of scales between the nervures just beyond the cell, and an indistinct submarginal row of spots along the hind margin brown; termination of nervures fulvous: *hind wings* pale ochreous; nervures brown; a submarginal band of indistinct brown spots between the nervures along the hind margin; front margin darker ochreous.

Body rich brown; tibiæ and tarsi of front legs and tarsi of middle and hind legs alternately brown and white.

Expanse of wings $3\frac{1}{2}$ inches.

Hab. North India.

This insect was named by Mr. Frederick Moore, of the Indian Museum.

4. *Heterochroa Lydia.*

Upperside rich brown, with a central white band, faintly tinted with violaceous, extending, entire, from the first discoidal nervure of the front to the anal angle of the hind wings, continued above the first discoidal to the subcostal nervure in the form of two minute and indistinct white spots; a large angular orange blotch near the apex of the front wings, extending from the costa to the first discoidal nervure; a small orange blotch at the anal angle of hind wings; two submarginal dark-brown bands, interrupted by the nervures, near the hind margin of front wings, and three similar bands on the hind wings; base irrorated with orange scales; cell of front wings crossed by five equidistant, oblique, black lines, the one nearest the base more oblique than the others, extending half across the cell; three similar short black lines below the cell; hind-wing cell only crossed by two black lines, and closed by a third; inner margin pale brown.

Body olivaceous; head fulvous; antennæ black, tipped with fulvous.

Underside—central band extending to the costa, but interrupted near it by the nervures, which are fulvous, otherwise as above; base silvery, crossed by two pinkish bands margined with brick-red, the outer one lying close to the central band, except at the costa of the front wings; base of hind and cell of front wings crossed by an oblique brick-red dash: front wings with a subapical patch, creamy above, white and very narrow below, interrupted by the nervures; apex fulvous; the remainder of the apical half of the front wings pale brown, interrupted by the nervures, and varied with white lunules between the subcostal and second and third median nervules: apical half of hind wings violaceous outwardly, pale brown inwardly, the brown portion crossed longitudinally by a brick-red fascia; a lunulate, submarginal, fulvous line along the hind margin, an orange spot at the anal angle, and a small black lunule near it.

Body dirty cream-coloured.

Expanse of wings 2 inches.

Hab. Honduras.

Closely allied to *Heterochroa Iphicla*, Linn., differing from it *above* in having the central band produced above the first median nervule, the subapical orange patch much more angular, and the submarginal bands more interrupted; *below*, the basal bands are wider apart, the white submarginal lunules are fewer in number, the submarginal bands less curved, more regular, and not so much interrupted, the anal orange patch on the hind wing is much nearer to the margin, and the central band much more regular in outline.

XLIV.—*Remarks on Prof. H. J. Clark's* Peridinium cypripedium. By H. J. Carter, F.R.S. &c.

In the last two Numbers of the 'Annals' (viz. 94 and 95) are contained the description and illustrations of an animalcule called by Professor Clark *Peridinium cypripedium*; and no microscopical inquirer into such organisms can have read it, in connexion with his figures, without admiration and hope of future contributions of the kind from the same author.

Prof. Clark, however, not unlike those who have preceded him in such investigations, has confounded two kinds of infusoria, which, although extremely alike, nevertheless belong, one to the animal, and the other to the vegetable side of the imaginary line which divides the two great kingdoms of organized beings. Nor would this confusion have been made had the authors of that most excellent work to which Prof. Clark alludes, viz. 'Les Études sur les Infusoires, &c.,' Messrs. Claparède and Lachmann, been able to contribute as much to the description of their second family of Vorticellina as they wished.

This has now been added by Prof. Clark himself so completely that henceforth no such confusion can exist. But while Prof. Clark's mistake serves to show how very like *Urocentrum Turbo*, Ehr. (which I believe to be Prof. Clark's *Peridinium cypripedium*) is to *Peridinium*, it also affords me the opportunity of pointing out more strongly than has hitherto been done, the striking resemblance between these two Infusoria, situated on different sides of the line mentioned, which, from a late examination of the former, appears to be desirable.

Prof. Clark's *Peridinium cypripedium*, if not identical with Ehrenberg's *Urocentrum Turbo*, seems to differ from it so slightly that it can hardly be termed another species.

Of *Urocentrum Turbo* Claparède states (*op. cit.* p. 134), among other characters, that the mouth or buccal cavity is spiral, and, on behalf of his lamented coadjutor, the late M. J. Lachmann, that the anal orifice is posterior; while Ehrenberg asserts, on the contrary, that the mouth is "not spiral" (Micrograph. Dict.). Claparède also adds that the setaceous or large ciliary appendage is composed of "long cilia agglomerated into a bundle."

Urocentrum Turbo has been placed by Ehrenberg among his Vorticellæ; but if the mouth be *not* spiral, as he has stated, and the anal orifice be posterior, as observed by Lachmann—while Prof. Clark, in his minute examination, although unable to determine the position of the latter, mentions nothing spiral about the mouth or buccal cavity, and my own observations are of a like nature—then such testimony is opposed to placing this organism in the position assigned to it by Ehrenberg.

On this account, probably, the intelligent authors of 'Les Études' have made a separate family for it, under the head of "Urocentrina," which they have placed between their Vorticellina and Oxytrichina, probably also seeing, among other things, that the setaceous or large ciliary appendage, by its brush-like form, allied it more strongly to the Oxytrichina (characterized by large ciliary feet) than to any other family of Infusoria.

While, then, *Urocentrum* differs so much from the ciliated animalcules, on the animal side, as to afford the type of a separate family, it so nearly resembles *Peridinium*, on the vegetable side, that Prof. Clark has set it down as one of the latter—an oversight which needs explanation, lest the organization of *Urocentrum Turbo* should be applied to that of the Péridiniens.

By reference to the 'Annals' (1859, vol. iii. p. 15) it will be observed that I have endeavoured to clear up the confusion which

Ehrenberg and Dujardin made by mixing up the *Trachelius trichophorus* of the former, which is the *Astasia limpida* of the latter, with the *Euglenæ*; and have proposed that under the latter should only be included Infusoria of the type *Euglena*, and under that of *Astasia* the type only of *Astasia limpida*,—*Euglena* belonging to the vegetable, while *Astasia* belongs to the animal side of the boundary of the two kingdoms; *Astasia* being colourless, presenting an oral and an anal orifice, and taking in crude material for food, while *Euglena* is for the most part green, presents no oral or anal orifice, and cannot be seen to incept crude material. There are other distinctions between these organisms; but generally they are so much alike that Dujardin placed the whole under the head of *Euglenæ*; so that if the organization of *Astasia limpida* were attributed to *Euglena*, the same erroneous view respecting the organization of the latter would arise as that which would be caused by attributing the organization of *Urocentrum* to *Peridinium*. Claparède has also some observations (p. 316) bearing on the subject; but they were written unknown to me, if not probably published subsequently to mine. For my own, *in extenso*, I must refer the reader to the volume of the 'Annals' already mentioned.

Now, *Urocentrum Turbo* bears a similar resemblance to *Peridinium* that *Astasia limpida* (Duj.) bears to the *Euglenæ*. Hence the object of this communication.

As yet, *Peridinium* must be viewed as *closely* allied to *Euglena* (see my description of *Peridinium sanguineum*, which imparts a red colour to the sea round the shores of the island of Bombay, 'Annals,' 1858, vol. i. p. 258). It has a large cilium, which does not appear to be composed of a lash of hairs; a reddish eye-spot, which may be double or quadruple, according with the number of divisions which the organism may be undergoing within its lorica, but always connected with a hyaline space, which in *Euglena* is seen to be the contracting vesicle; a nucleus, and vesicles of green or otherwise coloured chlorophyll (see the communication to which I have last referred); but no oral or anal orifice, and no appearance of being supported by the inception of crude material for food.

On the other hand, *Urocentrum Turbo* is colourless, has an oral and probably anal orifice; incepts crude material for food, as pointed out by Prof. Clark; presents a circular and a median groove, but with the crown of minute cilia not situated along the line of the former, as in the cinctum of *Peridinium*, but in front of it, and the large cilium, although issuing from the median groove, composed of a bundle of hairs, instead of a single filament. Yet this organ serves to anchor *Urocentrum*, just as the simple filament can arrest the progress of *Peridinium*, while the latter swims with its small, and the former, *Vorticella*-like, with its large end foremost.

There is no lorica in *Urocentrum*; and, according to Prof. Clark, its surface, excepting the crown, is scattered over with small cilia, in which it further differs from *Peridinium*—where, on the other hand, there is a distinct lorica, and cilia *only* on the anterior border of the cinctum.

These are some of the chief differences between the two organisms, of which the most distinguishing are first named.

It is not my object here to go further into the detail of *Urocentrum Turbo*, nor am I prepared to enter the lists with Prof. Clark respecting its organization.

My observations were for the most part made cursorily, on a supply of this animalcule which I found here in a freshwater pool partly filled with decayed leaves, in July last; but, seeing that the vesicula (contracting vesicle) was particularly active, I availed myself of the opportunity of watching it carefully with reference to the question whether it threw back into the body or discharged externally its contents, and noted down—(1) that from a simple globular form it became surrounded with a chaplet of ten (?) small globular sinuses; (2) on these disappearing, the vesicula became still more enlarged, contracted, and in its turn disappeared; and (3) that immediately after this, one or two vesicles became visible, which, breaking into each other, gave place to the globular form of the vesicula again, to be followed by the same series of changes, and so on,—still further convincing me that the contents of the vesicula do not return to the body through the sinuses, but are probably ejected from it through the cuticula direct, or through some excretory channel—in this instance close to the posterior extremity, where the vesicula and probably the anal orifice also, are situated.

Urocentrum was also formerly confounded with *Cercaria* by Nitzsch and Bory; but the improved quality of our modern microscopical instruments no longer admits of such a mistake.

Budleigh Salterton, Devon.
Nov. 7, 1865.

XLV.—*Descriptions of new Genera and Species of* Gallerucidæ. By J. S. Baly, F.L.S.

Subfam. Halticinæ.

Genus Diamphidia, Gerst.

Diamphidia vittatipennis.

D. oblongo-ovata, convexa, sordide fulva, subopaca, antennis, plaga frontali, oculis, thoracis maculis septem (4 . 3 dispositis), scutello, genibus, tibiis tarsisque nigris; elytris crebre punctatis, singulatim puncto apicali vittisque duabus, una submarginali, plerumque puncto apicali confluente, alteraque subsuturali, ante apicem desinente, basi dilatata, nigris.

Long. $4\frac{3}{4}$ lin.

Hab. Damara Land, South Africa.

Head coarsely punctured; apex of jaws and a quadrangular patch between the eyes black: antennæ robust, slightly compressed, not serrate. Thorax more than twice as broad as long, coarsely punctured; on the surface are seven black patches, which resemble in shape and are arranged in a similar way to those on the thorax of *D. flabellicornis,* the front row consisting of four spots, of which the outer two are minute; the hinder row is formed of three patches, the outer two of which are large and irregular, the middle small and oblong.

Diamphidia flexuosa.

D. robusta, convexa, flava, subnitida, antennis, verticis maculis duabus, thoracis maculis septem (4 . 3 dispositis), scutello, genibus, tibiis, tarsis pleurisque nigris; elytris postice paullo ampliatis, crebre punctatis, singulis apice plaga transversa subapicali, fasciisque latis flexuosis duabus, una ante, altera vix pone, medium dispositis, nigris.

Long. $6\frac{1}{2}$ lin.

Hab. Zulu country, Port Natal.

Very closely allied to *D. ornata,* but larger and more robust than that insect; antennæ similar in form; sides of the thorax more regularly rounded.

Genus Podontia, Dalman.

Podontia evanida.

P. oblongo-ovata, convexa, subtus pallide fulvo-picea, nitida, supra sordide flava; thorace remote punctato, pallide rufo-piceo variegato, apice utrinque longitudinaliter sulcato; elytris sat profunde punctato-striatis, punctis pallide piceis, interspatiis ad apicem convexis, puncto humerali nigro, limbo inflexo nigro-tessellato; femoribus posticis valde incrassatis.

Long. $3\frac{1}{2}$–4 lin.

Hab. Damara Land, South Africa.

Larger, narrower, and more parallel than *P. stolida,* with which insect it otherwise agrees very closely.

Podontia marmorata.

P. ovata, convexa, pallide picea, nitida; antennis extrorsum infuscatis; thorace minute granuloso, tenuiter punctato, apice utrinque longitudinaliter impresso; elytris flavis, rufo-piceo marmoratis, profunde punctato-striatis, punctis piceis, interstitiis apicem versus convexis, limbo inflexo piceo-tessellato; scutello rufo-piceo; femoribus posticis valde incrassatis.

Var. A. Elytris rufo-piceis, flavo irroratis.

Mas. Œdeagus vix curvatus, apice ovatus, apice ipso subacuminato.

Long. 3–$3\frac{1}{2}$ lin.

Hab. Port Natal.

More ovate than *P. evanida*; very similar in form and size to *P. stolida*: from the latter species it may be known by the coarser and rather more distant punctures on the elytra.

Podontia nigrotessellata.

P. ovata, convexa, pallide picea, nitida; thorace subremote punctato, basi biimpresso, antice utrinque longitudinaliter sulcato; elytris sordide fulvis, sat profunde punctato-striatis, punctis piceis, interspatiis remote nigro tessellatis, ad apicem convexiusculis; femoribus posticis valde incrassatis.

Mas. Œdeagus vix curvatus, lateribus parallelis, apice lanceolato-ovato.

Long. $2\frac{1}{4}$–$2\frac{3}{4}$ lin.

Hab. Port Natal.

The much smaller size and the different coloration of the elytra will without difficulty distinguish this species from its congeners.

Podontia reticulata.

P. anguste oblonga, convexa, pallide piceo-fulva, nitida, antennis extrorsum infuscatis, capite scutelloque rufo-piceis; thorace piceo-marmorato, apice utrinque longitudinaliter impresso; elytris flavis, rufo-piceo reticulatis, profunde punctato-striatis, punctis piceis, limbo inflexo piceo-tessellato; femoribus posticis valde incrassatis.

Long. $3\frac{1}{2}$ lin.

Hab. South Africa.

Larger and more parallel than *P. stolida*, more convex than *P. evanida.* I only know a single specimen of this species.

Podontia flava.

P. elongata, parallela, convexa, flavo-nitida; thorace basi biimpresso, ad latera foveolato, utrinque infra medium ad apicem longitudinaliter sulcato; elytris ante medium gibbosis, sat fortiter punctato-striatis, interspatiis ad apicem convexiusculis; femoribus posticis modice incrassatis.

Long. 6 lin.

Hab. Sarawak.

This species may be at once known from *P. lutea*, Oliv., by the unicolorous body and legs, as well as by the coarser punctuation of the elytra.

Podontia Dalmani.

P. elongata, parallela, postice vix attenuata, pallide picea, nitida; thorace basi biimpresso, disco medio longitudinaliter sulcato, utrinque late foveolato, antice utrinque (a margine apicali ad foveam lateralem) longitudinaliter impresso; elytris ante medium gibbosis, fortiter punctato-striatis, nigro-piceis, flavo irroratis, singulatim plaga basali, fascia lata prope medium alteraque ante apicem flavis, punctis super partes flavescentes piceis; femoribus posticis modice incrassatis.

Long. 6 lin.

Hab. Lombok, Siam.

Podontia rufo-castanea.

P. subelongata, convexa, subtus cum antennis (his basi excepta) nigra, nitida, corpore supra et thorace infra rufo-castaneis; thorace basi obsolete biimpresso; disco utrinque profunde foveolato; elytris ante medium gibbosis, distincte sed tenuiter punctato-striatis; femoribus posticis modice incrassatis.

Long. 6 lin.

Hab. India.

This and the preceding insect were originally described by me as varieties of *P.* 14-*punctata* (Journ. Ent. i. p. 451). Subsequent investigation, however, has convinced me that they are entitled to the rank of distinct species.

Podontia congregata.

P. oblonga, convexa, pallide rufo-piceo, nitida, capite elytrisque fulvis; his ante medium gibbosis, punctato-striatis, maculis numerosis rufo-piceis, præsertim ad latera et apud suturam congregatis, ornatis; thorace ad latera foveolato, basi breviter bisulcato, ante medium utrinque longitudinaliter impresso; femoribus posticis modice incrassatis.

Long. $5\frac{1}{2}$ lin.

Hab. ——?.

Subfam. Gallerucinæ.

Genus Dircema, Clark.

The Rev. H. Clark, in his description of *Dircema cinctipenne*, has included five or six closely allied but distinct species: their diagnoses (together with those of several others entirely new) I have given below. The males of *Dircema* may be known from having the apices of the intermediate tibiæ armed with a short tooth or acute process; both sexes have the anal segment of the abdomen notched; in the ♂ this notch is large and angular, its extreme apex being impressed with a distinct fovea; in the ♀ the notch is smaller, somewhat variable in shape, although usually linear, and the apical fovea is obsolete.

Dircema discoidale.

D. elongatum, convexum, dorso subdeplanatum, flavum, nitidum, vertice, fronte, mandibulis antennisque nigris, his apice sordide albidis; thorace longitudine plus duplo latiore, lateribus ante medium modice ampliatis, transversim sulcato, utrinque foveolato, dorso fere glabro, remote punctato, nitido, nigro, marginibus basali et laterali flavis; elytris thorace multo latioribus, fere parallelis, convexis, dorso subdepressis, granulosis, metallico-cyaneis, subnitidis, pube brevissima vestitis, sutura anguste margineque flavis; femoribus quatuor anticis dorso fusco-lineatis.

Mas. Œdeagus basi incrassatus, curvatus, lateribus parallelis, apice ovato-lanceolatus, apice ipso producto, recto, truncato.

Long. 5 lin.

Hab. Nauta, Peru.

Forehead impressed with a large obovate depression, coarsely punctured, sparingly clothed with coarse hairs; eyes ovate-rotundate; four upper joints of antennæ pale fulvous. Apical border of thorax concave, entire, side-margin moderately dilated in front, nearly straight and parallel behind, hinder angles acute; disk shining, sparingly clothed with suberect hairs; transverse excavation broad, less deeply impressed than in most of the other species; it is, however, rendered deeper on either side by a large roundish fovea, which is placed about halfway between the middle and the lateral border. Elytra shorter than in the other species, much broader than the thorax, depressed above.

My collection contains two male specimens of this species.

Dircema laticolle.

D. elongatum, parallelum, convexum, fulvo-flavum, nitidum, capite (facie inferiore excepta) nigro, antennarum articulis tribus ultimis sordide flavis; thorace brevi, longitudine triplo latiore, lateribus ante medium late explanatis, disco minus crebre, medio subremote punctato, pube depressa nigra sparsius vestito, profunde transversim excavato, pone sulcum distincte elevato; elytris nigris, opacis, rude granulosis, pube adpressa fusca aut nigra vestitis, sutura margineque flavis; pedibus nigris, femoribus basi et infra fulvis.

Fœm. Abdominis segmentum anale apice obtuse angulatum, medio vix emarginatum.

Long. $3\frac{1}{2}$–$4\frac{2}{3}$ lin.

Hab. Amazons.

Forehead depressed, rugulose, vertex nitidous; epistome impressed with a deep longitudinal groove, which extends from the apical border to the encarpæ, its upper half very strongly marked; three upper joints of antennæ obscure fusco-fulvous. Thorax short, quite thrice as broad as long; apical margin concave, often slightly emarginate in the middle; lateral margin broadly dilated in front, hinder portion subparallel, hinder angles acute, slightly produced; upper surface smooth and nitidous, somewhat sparingly clothed with pale hairs; transverse sulcation deeply impressed, the surface of the thorax behind its posterior margin thickened and distinctly raised; in the centre of this raised surface is a more or less distinct longitudinal groove. Elytra broader than the thorax, nearly subcylindrical in the ♂; rather broader and more depressed in the ♀.

Dircema cinctipenne, Clark.

Ann. & Mag. Nat. Hist. Oct. 1865, p. 263.

D. elongatum, parallelum, convexum, flavum, nitidum, capite (facie inferiore excepta) nigro, antennis apice sordide flavis aut albidis; thorace brevi, longitudine fere triplo latiore, lateribus ante medium late explanatis, disco ruguloso, pube adpressa sat dense vestito, medio longitudinaliter canaliculato, profunde transversim excavato, pone sulcum distincte elevato, utrinque plaga magna nigra ornato; elytris opacis, granulosis, pube depressa fusca aut nigra dense vestitis, nigro-viridibus aut obscure viridi-metallicis, sutura margineque flavis; pedibus fusco-nigris, rarius obscure flavis, fusco lineatis.

Mas. Œdeagus basi incrassatus, curvatus, anguste lanceolatus, apice producto, subacuto, recurvato.

Fœm. Abdominis segmentum anale apice modice incisum.

Long. 4–4½ lin.

Hab. Amazons.

Head short; front clothed with adpressed hairs, with a more or less distinctly defined ovate depression, which is more or less finely rugulose; vertex nitidous; face grooved as in *D. laticolle*; three or four upper joints of antennæ yellowish white. Thorax three times as broad as long; apical margin concave, sometimes slightly notched in the middle; side margins broadly dilated in front, nearly straight and slightly diverging posteriorly, hinder angles acute; disk impressed in a similar manner to that of *D. laticolle,* but rugose-punctate, more closely covered with pubescence. Elytra similar in form to those of *D. laticolle,* dark metallic green, subopaque.

Dircema pulchrum.

D. elongatum, pallide flavum, nitidum; fronte, vertice antennisque nigris; his apice albis, articulo basali flavo; thorace brevi, longitudine triplo latiore, lateribus late ampliatis, disco profunde transversim excavato, minus crebre punctato, sparse pubescente, utrinque plaga nigra ornato; elytris pube adpressa brevi vestitis, subopacis, rugosis, metallico-viridibus, margine suturaque flavis; femoribus dorso nigro-piceis; tibiis ad apicem tarsisque fuscis.

Mas. Œdeagus apice lanceolato-ovatus, lateribus ad apicem bisinuatis, apice ipso vix producto, truncato, recurvato.
Fœm. Abdominis segmentum anale utrinque foveolatum, apice angulato sat profunde inciso; thorace toto flavo; antennis totis, femoribus dorso, tibiis tarsisque nigris.
Var. A. (*fœm.*). Elytris obscure nigro-purpureis.
Long. 5–6 lin.

Hab. Nauta, Upper Amazons.

This species, although of larger size and brighter coloration, very closely resembles *D. laticolle*, more especially in the form and punctuation of the thorax; the ♀ may be known by the linear notch at the apex of the abdomen, the ♂ by the paler legs and the brighter colour of the elytra. Front with a large semiovate rugulose depression; vertex nitidous.

I possess three specimens of this species, one ♂, two ♀.

Dircema columbicum.

D. elongatum, parallelum, sordide flavum, nitidum, vertice, fronte (hoc maculam flavam includente), antennis, femoribus dorso, tibiis tarsisque nigris; thorace longitudine duplo latiore, lateribus ante medium modice ampliatis, disco modice sed late transversim excavato, crebre punctato, pube adpressa dense vestito, utrinque macula ovata nigra ornato; elytris metallico-viridibus, subopacis, pube subdepressa brevi vestitis, margine suturaque flavis.
Fœm. Abdominis segmentum anale apice obtuse angulatum, breviter incisum.
Long. 6 lin.

Hab. Bogotá.

I only know a single specimen of the present species (a ♀). It may be easily separated from all its congeners by the peculiar form of the thorax; this part is less transverse, being only about twice as broad as long; its sides in front are less dilated, and the upper surface much less deeply excavated; the hinder angles are produced into an obtuse tooth. The elytra are much broader than the thorax, somewhat depressed above. Face long, clothed with pale hairs; vertex and front black, the latter nearly plane, marked in the centre with a transverse yellow patch.

Dircema lætum.

D. elongatum, parallelum, convexum, dorso subdepressum, sordide fusco-flavum, nitidum, vertice antennisque nigris, illo rugoso, his basi et apice flavis; thorace longitudine vix duplo latiore, lateribus ante medium modice ampliatis, disco late transversim excavato, crebre rugoso, pube brevi adpressa dense vestito, sordide flavo, utrinque plaga magna nigra ornato; elytris rugoso-granulosis, pube adpressa brevi fusco-fulva dense vestitis, viridi-æneis, sutura marginibusque anguste flavis; pedibus nigris, femoribus basi et infra sordide flavis.

Mas. Œdeagus basi incrassatus, curvatus, parallelus, ad apicem acute angulatus, apice producto, truncato, recurvato.

Fœm. Abdominis segmentum anale apice obtuse angulatum, sat profunde incisum.

Long. $4\frac{1}{2}$–5 lin.

Hab. Banks of the Napo, Ecuador.

Thorax rather less broadly dilated than in *D. cinctipenne*, its upper surface much less deeply excavated. Elytra pale, almost sea-green, fusco-sericeous, broader and more depressed than in *D. cinctipenne*; more nearly approaching in habit to *D. columbicum*, but from that species the smaller size and differently formed thorax will separate it; three upper joints of antennæ yellowish white, the remainder more or less fulvous beneath.

I obtained three specimens of this pretty species (two ♂ and one ♀) from the late Mr. H. Cuming, who received them from one of his correspondents in Ecuador.

Dircema sordidum.

D. elongatum, parallelum, convexum, fulvo-fuscum aut sordide fulvum, nitidum, femoribus dorso, tibiis tarsisque piceis, vertice fronteque viridi-nigris; antennis nigro-piceis, basi externa et apice fulvis; thorace longitudine triplo latiore, lateribus ante medium late explanatis; disco rugoso, profunde transversim excavato, pone sulcum elevato, pube adpressa dense obsito, nigro, vitta lata centrali et margine apicali dilatato flavis; elytris rude granulosis, obscure metallico-viridibus, pube adpressa fusca dense vestitis, sutura margineque obsolete flavo-marginatis.

Fœm. Abdominis segmentum anale apice obtuse angulatum, semicirculariter incisum.

Long. 4 lin.

Hab. Ega and Nauta, Upper Amazons.

Very similar in form, both of thorax and elytra, to *D. cinctipenne*; easily distinguished from that insect by the coarser and closer pubescence of the upper surface, and by the extremely narrow and almost obsolete fulvous margination of the elytra; the notch on the apex of the anal segment of the abdomen in the ♀ is semicircular, instead of linear, as in *D. cinctipenne*.

I know two specimens of the species, both ♀. The specimen from Ega has the scutellum dark fuscous.

Dircema modestum.

D. elongatum, parallelum, convexum, dorso subdeplanatum, flavum, nitidum, verticis macula bilobata antennisque nigris, his apice flavo-albis; thorace longitudine fere triplo latiore, lateribus ante medium sat late ampliatis, disco profunde transversim sulcato, pube adpressa sparse obsito, nitido, subremote punctato; elytris convexis, dorso subdepressis, rude granulosis, subremote punctatis, fusco-sericeis, murinis vel pallide viridibus, opacis; genibus, tibiis, tarsisque nigris.

Mas. Œdeagus basi incrassatus, curvatus, parallelus, ad apicem ovato-lanceolatus, apice ipso producto, capitato.

Fœm. Abdominis segmentum anale apice obtuse angulato, breviter angulariter inciso.

Long. 5 lin.

Hab. Magdalena River, Columbia.

Broader and flatter above than *D. cinctipenne,* closely resembling *D. nigripenne,* Fab., in form and unicolorous elytra. From this latter species it may be at once known by the bilobate black patch on the vertex, as well as by the paler elytra; the males of the two species differ also in the form of the œdeagus; the apex of this organ, instead of being capitate as in the insect before us, is produced in *D. nigripenne* into a broad slightly recurved process, the extremity of which is truncate and slightly notched, the lobes of the notch being also reflexed; the females may be separated by the difference in the apical notch of the last abdominal segment: in *D. nigripenne* this notch is linear, a longitudinal groove extending from its apex to the base of the segment; in *D. modestum* the notch is short and slightly angular, the longitudinal groove being entirely obsolete. The head of *D. modestum* is rather longer than in any of the other species described in the present paper; the front is impressed with the usual semiovate space.

Genus Hyphænia.

Corpus angustatum, parallelum, modice convexum. *Caput* exsertum; *facie* perpendiculari; *antennis* filiformibus, ♂ sæpe corpore longioribus, gracilibus; articulis primo curvato, a basi ad apicem incrassato, secundo brevi, cæteris cylindricis, subtus in ♂ sæpe setis erectis vestitis, singulis longitudine primo fere æqualibus; secundo, tertio quartoque interdum subtus compressis et dilatatis; ♀ corpore paullo brevioribus, articulis nunquam setiferis; *oculis* magnis, prominulis; *palpis* maxillaribus ovatis, apice acutis. *Thorax* transverso-quadratus, lateribus rectis, angulis singulatim tuberculo setifero armatis; dorso subdeplanato, medio transversim sulcato. *Elytra* thorace paullo latiora, elongata, parallela, confuse punctata. *Pedes* graciles, subelongati; *coxis* anticis erectis, contiguis; *femoribus* posticis non incrassatis; *tibiis* omnibus apice muticis; *tarsorum* posticorum articulo primo duobus sequentibus conjunctis æquali; *unguiculis* appendiculatis. *Prosternum* fere obsoletum.

Type *Hyphænia* (*Luperus*) *pilicornis,* Motsch. Birmah.

XLVI.—*On the Limits of the Subkingdom Mollusca.* By Dr. O. A. L. Mörch.

The Vertebrata form the only subkingdom with uncontroverted limits; yet the late Prince Bonaparte considered the Aphanozoa (*Sagitta*, &c.) the lowest Vertebrata.

Since the time of Cuvier, the Tunicata have been considered by zoologists true Mollusca. Professor Huxley has shown that the Bryozoa are inseparable from the Tunicata. The Brachiopoda are considered allied to the former, thus forming the subclass Molluscoidea of several modern authors. Dr. Macdonald* has lately added the Ctenophora † to the Brachiopoda ‡.

Prof. Lovén first raised a doubt as to the affinity of the Tunicata to the Mollusca, chiefly on account of the form of the larva of Ascidians. Dr. Macdonald founded the same doubt chiefly on the reproduction by budding, which is foreign to the nature of Mollusca. This reason alone cannot be considered sufficient, as there is found in nearly every class a division (subclass, microsthenic division) differing in having an abortive progeny, *e. g.* Marsupialia, Amphibia, Orthoptera among Mandibulata, and Hemiptera and Homoptera among Haustellata, Entomostraca, &c.

The systematic position of the Tunicata seems chiefly to be based on a supposed resemblance between the two apertures of Ascidians with the siphons of Acephala, and a still more superficial resemblance between "the shells."

Another division, containing gelatinous and arborescent forms (the Acalephæ), seems to have a much greater affinity to the Acephala, with which they agree in the four labial palpi and the fringed oculiferous edge of the mantle. This resemblance is very striking if the Acaleph be compared with a swimming *Lima*, as mentioned by Sars. The radiated form indicates the same relation to Acephala as Cephalopoda bears to Gasteropoda. The group Radiata as defined by Cuvier do not really exist. Cnidæ and phlebenterism are found in the Gymnobranchia to a great extent, being dependent on the want of a shell §. The Anthozoa, considered inseparable from the Acalephæ, look no stranger among the Mollusca than the Bryozoa.

There are, however, some other Cœlenterata which may be referred to the Mollusca with still more precision. I have always thought it strange that the Mollusca, although inferior to

* Transactions of the Royal Academy of Edinburgh, 1864.

† Mörch, Fortegnelse over Grönlands Blöddyr, 1857; Rink, Grönland, p. 97.

‡ Malacozoologische Blätter, vi. p. 104.

§ In *Cyanea* is found a brown membrane reminding us of the *Loligo*-shell.

the Arthropoda, contained only a single true intestinal species (the *Endoconcha* of John Müller), whilst the "Entozoa" have contributed considerably to the Arthropoda, viz. *Lernæa, Peltogaster, Clistosaccus, Linguatula.*

The Helmintha are generally divided into two sections,—viz. Nematodes with distinct sexes, and Platyhelmia with the sexes united. Mr. Bastian* has, at the last meeting of the Royal Society, on the 15th of June, pointed out that the Nematodes, parasitic and free, are closely allied to the Echinodermata. The Platyhelmia, containing the Trematoda, Cestoda, and Turbellaria, seem to me not to differ materially from the androgynous Mollusca.

The Turbellarians are united to the Mollusca by Mr. Ch. Girard†, on account of the resemblance of the embryonic state of *Planocera elliptica* with that of *Elysia*. It must, however, be remembered that the "chrysalis" state is not known among the Mollusca, and that all larvæ of Gasteropoda are provided with a nautiloid shell, except the larva of *Chiton*. The Turbellarians differ chiefly from the Gasteropoda in the presence of numerous eyes; but this difference is perhaps not of great importance, as Dr. Bergh has discovered four eyes in a species of *Fiōliana* from St. Thomas, and Agassiz‡ indicates that *Margarita* is provided with eyes, at the base of the pedal filaments, corresponding to those in the mantle-edge of *Pecten* and other Acephala. Dr. Bergh, however, has not found any lens in the "eyes" of the pedal filaments in *Margarita*. According to Prof. Hensen, the lens is absent in *Nautilus*.

The nervous system shows no important difference from that of Gasteropoda. The want of a true foot is of no consequence. In *Bulla*§, *Akera*, &c., the locomotion is partly, and in Pellibranchiata almost entirely, effected by the hind part of the body, the true foot being reduced to a crescent-like disk, not unlike the sucker in many Entozoa. The arborescent form of the intestinal canal, generative organs, and kidneys is common to all animals wanting special respiratory organs.

Salivary glands are present, but the liver is entirely absent, as is usually the case in animals (*e.g.* perfect Insects) living upon food not requiring preparation. The *Tæniæ* want even a mouth and intestinal canal, living in a prepared nutrimental juice, which the parasite absorbs through the surface of its skin; a

* The Athenæum, June 1865, p. 850. [Annals for September, p. 197.]

† Researches upon Nemertians and Planarians. Philadelphia, 1854.

‡ Lectures on Embryology, p. 86, 8vo.

§ Mörch, "Contributions à la Faune malacologique des Antilles danoises," Journ. de Conch. 1863, p. 19.

circulatory system, therefore, would be of no use. The Platyhelmia seem to me not to differ more from the Mollusca than *Peltogaster* and *Clistosaccus* from the Crustacea. In the entozoic Crustacea some of the harder oral parts are generally preserved, in order to serve the animal for attachment. It is therefore likely that the hooks of Cestoda are homologous with similar hard organs of Mollusca. Gegenbaur * compares in this way the four uncigerous retractile organs of *Tetrarhynchus* with the cheek-hooks (harpagæ) of the Pteropoda gymnosomata. Perhaps a closer study of the genus *Homoderma* of Van Beneden † (outwardly resembling a *Distoma*, but anatomically agreeing with *Pneumodermon*) may throw some light on this question. The hooks of the Cestoda may also be compared with the lingual teeth of the Pellibranchiata, and chiefly with that part called by Messrs. Alder and Hancock ‡ the "prehensile collar" in *Limapontia nigra*. These hooks probably assume a circular arrangement. The lingual teeth are frequently absent among Gasteropoda, e. g. *Doridopsis* (Hancock), *Cirroteuthis* and *Tethys* (according to Bergh).

A secretory organ (kidney) is never absent in any animal taking food; and it therefore exists in all Entozoa, agreeing in form with the renal organ of *Elysia* as represented by Souleyet.

The generative organs of the Platyhelmia agree exactly with those of the androgynous Mollusca in general, but chiefly with those of the genera § *Chalidis* and *Pelta*; at least I cannot discover any notable difference on comparing the anatomy of the two latter genera with that of *Amphistomum subclavatum* as represented by Dr. Walter ‖. The Hirudines and Lumbrici, which are considered by Prof. Quatrefages distinct classes, are also androgynous, with reciprocal copulation; but the generative organs, like the nervous system, seem to be formed according to quite another plan, although they may have some distant resemblance to those of *Elysia*. It may be questioned if androgyny is of sufficient importance to unite animals differing so greatly in their exterior form, especially as hermaphroditism is only of specific value among Fishes (*Serranus scriba*) and Acephala (*Pecten opercularis*). I, however, believe that andro-

* Vergleichende Anatomie, p. 329.

† Exercices zootomiques, 1839, p. 54, t. 3. f. 4–6 (Mém. de l'Acad. Roy. des Sciences de Bruxelles, tome xi.)

‡ Ann. Nat. Hist. ser. 2. vol. i. p. 208, pl. 20. f. 2. Quite different from "the prehensile collar" of the same authors in their 'British Nudibranchiata.'

§ Quatrefages, Mémoire sur les Gastéropodes phlébentérés (Ann. Sc. Nat. 3 sér. 1844, tome i. p. 155, t. 4. f. 4); Mörch, "Contributions à la Faune malacologique des Antilles danoises," *l. c.* p. 24.

‖ Archiv für Naturgeschichte, xxiv. p. 269, t. 11. f. 5.

gyny is of the highest importance in connexion with the other characters mentioned above, as opposed to the vermicular form and white colour—characters common to most burrowing animals and plants.

If this proves correct, there will only remain among the Cœlenterata Lumbrici, Hirudines, Annelida, Echinodermata*, Nematoidea, Tunicata, Bryozoa, Brachiopoda, Ctenophora, Rhizopoda, Spongiaria. It seems very doubtful whether these divisions together would correspond to the three other subkingdoms. The limits of the second subkingdom, Arthropoda, are much litigated, as the lowest Crustacean does not show the same degradation of the copulatory organs as the Fishes among Vertebrata, and the Acephala among the Mollusca. I therefore consider it probable that the subkingdom Articulata, chiefly on account of the nervous system, ought to be reestablished as it was defined by Cuvier.

XLVII.—*Notes on the Palæozoic Bivalved Entomostraca.* No. VI. *Some Silurian Species* (Primitia). By Professor T. Rupert Jones, F.G.S., and Dr. H. B. Holl, F.G.S.

[Plate XIII.]

In the 'Annals of Natural History' for August 1855, September 1855, and April 1857 were published descriptions of some Silurian Bivalved Entomostraca, comprising, among others, *Beyrichiæ* of three types,—"simplices," "corrugatæ," and "jugosæ." The first of these groups, the simple or unisulcate, seems to us now to be deserving of generic distinction, since, among a still larger number of forms, we find a persistent occurrence of the chief features, with a passage towards *Leperditia*, by the complete loss of the furrow, rather than towards the two-furrowed or real *Beyrichiæ*.

We do not presume, however, that we hereby do more than somewhat improve our classification of these necessarily obscure Silurian Entomostraca, represented only by carapace-valves, always minute and often variable in form and ornament, besides being subject to alterations by pressure and by chemical change, and rarely to be cleared of their matrix on all sides. In some cases, too, we have had to be content with what we could make out of casts and imprints.

There remain, therefore, several difficulties in classifying these little Bivalve Entomostraca—and especially since with the total disappearance of the dorsal sulcus we do not seem necessarily to

* According to Mr. Williamson, closely allied to the Annelida (British Association Report, 1857).

enter on a distinct genus, judging from the general shape and character of some of these minute valves associated with others that are furrowed and, from similarity of style and structure, apparently congeneric with them. We allude to the dwarf forms of *Leperditia*, on one hand, where relative size is often the only available basis of distinction (for the eye-spot may be wanting, the muscle-spot invisible, and the flanged edges may be hidden), and, on the other hand, to those true *Beyrichiæ* with a single sulcus, and in which the second sulcus is reduced to a minimum or altogether wanting (*B. arcuata*, &c.). In this case also relative size is distinctive, as well as, perhaps, the difference of geological horizon.

Another difficulty is found in defining the probable alliances of some minute Silurian Entomostraca which have been grouped under "Cytheropsis," and which in outline agree with *Primitia*, but want the sulcus altogether. It is possible, however, that the sulcus is not an essential character zoologically, and that the merely slight impression (as in *P. Beyrichiana* and *P. obsoleta*) leads us to altogether non-suleate forms: and here the balance of probabilities, judged of by the general aspect of the specimens, must be our guide; and we must still be content with imperfect classification, if we wish to make our present knowledge of these little Palæozoic fossils available. If, therefore, they are to be catalogued and brought into relationship with their larger contemporary allies and their modern representatives, we must accept and make the most of such features as are apparent, and give credit for probable divergency in the unpreserved soft parts when the valves show differences of contour, foldings, and sculpture. Hence we have been induced to value more highly than formerly the differences in recorded varieties of the so-called *Beyrichia strangulata* (Annals Nat. Hist. Sept. 1855), and we shall offer diagnoses for them accordingly.

PRIMITIA, gen. nov.

Carapace minute, bivalved, either equivalved or nearly so, convex, more or less oblong, often approaching *Leperditia* in shape, by the sloping of the dorsal angles; hinge-line straight, sometimes nearly as long as the valve. Surface of each valve usually impressed on the dorsal region, either medially or towards the anterior extremity, with a vertical sulcus, variable in size, sometimes barely visible, sometimes passing into, or even merely represented by, a navel-like pit; and sometimes the sides of the sulcus are swollen, and even raised up into tubercles*.

* With some additional details, the diagnosis for "Beyrichiæ simplices," given in Ann. Nat. Hist. ser. 2. vol. xvi. p. 85, serves for *Primitia*.

Table of the Distribution of Primitia.

Name.	Having	Formation.	Locality.
1. P. strangulata, *Salter*, sp....	a sulcus	Lower Silurian	Lancashire.
1*. ——, var. *α*..................	"	"	Pembrokeshire.
2. P. Salteriana, *nov.*	"	"	"
3. P. semicordata, *nov.*	"	"	Salop.
4. P. simplex, *Jones*...........	"	"	Portugal and Salop.
5. P. Logani, *Jones*	"	"	Canada.
5*. ——, *var.* reniformis ...	"	"	"
5**. ——, *var.* leperditioides.	"	"	"
6. P. matutina, *nov.*............	no sulcus	"	Salop.
7. P. Seminulum, *Jones*	a sulcus	Upper Silurian	Montgomery.
8. P. sigillata, *Jones*...........	"	"	Beechey Island.
9. P. variolata, *nov.*	"	"	near Malvern.
9*. ——, *var.* paucipunctata .	"	"	"
10. P. rugulifera, *Jones*	"	"	Beechey Island.
11. P. renulina, *nov.*	"	"	near Malvern.
12. P. mundula, *Jones*	sulcus and tubercles (faint)	"	Sweden and near Malvern.
13. P. nana, *nov.*	sulcus and tubercles	Lower Silur.	Salop.
14. P. bicornis, *Jones*.........	sulcus and tubercles (strong)	"	"
15. P. umbilicata, *nov.*	pit	Upper Silurian	near Malvern.
16. P. cristata, *nov.*	"	"	"
17. P. tersa, *nov.*	"	"	"
18. P. trigonalis, *nov.*	pit (faint)	"	"
19. P. Beyrichiana, *nov.*......	very faint sulcus	"	Sweden.
20. P. Roemeriana, *nov.*.........	"	"	near Malvern.
21. P. obsoleta, *nov.*	"	"	Sweden.
22. P. oblonga, *nov.*	no sulcus	"	"
23. P. ovata, *nov.*	"	"	"
24. P. semicircularis, *nov.*	"	"	"
25. P. pusilla, *nov.*...............	small sulc.	Lower Silurian	near Malvern.
26. P. concinna, *Jones*	no sulcus	Upper Silurian	Canada. Gothland; Nova Scotia.
27. P. muta, *nov.*	"	"	Beechey Island.

1. *Primitia strangulata*, Salter, sp.

Beyrichia strangulata, Ann. Nat. Hist. ser. 2. vol. xvi. p. 171, pl. 6. fig. 18.

This is one of the largest forms belonging to *Primitia*, and it has a larger marginal rim than any other. Found in calcareous schists (Lower Silurian) at Coniston Waterhead, Lancashire.

This species was mentioned, under the provisional name of "Cytherina lævigata," by Mr. Salter in 1845 (Quart. Journ. Geol. Soc. vol. i. p. 445), as occurring abundantly in the Coniston Limestone; but in 1852 (Brit. Pal. Foss. Camb. Mus. Appendix A, p. ii.) he decided to call it *B. strangulata*.

Schrenk recognizes this species in the brown bituminous marl (Brandschiefer) of the Lower Silurian of the Baltic Provinces (Untersuch. p. 195).

1*. *Primitia strangulata*, Salter, sp., var. *a*.

Beyrichia strangulata, var. *α*, *ibid.* p. 172, pl. 6. fig. 19.

Differing from the foregoing chiefly by the furrow being faint and extending far across the valve. In fossiliferous schist (Lower Silurian) at Robeston Wathen, Pembrokeshire.

2. *Primitia Salteriana*, nov.

Beyrichia strangulata, var. *β*, *ibid.* fig. 20.

This differs from *P. strangulata* in the absence of the raised rim, in the more acute anterior extremity, and in the punctation of the surface. In fossiliferous schist (Lower Silurian), Sholes Hook, Haverfordwest.

Schrenk speaks of this variety (but with papillæ instead of pits) as occurring in the Lower Silurian Brandschiefer and Borkholm beds of the Baltic Provinces (Untersuch. p. 196). He also refers to another form ("var. *crenulata*"), with a broad and notched border, from the Lower Silurian beds at Paggar and Borkholm (Untersuch. p. 196).

3. *Primitia semicordata*, nov.

Beyrichia strangulata, var. *β*, young, *ibid.* fig. 21.

Besides being smaller than any of the above, this is relatively short and broad, nearly semicircular, and smooth. Accompanying the last mentioned.

4. *Primitia simplex*, Jones.

Beyrichia simplex, ibid. figs. 25, 26, 27.

This small, smooth, subovate species was first observed in the Lower Silurian schist of Busaco, near Coimbra, Portugal; and the very slightly different forms from a Lower Silurian schist at Harnage, near Shrewsbury, do not appear to be separable from it.

5. *Primitia Logani*, Jones; et varr.

Beyrichia Logani et varr. *reniformis* et *leperditioides*, Ann. Nat. Hist. ser. 3. vol. i. p. 244, pl. 9. figs. 6–10.

A large number of this gregarious species comprise so many variations of form, from oblong to reniform, on one hand, and from oblong to subovate, on the other, with or without punctation of surface, but always sulcated, that it seems impossible to draw any lines of distinction, excepting such as may limit the oblong forms to *P. Logani* proper (whether long-oblong or ovate-oblong),—dividing off the kidney-shaped valves as var. *reniformis*, and those that have the most sloping dorsal angles as var. *leperditioides*. They all come out of a Lower Silurian limestone (upper portion of the Calciferous Sandrock) at Grenville and Hawkesbury, Canada.

6. *Primitia matutina*, nov. Pl. XIII. figs. 7*a*, 7 *b*.

Length $\frac{30}{1000}$, height $\frac{21}{1000}$ inch.

This small, smooth, convex, *Leperditia*-shaped, non-sulcated *Primitia* might be catalogued as a variety of *B. Logani*, had we ever seen a specimen of the latter without a sulcus, or with an inclination to lose its furrow. Under existing circumstances, however, we give the benefit of the doubt, and the value of geographical distance, such as it is, to the probability of this little Lower Silurian form being distinct from its Canadian ally. The Trinucleus-shale (belonging to the upper part of the Bala or Caradoc formation) in the river Onny, near Cheney-Longville, Shropshire*, abounds with such small Entomostraca as this *Primitia*; but we have been able only to pick out this form in a well-preserved state.

7. *Primitia Seminulum*, Jones.

Beyrichia Seminulum, Ann. Nat. Hist. ser. 2. vol. xvi. p. 173, pl. 6. fig. 24.

A neat little semicircular form, from the Upper Silurian schists of Montgomery, where it occurs with *Beyrichia Klœdeni*.

8. *Primitia sigillata*, Jones.

Beyrichia sigillata, Ann. Nat. Hist. ser. 3. vol. i. p. 242, pl. 9. fig. 5.

More oblong than *P. Seminulum*, less deeply furrowed, and somewhat more coarsely punctate. From the Upper Silurian Limestone of Beechey Island, with *P. rugulifera*, *P. muta*, and *Leperditia gibbera*. *P. variolata* is the British representative of *P. sigillata*.

9. *Primitia variolata*, nov. Pl. XIII. figs. 6 *a*, 6 *b*.

Length $\frac{20}{1000}$, height $\frac{10}{1000}$ (as 3 to 2).

Carapace moderately convex, varying between suboval and subquadrate; rather more obtuse behind than before. Hinge-line straight, but somewhat overhung by the dorsal part of the valves. Valves somewhat flattened, impressed with a distinct dorsal sulcus, which ends, towards the middle of the valve, in a

* An account of this Trinucleus-shale is given in a paper by Messrs. Salter and Aveline, Quart. Journ. Geol. Soc. vol. x. p. 62, &c. See also 'Siluria,' 2nd edit. p. 72, &c. The Caradoc and Bala beds are regarded as belonging to a higher horizon than the Calciferous Sandrock of Canada, in which *P. Logani* abounds.

subcircular umbilical pit. The surface of the valves is dotted with coarse shallow pits, and sometimes slopes gradually to the margins, but is generally deflected abruptly. There is a slight rim at the border. *P. variolata* is not far removed from *P. sigillata* and *P. Seminulum*; indeed, it may be said to be the British representative of the former. From the Woolhope Limestone, west of the Wych, Malvern.

9*. *Primitia variolata*, var. *paucipunctata*, figs. 6 *c*, 6 *d*.

Length $\frac{35}{1000}$, height $\frac{24}{1000}$ inch.

This bears fewer pock-marks, has a less well defined border-rim, and a rather smaller sulcus. From the Woolhope Limestone, west of the Wych.

10. *Primitia rugulifera*, Jones.

Beyrichia rugulifera, Ann. Nat. Hist. ser. 3. vol. i. p. 242, pl. 9. fig. 4.

Oblong, ornamented with minute transverse wrinkles, and impressed with a broad and deep sulcus on the anterior half. From the Upper Silurian Limestone of Beechey Island, together with other small Bivalved Entomostraca.

11. *Primitia renulina*, nov. Pl. XIII. figs. 5 *a*, 5 *b*.

Length $\frac{1}{25}$, height $\frac{1}{38}$ (as 3 to 2), thickness $\frac{1}{43}$ inch.

Carapace convex, ovate-oblong, straight on the back, boldly curved on the other margins, especially backwards; dorsal angles distinct; anterior region compressed. Valves smooth, bilobed, impressed with a deep well-defined dorsal sulcus, and bordered all round with a narrow depressed rim, which runs into the sulcus at the back or upper part of the valve. From the Wenlock Limestone at the Crofts, Malvern.

12. *Primitia mundula*, Jones.

Beyrichia mundula, Ann. Nat. Hist. ser. 2. vol. xvi. pp. 90 & 174, pl. 5. fig. 23, & pl. 6. figs. 28–31.

In addition to the diagnosis of this neat little species given at p. 174, *op. cit.*, we have to allude to the swelling of the sides of the sulcus in some well-grown individuals, which, however, are not specifically distinct from others with less developed sulcus,—also to the beautifully delicate reticulated sculpture of the surface, which sometimes appears as excessively fine longitudinal wrinklings, with inosculating meshes, and sometimes as a minute pitting.

Small individuals (long $\frac{1}{26}$, high $\frac{1}{48}$ inch) are more oblong than others, having rounded ends, parallel upper and lower borders, and a faint sulcus. The normal form approaches that of *Leperditia*; and, with a short hinge-line, angular ends, and convex belly, the valves become almost oval. *P. mundula* has some of the characteristics of the Lower Silurian *P. bicornis*, but in a much less degree.

From the Upper Silurian (Scandinavian) Limestone found as drifted blocks in North Germany. We have seen a small specimen in a limestone of the Wenlock Series from near Malvern.

13. *Primitia nana*, nov.

Beyrichia strangulata, var. γ, *ibid.* p. 173, pl. 6. fig. 22.

Very small, nearly oblong, but proportionally longer than *P. strangulata*. Edges of sulcus swollen into two minute unequal tubercles. In soft fossiliferous schist (Lower Silurian) at Harnage, near Shrewsbury, in company with *P. simplex* and *P. bicornis*. It is possibly the young of the latter.

14. *Primitia bicornis*, Jones.

Beyrichia bicornis, ibid. fig. 23.

Very small, but readily distinguished by its two subcylindrical tubercles bordering the sulcus on each valve, and by its crested marginal rim. From the Lower Silurian beds at Harnage, near Shrewsbury.

15. *Primitia umbilicata*, nov. Pl. XIII. figs. 2 *a, b, c, d*.

Length $\frac{40}{1000}$, height $\frac{30}{1000}$, thickness $\frac{25}{1000}$ inch.

Carapace convex, rounded-oblong; dorsal angles sharp; hinge-line straight, and sunken in an elliptical or acute-ovate depression formed by the convexity of the dorsal borders of the two valves; this flattened area is broadest posteriorly, and terminates, near the antero-dorsal angle, by a slight notch. The hinge itself is formed by the meeting of simple edges. The ends of the valves are boldly rounded; the ventral line is gently convex; surface of the valves convex, rather compressed in front, usually smooth, but sometimes ornamented with minute, close-set, undulating lines. Each valve is marked in the middle with a short longitudinal furrow, more or less pronounced in different individuals, and widened at its centre into a navel-like pit. A well-defined rim extends from one dorsal angle to the other, round the ventral border of each valve, nearly parallel to the edge, from which it is separated by a shallow groove. The edge itself is sculptured with minute transverse pits.

This is the characteristic *Primitia* of the Aymestry Limestone of Chances Pitch, near Malvern.

16. *Primitia cristata*, nov. Pl. XIII. figs. 1 *a, b, c*.

Length $\frac{38}{1000}$, height $\frac{24}{1000}$, thickness $\frac{18}{1000}$ inch.

Carapace convex, but most tumid posteriorly; suborbicular or rounded-oblong, and about one-third longer than high.

Dorsal margin straight or slightly depressed; dorsal angles marked; extremities broadly rounded, the posterior rather less obtuse than the other; ventral margin boldly convex. Valve-surface compressed forwards, giving a wedge-like outline to the carapace seen edgeways; it is also turned inwards at the margins, thus being flattened at the margins, particularly on the ventral aspect, where the angle of deflection is marked by a slight ridge; a delicate rim also accompanies the terminal and ventral edges. Between the marginal angle above mentioned and the border itself, there is, at the posterior extremity of each valve, a sharp crest, directed upwards and inwards to meet its fellow at the postero-dorsal angle, giving a notched appearance to the dorsal aspect of the carapace. The surface is smooth, but bears a deep umbilical pit on the middle, rather towards the dorsal line.

In the Wenlock Limestone at Crofts Quarry, near West Malvern.

Symptoms of the marginal angle of deflection, so strong in *P. cristata*, are seen in several *Primitiæ*, and particularly in *P. umbilicata* and *P. tersa*. These three forms are nearly allied; and *P. umbilicata* is of medium development, and may stand as the type of the subgroup they represent.

17. *Primitia tersa*, nov. Pl. XIII. figs. 3 *a–c*.

Length $\frac{38}{1000}$, height $\frac{27}{1000}$, thickness $\frac{26}{1000}$ inch.

Carapace tumid, most convex at the hinder third, rounded-oblong, one-fourth longer than high; dorsal border straight, angles pointed; ventral border very convex; ends nearly equally rounded. Surface of valves smooth, bearing a pit or umbilical depression, with irregular outline, in the dorsal region, and having a slight marginal ridge, which, commencing at the antero-dorsal angle, runs round the anterior extremity parallel to the border, and becomes lost, or very faint, at the middle of the ventral border. In the Wenlock Limestone at Crofts Quarry, near West Malvern.

18. *Primitia trigonalis*, nov. Pl. XIII. figs. 4 *a, b*.

Length $\frac{48}{1000}=\frac{1}{21}$, height $\frac{36}{1000}=\frac{1}{28}$, thickness $\frac{27}{1000}=\frac{1}{37}$ inch (about)—11 : 8 : 6.

Carapace convex, compressed towards the margins, trigonal, very much like the right valve of *Leperditia arctica* in shape, having sloping dorsal angles and protruding ventral border; but it has no eye-spot, or radiating muscle-spot, and the valves are symmetrical and almost equal; indeed the right valve is slightly smaller than the left, though of similar outline, instead of the left being much the smaller, of different shape, and strongly overlapped on its ventral border. A slight impression on the middle of the valves, and the nearly equivalved condition, characterize this as a *Primitia*, in spite of its *Leperditia*-like outline,—the last being a feature taken on by other *Primitiæ*, as we have already shown. The most convex portion of the surface is faintly and irregularly corrugated by broadish shallow pits, which enlarge towards the middle, and there merge into the feeble sulcus. From the Wenlock Limestone of Crofts Quarry, near West Malvern.

19. *Primitia Beyrichiana*, nov. Pl. XIII. fig. 9.

Length $\frac{1}{28}$, height $\frac{1}{42}$ inch (as 3 to 2).

Carapace-valve suboblong, straight along the back, boldly curved behind, gently convex ventrally, obliquely truncate with a gentle curve in front. Surface convex, and marked with a broad, subtriangular, faint impression in the middle of the dorsal region; and, excepting on the dorsal edge, margined with a neat flattened rim, rather narrower at the anterior edge than elsewhere, and uniformly sculptured with minute elongate pits, perpendicular to the peripheral curve of the valve, and thus forming a radiate ornament. Such a style of margin is present also in *P. Roemeriana*, and is still more developed in *Beyrichia Maccoyiana*; and a simply pitted rim is found in *B. Salteriana*, *Isochilina gracilis*, &c.

P. Beyrichiana is rare, and is one of the small Bivalve Entomostraca referred to (under the terms *Cytheres*, and *Cytheropses*) in Ann. Nat. Hist. ser. 2. vol. xvi. p. 84, and ser. 3. vol. i. p. 249, as abounding in the drifted Scandinavian blocks of Upper Silurian Limestone found in North Germany, with some of which material Prof. E. Beyrich, the eminent palæontologist at Berlin, long ago supplied us.

20. *Primitia Roemeriana*, nov. Pl. XIII. figs. 8 *a*, *b*.

Length $\frac{47}{1000}$, height $\frac{35}{1000}$, thickness $\frac{25}{1000}$ inch.

Carapace ovate, back-line less convex than the ventral border. Valves convex, bearing a very faint subcentral impression, and marked with numerous, small, roundish, shallow pits, the intervening surface being a smooth, nearly regular meshwork (like the pattern on the side of a thimble). The valves are also bordered with a flat marginal rim, broadest ventrally, thinning away at the dorsal slopes, and neatly ornamented with a row of minute subquadrate pits, forming a radiate fringe, as in *P. Beyrichiana*. The ventral profile of the united valves is acutely ovate.

This ornamented species, differing markedly from the pretty radiated *P. Beyrichiana* of Sweden, is from the Wenlock Limestone of the Crofts near Malvern; and we name it after our friend

Professor Dr. Ferdinand Roemer, of Breslau, who has already enlarged our knowledge of palæozoic fossils from the Scandinavian Limestones.

21. *Primitia obsoleta*, nov. Pl. XIII. figs. 12 *a, b, c.*

Length $\frac{15}{300}$ ($\frac{1}{20}$), height $\frac{11}{300}$, thickness $\frac{9}{300}$ inch.

Carapace-valves obtusely subovate, straight at the back, convex ventrally; one end broadly and obliquely curved, with a dorsal angle, the other semicircular; a slightly raised smooth rim runs along the ventral border, continues along the broad end, widens at the dorsal angle, and dies out on the hinge-line. Surface convex, slightly flattened towards the narrower end, smooth, and presenting, at the middle of the dorsal region, a faintly indicated impression, fainter even than the shallow sulcus in its companion *P. Beyrichiana*.

In Scandinavian limestone (Upper Silurian), drifted blocks, North Germany.

22. *Primitia oblonga,* nov. Pl. XIII. figs. 14 *a, b, c.*

Length $\frac{1}{15}$, height $\frac{1}{25}$, thickness $\frac{1}{50}$ inch ($3\frac{1}{4}:2:1$).

Carapace-valves convex, sloping gently and nearly equally towards the margins, oblong, with rounded, almost symmetrical ends; the dorsal line slightly sinuous, and the ventral line very faintly convex. Surface smooth. The slight sinuosity of the dorsal line is probably a trace of the sulcus, as in *P. radiata* and other associated forms. The ventral margin is very slightly thickened by being suddenly inturned. Excepting this last feature, the absence of positive characters in this relatively large form might have made us doubtful whether it be really a *Primitia* as defined above, or whether we ought to have classed it as a *Cythere,* with some fossil and recent carapaces of which it might almost equally well be compared.

In the Scandinavian limestone blocks (Upper Silurian) from Northern Germany.

23. *Primitia ovata,* nov. Pl. XIII. figs. 13 *a, b, c.*

Length $\frac{3}{67}$, height $\frac{2}{67}$, thickness $\frac{1\frac{1}{2}}{67}$ inch.

Carapace-valves nearly ovate, excepting that the dorsal margin is not so convex as the ventral; extremities round, but one much narrower than the other; surface smooth, convex, sloping off gently towards the ends; ventral border thickened by a sudden inturn of its edge, with a low rounded ridge at the angle of deflection. In this last feature it has an alliance with *P. obsoleta*; but its outline, want of postero-dorsal angle, and smaller convexity distinguish it.

Drifted Scandinavian limestone (Upper Silurian), with *P. obsoleta*, &c.

24. *Primitia semicircularis*, nov. Pl. XIII. figs. 10 *a, b, c.*

Length $\frac{2}{75}$, height $\frac{1\frac{1}{2}}{75}$, thickness $\frac{1}{75}$ inch (8 : 6 : 4).

Carapace-valves moderately convex, subovate, sometimes suborbicular, with a straight back, and with one end more or less acute at the dorsal angle, and the other well rounded and forming a bold semicircular curve with the ventral line. The ventral margin is thickened, as in *P. ovata*. There is no doubt that *P. semicircularis*, *P. ovata*, *P. obsoleta*, and *P. oblonga* are all closely allied forms of the simplest of *Primitiæ*; still, presuming that their soft parts may have had distinctive characters (as is likely) we keep them apart for convenience. They are gregarious, and, together with *P. mundula*, form a considerable proportion of some parts of the Upper Silurian Limestone of Sweden.

In the Scandinavian limestone (drifted), North Germany. *P. pusilla* seems to represent *P. semicircularis* in Britain.

25. *Primitia pusilla*, nov. Pl. XIII. figs. 11 *a*, 11 *b*.

Length $\frac{27}{1000}$, height $\frac{21}{1000}$ inch.

This little smooth subovate form may possibly be a variety of *P. semicircularis*; but its less convexity and more rounded outline distinguish it, to say nothing of its faint sulcus—a feature, however, which may possibly be present in some specimens of *P. semicircularis*. From the Wenlock Limestone, near West Malvern.

26. *Primitia concinna*, Jones.

Cytheropsis concinna, Ann. Nat. Hist. ser. 3. vol. i. p. 249, pl. 10. figs. 3, 4.

This neat subcylindrical carapace probably belongs to a furrowless *Primitia*; there is, indeed, a faint dorsal hollow in the original, which may stand for the sulcus. From the Lower Silurian Limestone on the Ottawa River, Canada.

The same form is not uncommon among the little Entomostraca of the Upper Silurian Limestone of Gothland (from Dr. Lindström); and we have seen one like it also in the Upper Silurian Limestone of Arisaig, Nova Scotia (from Dr. Honeyman). It is not impossible that Eichwald's *Leperditia minuta* may prove to be the same species; for though the published figures* are not quite similar, yet some specimens with which M. E. d'Eichwald has favoured us can scarcely be distinct; the state of preservation, however, hinders exact comparison.

* Bullet. Soc. Nat. Imp. Moscou, 1854, part 1. p. 99, pl. 2. fig. 6; and Lethæa Rossica, livr. 7 (1860), p. 1335, pl. 52. fig. 2. Schrenk finds *L. minuta* in the Lower Silurian of the Baltic Provinces (Untersuch. p. 195).

27. *Primitia muta,* nov.

Cytheropsis concinna?, ibid. p. 254, pl. 9. fig. 3.

Oblong-ovate, nearly *Leperditia*-shaped; back straight, ends rounded but unequal; ventral edge convex; surface smooth. Though resembling *P. concinna* at first sight, it is less cylindrical, broader at the obliquely rounded end, and its ventral dge is more symmetrically curved: it is near to *P. rugulifera* in shape. From the Upper Silurian Limestone of Beechey Island, with *P. rugulifera, P. sigillata, Beyrichia clathrata, B. plagosa,* and *Leperditia gibbera.*

EXPLANATION OF PLATE XIII.

[The figures are magnified about 20 diameters.]

Fig. 1. *Primitia cristata,* J. & H.: *a*, carapace, view of right valve; *b*, posterior view; *c*, dorsal view.
Fig. 2. *P. umbilicata,* J. & H.: *a*, left side of carapace; *b*, dorsal view; *c*, ventral view; *d*, inside of valve (filled with matrix).
Fig. 3. *P. tersa,* J. & H.: *a*, carapace, side view; *b*, dorsal view; *c*, ventral view.
Fig. 4. *P. trigonalis,* J. & H.: *a*, carapace, view of left valve; *b*, dorsal view.
Fig. 5. *P. renulina,* J. & H.: *a*, carapace, side view; *b*, dorsal view.
Fig. 6. *P. variolata,* J. & H.: *a*, left valve; *b*, its edge-view; *c*, right valve of var. *paucipunctata*; *d*, its edge view.
Fig. 7. *P. matutina,* J. & H.: *a*, right valve; *b*, its edge view.
Fig. 8. *P. Roemeriana,* J. & H.: *a*, carapace, side view (left valve); *b*, profile.
Fig. 9. *P. Beyrichiana,* J. & H., right valve.
Fig. 10. *P. semicircularis,* J. & H.: *a*, left valve; *b*, its end view; *c*, ventral edge.
Fig. 11. *P. pusilla,* J. & H.: *a*, right valve; *b*, its edge view.
Fig. 12. *P. obsoleta,* J. & H.: *a*, right valve; *b*, its end view; *c*, edge view (ventral).
Fig. 13. *P. ovata,* J. & H.: *a*, right valve; *b*, its end view; *c*, edge view (ventral).
Fig. 14. *P. oblonga,* J. & H.: *a*, right (?) valve; *b*, its end view; *c*, edge view (ventral).

XLVIII.—*On the Names of the Genus* Mystomys. (In a Letter to Professor Allman.) By Dr. J. E. Gray, F.R.S., V.P.Z.S., F.L.S. &c.

British Museum, Nov. 15, 1865.

Dear Professor Allman,

As I have been informed that, in your paper on the animal that Du Chaillu noticed as *Cynogale velox*, you persist in retaining the generic name of *Potamogale,* I venture to send you the following observations, in the hope that I may induce you to reconsider the question, and avoid adding another to the several useless names which the animal has already received.

I did hope that I had clearly explained why I rejected that name in my paper in the 'Annals and Magazine of Natural History' for July 1861, vol. viii. p. 62.

M. du Chaillu's description of the *Cynogale velox* is so incorrect that, if the skin had not fortunately come into the possession of the British Museum, the animal must have remained, like the genus of Bats proposed by Bowdich because his specimen had a large *Acarus* affixed inside of the ears, one of the puzzles of zoologists.

M. Du Chaillu observes:—"*Cynogale velox*. This resembles the Asiatic *Cynogale Bennettii*, Gray. I have now nothing but the skin of the animal, the skull having been destroyed by fire. The teeth resemble those of the above genus of Gray, as well as the general appearance; but the size of the animal, the length and character of the tail, and the habitat indicate a distinct species." Then follow the description and some observations on its habits, which are succeeded by the following remarks:—"Only a single species of *Cynogale* being described, and that a native of Asia, I thought the different shape and proportion of the tail, with its African habitat, were sufficient to make this the representative of a different genus, for which I proposed the name of *Potamogale*, preferring, however, to wait until I can procure the skull and skeleton. I have placed it with the genus *Cynogale*, to which it certainly bears a close resemblance."

This is all that M. du Chaillu says upon the question. Is such a general observation sufficient to establish a genus, more especially when the animal described has not the slightest resemblance, either in external form, character of feet and claws, or in dental character, to the animal with which it is compared? I need not say that the teeth have not the slightest resemblance to those of *Cynogale*, though he says he had the skull, but it was destroyed—and that the extremities can scarcely be called "small, the first joint enclosed within the skin of the body," and the *fore claws* are not "very slightly if at all webbed," nor are the "*hind claws* partially webbed." With such a description you had every excuse for believing that your animal was an "entirely new genus," as you did when you first spoke to me about it, before you were shown Du Chaillu's skin of *Cynogale velox* in the British Museum.

I can only repeat what I said in the paper before referred to, "As M. du Chaillu has not characterized his genus *Potamogale*, and as he has given such an erroneous description of the feet of the specimen that no one could recognize it, I do not think that his name has any reason to be retained," more especially as in one place he gives the same reason for considering it a species of *Cynogale* which he gives in another for thinking that it may be a different genus.

If the name *Potamogale* is to be used, it must by every just naturalist be quoted as *Potamogale,* Allman, as you have characterized the genus, and Du Chaillu has not done so. This would be all well, if the genus had not already been characterized, as far as the materials at command would allow, and in a manner which can leave no doubt of the identity of the animal, as it is the only one which has the characters assigned to it.

If the rules of nomenclature are rigidly adhered to, you are in an untoward dilemma yourself; but I cannot believe that can have any influence on you on this occasion. The paper in which you established and characterized the genus *Potamogale* was read several months ago; but there was no abstract of the paper including the character of the genus printed in the 'Proceedings,' and the account of the genus which is to appear in the 'Transactions' of the Society has not been published yet, and may not appear probably until the end of the year; so in fact your character of the genus has not been published even yet.

In the meantime Dr. Barboza du Bocage has read a paper in which he has described and figured the teeth, and established for it a genus under the name *Bayonia.* This paper was published in the second part of the 'Proceedings' for the year 1865, p. 401, and therefore it must have priority. The synonyma of the genus will stand thus:—

1. *Cynogale,* part, Du Chaillu, 1860.
2. *Mystomys,* Gray, Ann. & Mag. Nat. Hist. 1861, p. 63.
3. *Bayonia,* Dr. Barboza du Bocage, Proc. Zool. Soc. 1865.
4. *Potamogale,* Allman, Trans. Zool. Soc. ined. 1865 or 1866.

From the form of the feet and tail, and also from the similarity of the fur to that of *Castor* and *Fiber,* I observed that "I suspect that it is a Glirine animal, much more nearly allied to *Fiber, Hydromys,* and *Castor* than to any ferine genus." This has turned out to be an unfortunate suspicion, the fur being as like that of the aquatic Insectivore *Galemys,* which did not at the instant occur to me, as it is to that of the aquatic *Glires.*

From this observation I have been accused of referring the genus to *Glires**. Perhaps the name I adopted may have had something to do with this mistake; I only said "I suspect" it might be one. But I used the Greek for Mouse as we use it in English: thus we call a Bat Fluttermouse, a Marsupial Opossum Mouse, and, more bearing on the question, several Insectivores Shrewmouse, Elephant Mouse, Hopping-mouse, and Musk-rat; and no one that I am aware of has objected to the names of *Hylomys,* Temm. (a Mole), *Echinomys,* Licht. (the Elephant Shrew), and especially *Myogale* or *Myogalea* or

* "M. Gray pour un Rongeur," Proc. Zool. Soc. 1865, p. 402.

Galemys for the Musk-rat, a genus very nearly allied, as is now proved, to *Mystomys*; and the animal is quite as much allied to a Mouse or Rat as it is to a Weasel, which the name *Potamogale* implies. Both the names, if strictly interpreted, have the objection that Fabricius so forcibly put against the use of generic names having a signification, which has so frequently induced me to use names which it is the fashion of some to call barbarous, though they appear to me much less barbarous than many of the sesquipedalian Greek names which some of these purists have given to the genera they have described.

I see in M. Bocage's paper that he quotes "*Potamogale velox*, Du Chaillu, Journ. N. H. Soc. of Boston, 1860, p. 361." But no such combination of words is to be found in that work at the page quoted, or in any other that I can find, not even in the index.

Therefore your adoption of this name is only adding another to the superabundant names that have been applied to this animal.

I can only hope that you will reconsider the question. No one is more desirous than I am that every one should have his due claim for priority of description properly considered; but I cannot but believe that in the interest of science one is called on to resist the adoption of names given, as *Potamogale* was, without any character, and with particulars that were only fitted to mislead the student.

I am, my dear Professor,
Yours sincerely,
JOHN EDWARD GRAY.

XLIX.—*Descriptions of new Species of Shells.* By E. VON MARTENS, M.D.

1. *Paludina purpurea.*

P. testa conico-globosa, obtecte perforata, solidula, lineis spiralibus elevatis subtilibus numerosis sculpta, rufo-fusca, non fasciata; spira convexe conoidea; anfr. 5, convexi, sutura mediocriter profunda divisi; apertura vix obliqua, subcircularis, *superne rotundata*, non angulata, *intus purpurea*; peristoma interruptum, rectum.

Alt. 25, diameter major 22, minor 17, aperturæ alt. 15, lat. $12\frac{1}{2}$ mill.

Australia, Murray River. The specimens in the Berlin Zoological Museum were received from Mr. Krefft.

In young specimens a narrow umbilicus is to be seen, which is shut up in the full-grown by the inner lip; the upper two whorls are worn off in the last. I am not aware of any species closely resembling it.

2. *Cyclophorus cruentus.*

C. testa anguste umbilicata, turbinata, oblique striatula, striis spiralibus rarioribus et costis obtusis supra suturam 3, infra 5 sculpta, subunicolori, rufo-fusca; spira turbinata, apice obtusa; anfr. $4\frac{1}{2}$, convexi, supremi distinctius oblique striati, carinis in tertio demum incipientibus, ultimus non descendens; apertura parum obliqua, circularis, *intus intensive rubra*; peristoma multiplex, externum leviter expansum, ad umbilicum vix arcuato-productum, internum rectum, continuum.

Diam. maj. 24, min. 19, alt. 19; apert. incluso peristomate 13, excluso 10 mill.

Loquilocun, island of Samar, Philippines. Collected by Mr. F. Jagor.

Allied to *C. tigrinus*, Sow., but of smaller size, the last whorl more flattened, the inner lip scarcely dilated, never covering the umbilicus. On the upper whorls a flammulated pattern is sometimes found, as in *C. tigrinus*.

3. *Tellina semilævis.*

T. testa elongata, tenui, convexa, alba, intus flavescente, verticibus coccineis; *valva dextra sulcis concentricis confertis scabra, sinistra lævis,* nitida; margo ventralis antice arcuatus, postice ascendens, dorsalis antice vix declivis, convexiusculus, postice descendens, primum concavus, dein convexus; pars antica longior, postica rostrata, biangulata, angulo superiore magis obtuso; costæ umbonales valvæ dextræ duæ subæquales, rotundatæ; flexura distincta; dens cardinalis (compressus, prominens) unus in valva sinistra, duo in valva dextra; ligamentum breve, immersum; dentes laterales nulli.

Long. 48, alt. 24, crass. 10 mill; vertices in $\frac{7}{12}$ longitudinis.

Querimba Islands, near Mossambique (Peters); Red Sea (Ehrenberg and Dr. Schweinfurt).

Near *T. Pharaonis*, Hanley; distinguished by its form, which is like that of *T. perna*, Spengl.

4. *Tellina depauperata.*

T. testa transversim oblonga, tenui, pellucida, concentrice striata, nitida, lactea, antice rotundata, postice subrostrata, margine ventrali vix ascendente, dorsali postice subrectilineo; flexura indistincta; dentes cardinales parvi, in utraque valva singulo, valvæ sinistræ simplex, compressus, valvæ dextræ latior; laterales nulli; sinus palliaris magnus, per totam longitudinem lineæ palliari adnatus, musculo antico appropinquans, etiam in facie externa testæ conspicuus.

Long. 26, alt. 15, crass. 6 mill.; vertices in $\frac{5}{11}$ longitudinis.

Cavite, Bay of Manila, Philippines.

Near *T. lilium*, Hanl., and *T. cygnus*, Hanl.

5. *Tellina Moluccensis.*

T. testa transversim oblongo-ovata, inæquilatera, inæquivalvi (valva dextra magis convexa), tenui, concentrice leviter striata, alba, ad margines epidermide brunnea vestita, antice rotundata, postice breviore, angustata, extremitate subperpendiculariter truncata; flexura distincta, carinula nulla; dentes cardinales in utraque valva bini, anterior valvæ dextræ parvus; ligamentum infossum; sinus palliaris latus, ascendens, magna parte a linea palliari solutus.
Long. 22, alt. 16, crass. 7 mill.; vertices in $\frac{5}{8}$ longitudinis.

Island of Batjan, Moluccas.

Allied to *T. angulata*, Chemn., but smaller and without keel.

6. *Tellina prætexta.*

T. testa transverse ovata, compressa, inæquilatera, subinæquivalvi, concentrice tenuiter striata, nitida, rosea, zonis pallidioribus concentricis picta, margine albo, antice rotundata, postice breviore, subrostrata, margine ventrali paulum ascendente, dorsali rectilineo, valde declivi; flexura distincta; dentes cardinales in utraque valva bini, laterales nulli; area ligamenti excavata, carinula cincta; sinus palliaris modicus, transversus, superne angulatus, antice acutus, a musculo antico longe remotus, per $\frac{2}{3}$ longitudinis suæ cum linea palliari concretus.
Long. 31, alt. 20, crass. 8 mill.; vertices in $\frac{3}{5}$–$\frac{9}{16}$ longitudinis.

Yokohama, Japan.

At first sight nearly allied to *T. tenuis*, Maton; on closer inspection, more nearly to *T. nitida*, Poli.

7. *Tellina dissimilis.*

T. testa trigono-oblonga, convexiuscula, solidula, striis concentricis subtilibus sculpta, opaca, alba, vertice et zonis nonnullis ochraceis, ad margines epidermide fusco-grisea vestita, antice rotundata, postice acuminata; margo ventralis medio subrectilineus; flexura distincta; ligamentum superficiale, dimidium fere marginis dorsalis postici occupans; carinula in utraque valva a vertice prope marginem superum usque ad extremitatem posticam excurrens. Dentes cardinales valvæ dextræ duo, anterior minor simplex, posterior validus bifidus; valvæ sinistræ unicus, validus, bifidus, interdum adjecto altero posteriore minore simplici; dentes laterales nulli. *Sinus palliaris* magnus, primum versus verticem ascendens, dein angulatim deflexus, lineam palliarem petens et cum hac aut angulo recto conjunctus, aut antea paulum recurrens, *in valva sinistra musculo antico approximatus, in dextra inde sat remotus.*
Long. 49, alt. $33\frac{1}{2}$, crass. $14\frac{1}{2}$ mill.; vertices ad $\frac{1}{2}$ longitudinis.

Yeddo Bay, Japan.

Contours like those of *T. laceridens*, Hanl.

8. *Tellina incongrua.*

T. testa trigono-rotundata, convexa, solidula, obsolete concentrice striata, opaca, albida, prope vertices subfasciata et facie interna media ochracea; antice rotundata, postice subrostrata, margine ventrali postice ascendente; flexura distincta; ligamentum superficiale, dimidium marginis dorsalis postici occupans; dens cardinalis valvæ sinistræ unicus crassiusculus, valvæ dextræ duo, posterior bifidus; margo cardinalis incrassatus; *sinus palliaris* magnus, per totam longitudinem cum linea palliari concretus, *in valva sinistra musculum anticum attingens, in dextra ab eo sat remotus.*

Long. 33, alt. 27, crass. 15 mill.; vertices ad $\frac{15}{19}$ longitudinis.

Yokohama, Japan.

Similar to *T. frigida*, Hanl.; but the posterior part shorter, more sloping, and distinctly bent to one side.

9. *Tellina iridella.*

T. testa transversim oblonga, sat compressa, inæquilatera, tenui, concentrice striata, nitida, roseo-albida, iridescente; antice rotundata, postice breviore, subrostrata, margine ventrali subrecto, dorsali postico valde declivi; flexura parum distincta; dentes cardinales in utraque valva bini, parvi, in valva dextra subæquales, in sinistra anterior major; sinus palliaris magnus, musculo antico appropinquatus, per totam longitudinem lineæ palliari adnatus.

Long. 19, alt. 10, crass. $4\frac{1}{2}$ mill.; vertices in $\frac{11}{19}$ longitudinis.

Japan.

10. *Gastrana Japonica.*

G. testa transversim pyriformi-ovata, ventricosa, valde inæquilatera, concentrice striata et *striis radiantibus* elevatis obtusis superficialibus confertis *decussata*, albida, unicolori, antice breviore, rotundata, postice producta, subperpendiculariter truncata, carinula nulla, margine ventrali medio recte utrinque ascendente. Dens cardinalis valvæ sinistræ anterior porrectus, triangularis, leviter bifidus, posterior parvus, postice sensim in marginem cardinalem abiens; sinus palliaris ascendens, rotundatus, major parte a linea palliari solutus, dimidiam longitudinem testæ attingens.

Long. 33, alt. $23\frac{1}{2}$, crass. 17 mill.; vertices in $\frac{4}{11}$ longitudinis.

Yokohama, Japan.

11. *Psammobia* (*Psammotæa*) *connectens.*

P. testa ovato-oblonga, subæquilatera, postice paulo elatiore, utrinque rotundata, leviter concentrice striata, violacea, epidermide intense violaceo-fusca, nitida vestita; margo ventralis rectus; dens cardinalis valvæ dextræ unicus, compressus, valvæ sinistræ duo, minores, anterior compressus, posterior depressus, nymphis acclinatus; sinus palliaris primum transversus, dein oblique descendens, lineæ palliari totus fere adnatus.

Long. 28, alt. $15\frac{1}{2}$, crass. $8\frac{1}{2}$ mill.; vertices in $\frac{4}{7}$ longitudinis.

Banka Island, east of Sumatra.

12. *Solen brevissimus.*

S. testa parva, recta, brevi, concolori, cornea; margo anticus perpendicularis, extus sulco notatus, intus incrassatus; cardo in utraque valva unidentatus, pone sulcum situs.

Long. 37, alt. 9, crass. $8\frac{1}{2}$ mill.

Singapore.

The relatively shortest species of *Solen* I know—distinguished by the perpendicular anterior edge from *Ceylonensis,* Leach, = *intermedius,* Phil., and from *S. brevis,* Gray, = *abbreviatus,* Phil., = *truncatus,* Reeve, Conch. Syst. i. 25. 1, and both from these and from *S. versicolor,* Phil., by the position of the hinge behind the anterior marginal furrow.

L.—*On* Glyptodon ornatus. By M. Serres*.

Recent investigations have made us tolerably well acquainted with the peculiarities of the organization of the Glyptodons; but as regards the number and characteristics of the species little has been done since Nodot, in 1856, summed up the state of science on this point. Unfortunately Dr. Burmeister was unable to consult this work, and consequently his memoir†, although more recent, and notwithstanding the new facts its author was enabled to observe at Buenos Ayres, does not contribute much to the history of the different species the remains of which have hitherto been discovered.

The lateral margins of the carapace which forms the subject of this note are alone deficient; but it is easy to see that upon these margins the osteites of the dermal skeleton, instead of acquiring a tubercular form, as in other species of this group, tended, on the contrary, to become diminished, as in the Armadillo.

The carapace has a semiovoid form, emarginate at the two extremities. Its dimensions are as follows:—

Distance from the centre of the anterior notch to that of the posterior one 1·14 metre.

Perimeter of the carapace from one of these points to the other 1·33 m.

Greatest distance from one lateral margin to the other 0·68 m.

Corresponding perimeter 1·23 m.

Aperture of the caudal and cephalic notches, about 0·35 m.

When this carapace is looked at in profile, one is immediately struck by the complete difference of its aspect from that of the

* Translated from the 'Comptes Rendus de l'Académie des Sciences,' Oct. 2 & 23, 1865, by W. S. Dallas, F.L.S.

† Annals, vol. xiv. p. 81.

carapaces figured by Owen and Nodot. The latter have a very distinct convexity from one extremity to the other. Ours, on on the contrary, presents a well-marked sort of constriction at about the second third of the length of the body. Hence a rule tangent to the line of the back may touch it at two points, and subtend an arc (which, however, is very flat) between the scapular and iliac regions. Behind this constriction the carapace, throughout the iliac region, presents the form of the segment of a sphere.

All the osteites forming it have a common characteristic type, which, however, is more or less altered in certain regions—namely, in front, behind, and on the margins. These modifications, on which I cannot dwell here, are nevertheless useful to know. They might lead to error in specific determinations made from too small fragments. This common type evidently corresponds with the fragment of a carapace figured by Owen under the name of *Glyptodon ornatus*, and reproduced less successfully by Nodot.

Here and there we perceive little shapeless plates filling the vacant spaces left by the regular design of their neighbours, which does not accommodate itself well to the spherical surface of the carapace. But this aberration is a normal fact,—the dermal bones of the Edentata belonging, like the squamose bones of the cranium, to that variety of the primary osseous organs which originate without preexistent cartilages, and which, in consequence of their spontaneous mode of origin and development, always present great variations of number and configuration.

The inner face of the plates generally presents a remarkable uniformity. At the points where they were in connexion with the bones of the muscular skeleton the union was effected by fibrous tissue, and not, as Burmeister gives us to understand, by cartilaginous tissue. Indeed in the Armadillo it is likewise fibrous tissue that unites the extremities of the ischia to the processes of the posterior buckler to which they apply themselves—a very dense fibrous tissue, with fibres of variable but generally considerable diameter, attaining as much as 0·007 mill. These fibres are arranged in slightly undulated and imperfectly limited bundles.

Throughout the anterior region of the carapace the inner face of the plates is perfectly smooth. They all uniformly present a nutritive foramen in their centre, analogous to that which is seen on the inner face of the plates of the Armadillo, into which an arterial branch of considerable volume always penetrates. It is evident that in this region the carapace reposed upon a thick cushion of adipose tissue.

Behind, in the vicinity of the posterior emargination, the inner face of the plates is, on the contrary, irregular, rugose, and uneven; nor do we find the same regularity in the distribution of the vessels, each plate having often several nutritive foramina. To all appearance this region gave attachment to muscles analogous to the elevators of the tail in the Armadillo, muscles which are seen to attach themselves, on the one hand, to the inner face of the posterior buckler, and, on the other, to the spinous apophyses of the first caudal vertebræ.

The margins by which the plates are articulated together present the asperities usual on such organs. They were united by fibrous tissue. Perhaps, at the perfectly adult age to which our specimen had attained, some of these articulations were ossified in the dorsal region; but certainly this was not the case throughout. It may be asserted that the carapace no more formed a shell homogeneous and solid in all its parts, than the thoracic and iliac bucklers of the Armadillo are solid and inflexible. It must have become flattened or arched a little in accordance with the efforts of the animal; in other words, it must have changed its form, certainly within narrow limits, but still appreciably.

The caudal emargination is formed by a single row of plates arranged in an arc, like the stones of a bridge.

The cephalic emargination is much more complicated in its structure. It is not simply circular, but shows on the median line a projection in the form of a hood, slightly prominent, but massive, with its margins rounded at the expense of the outer face of the carapace, sharp at the level of the inner face.

Three different rows of plates assist in the formation of this anterior emargination, and furnish in turn its marginal pieces. The series which borders the most lateral part of the emargination extends, gradually diminishing, over one-third of its compass. Here it disappears. The row which was the second on the sides thus becomes marginal, and disappears in its turn in the same manner. There remains the third, which thus becomes marginal in the middle of the notch. In other words, the row which bounds the emargination in the centre alone constitutes a complete arch, resting on each side upon two other arches, which become less and less complete.

All the plates in the vicinity of the anterior emargination bear on their surface excavations measuring about 4 millimetres in all directions; these are rounded, with two or three Haversian canals opening in their bottom. These cavities lodged the bulbs of large hairs, directed forwards, which fringed the anterior margin of the carapace of the animal.

I now come to that which constitutes the great interest of this carapace—namely, the persistence of its natural relations with the pelvic ring.

Besides the pelvis, a fragment of the dorsal column was found in its interior, but not in place. This fragment will be the subject of a second note (p. 438), in which I propose to examine the other bones which appear to me to be referable to *Glyptodon ornatus*, and which present remarkable differences from the same organs in *G. clavipes*.

Anatomists are not yet agreed as to the number of vertebræ which must be regarded as constituting the sacrum in the Glyptodons. With Huxley, I refer to this bone the two vertebræ with large transverse apophyses, united by their extremities to each other and to the ischium, which limit the pelvic cavity behind. Huxley calls them *coccygeal vertebræ of the sacrum*. There is no doubt that the first should be referred to the mass of the sacrum; as to the second, it has with the former such connexions and such a community of relations (especially in a gigantic species which I shall hereafter have occasion to bring before the Academy), that it seems difficult to separate it from the same group. In *Glyptodon ornatus* these two vertebræ appear to me to be the tenth and eleventh, counting as the first the vertebra of which the lateral expansion forms the sacral crest.

In our specimen the iliac crests and bones, as also the cotyloid cavity, present nothing particularly remarkable.

The rami of the pubis have not been preserved.

Behind the cotyloid cavities originate the ischia, which are quite different here from the oblique and fan-like ischia of *G. clavipes*. These ischia are directed straight backwards, only diverging a little. With the sacral crests in front and the two coccygeal vertebræ of the sacrum behind, they bound a nearly quadrangular cavity, over which the narrow region of the sacrum is thrown like a high-arched bridge.

The ischium has the form of a triangular lamina placed in a vertical plane. The apex of the triangle is at the cotyloid cavity in front, the base at the carapace behind. This base, or posterior margin of the ischium, is free below. Above it is cut off somewhat obliquely, to adapt it to the convexity of the carapace, which rests upon it. The upper margin is thick, and regularly concave; the lower margin is more irregular. Near the cotyloid cavity it presents a concavity, a portion of the orifice of the obturator foramen. Beyond this it was united with the ramus of the pubis, now destroyed. Further on it forms a lozenge-shaped synarthrodial surface, bristling with highly developed osseous rugosities, which give attachment, during life, to a powerful interarticular ligament. Behind this rugose surface, and quite at the extremity of the lower margin of the ischium, there is a small, smooth articular surface, about 1 centimetre in diameter.

The outer surface of the ischium is convex from above downwards, and slightly concave from before backwards. The inner surface presents the opposite arrangement.

At the lower posterior part, in the immediate vicinity of the lozenge-shaped surface of the lower margin of the ischium, the inner face also presents a large synarthrodial surface, of a somewhat pyriform shape, 2 centimetres broad in front, narrower behind, and about 6 centimetres in length.

The ischium, regarded as I have just described it, measures 25 centimetres in length from the margin of the cotyloid cavity to the carapace. But it is easy to see that it is really composed of two different osseous pieces. The bad condition of the parts has prevented my investigating this curious point of osteogeny so completely as I could have wished. It is necessary to take into consideration the difficulties inherent in such observations on broken and reconstructed bones. Moreover the individual itself was by no means favourable for investigations of this nature, age having already produced in it certain synostoses which were evidently accidental.

Nevertheless I think it very probable that we may regard the posterior region of the ischium as independent of the region united to the sacrum, as a sort of epiphysis of which the anchylosis is very late, if indeed it ever takes place. I may, moreover, remind the reader that in the young Armadillo the ischium likewise presents at its extremity a distinct osseous piece, the nature of which must be the same.

In our specimen, at about three-fourths of the length of the ischium, we see very distinctly a solution of continuity parallel to the base of this bone, and consequently nearly vertical, which separates it into two regions. This solution of continuity is an articulation. This may be very well seen towards the upper margin of the ischium, where the articular surfaces of the two pieces become considerably widened in consequence of the thickness of that margin. They are there nearly 2 centimetres in diameter, and present pretty nearly the aspect of the epiphysary surfaces of young bones.

This curious synarthrosis is very distinctly visible on the two sides. Below, it pretty nearly cuts in half the lozenge-shaped and pyriform articular surfaces of which I have already spoken as occurring on the inner face and inferior margin of the ischium.

From this arrangement it follows that, in *Glyptodon ornatus*, the sacro-iliac region of the pelvis was not united in a perfectly rigid manner to the carapace by the ischium. It is evident that at this point there existed certain conditions of mobility, which were doubtless of but little extent, but of which the multiplication and complication of all these synarthroses accumulated at the same point furnish a certain indication. The whole of this organic construction, moreover, is in accordance with what I have said above as to the partial flexibility of the carapace.

The two coccygeal vertebræ of the sacrum present modifications corresponding with those of the ischium, with which they are articulated. The first of these vertebræ, which is intimately united to that which precedes it, is placed nearly in a vertical plane, slightly inclined from above downwards, and from before backwards. The total height of the vertebra is 8 centimetres; its apex is about 3 centimetres distant from the carapace. The spinous lamina which surmounts its arch presents posteriorly two diarthrodial facets (articular apophyses), corresponding with two facets of the following vertebra.

The transverse apophysis, which is lamellar as in *G. clavipes*, is placed at first in the same plane as the body of the vertebra, but undergoes a slight torsion and becomes horizontal. It conceals the transverse apophysis of the following vertebra, and articulates therewith much more completely than in *G. clavipes*. By its squarely truncated extremity it articulates with the pyriform synarthrodial surface which occurs on the inner face of the ischium.

The second coccygeal vertebra of the sacrum is placed in a much more oblique plane than the preceding one. Hence the body of this vertebra makes with that of the preceding one a salient angle about equal to the sacral angle in man. In its form the body of this vertebra exactly resembles that of the caudal vertebræ. The rhachidian canal becomes suddenly much less in diameter on reaching its level. The spinous apophysis is no longer a lamina, but is rounded and obtuse. At its base in front are articular apophyses corresponding to the two facets borne by the arch of the preceding vertebra.

It was of interest, with regard to the mechanism of the tail in *Glyptodon*, to ascertain exactly the position of this vertebra with relation to the caudal emargination of the carapace. A straight line drawn from the centre of this emargination to that of the cephalic notch passes through the apex of the salient angle which this vertebra assists to form. The distance from the posterior face of the body of the vertebra to the centre of the caudal emargination is 0·125 metre. The distance from the apex of its spinous apophysis to the same point is 0·080 m.

The transverse apophysis passes entirely beneath that of the preceding vertebra. But, contrary to what occurs in *G. clavipes*, it passes this, and articulates by its superior face, which is roughened with rugosities, with the lozenge-shaped synarthrodial surface of the lower margin of the ischium. A small diarthrodial facet also corresponds with that which terminates this margin.

At the level of its articulation with the ischium, the transverse apophysis bends suddenly downwards nearly at a right angle. It becomes vertical, and continues the outer face of the ischium downwards for some centimetres. I may remark, in conclusion, that this arrangement of the second coccygeal vertebra of the sacrum, which is thus suddenly bent downwards in *G. ornatus*, occurs also upon all the middle caudal vertebræ of the different species of *Glyptodon*.

When we take up the study of fossils we are inevitably led towards the highest questions of zoology. These ancient spoils of an extinct world bear imprints which the genius of Cuvier taught us to read—imprints by the aid of which we can approximate the action of the forces at such remote periods to the action of the forces which are still exerted upon the development of organized beings.

In organized beings there exist constant differences of organization, upon which is founded their arrangement in classes, families, genera, and species. From these differences, and from them alone, results the variety in the animal and vegetable kingdoms; but is the cause or principle of this variety, or of these differences, inherent in the vegetable or animal organism? or is it in great part exterior to it?

Let us remark, in the first place, that whatever may be the opposition of these two methods of looking at the differences of plants and animals, there is one idea and one word which neither of them has been able to eliminate—the idea and the word *type*. For it is certainly necessary to recognize differences between organisms, diverse imprints, and to give them a name. But while some believe that every specific difference corresponds to an immutable type, others think that there exists only one type indefinitely modifiable by the action of the media in which it is developed.

This latter hypothesis, to which Mr. Darwin's work on the origin of species (which, at the time of its appearance, produced so deep a sensation among naturalists) referred, appears to me to be equally irreconcileable, on the one hand, with what logic compels us to admit philosophically, and, on the other, with the facts of experience. In fact, this unique type, not being immutably determined, would not be so essentially, which destroys the very idea of type, and substitutes in its place that of the indeterminate substance. Notwithstanding the development given to this hypothesis, the question of variation, or of the differences of animals and plants, has not made a single step; it remains entire, inasmuch as there always remains to be explained the first origin of form or of determination, which evidently has a cause, a principle anterior to what are called media.

As I have said elsewhere, in the numerous differences which organized beings may be subject to, they never pass the limits of their class to acquire the forms of a higher class: a Fish will never ascend to the form of a Reptile; the latter will never attain that of a Bird, or a Bird that of a Mammal. Even in monstrosities, a monster may repeat itself—it may present two heads, two tails, six or eight extremities; but it will always remain circumscribed within the limits of its class. This surprising phenomenon is doubtless connected with the general harmony of creation. What can be its cause? Of this we are ignorant. But it results from this, nevertheless, that everything is not primitively in the materials—that evidently we must conceive a principle exterior to them, which determines their employment and presides in their arrangement.

Media, however, exert a powerful influence in the production and development of organized creatures. They do not create the types; but, in the physical world, they are an indispensable condition of their evolution. If they created the types, only a single type could exist in the same medium, there would be only a single determination for the beings which would be produced there. Now, on the contrary, the same media present multitudes of creatures differing in nature or in form. Moreover, if the type which specializes each of these creatures were only the effect, the term of action of the media, it would be in itself only a simple modality, something purely passive, whilst facts show evidently that, in each type, there resides an active energy, a distinctly determinate organizatory power.

Specific differences therefore cannot have their cause in the media in which the animals are developed, since they affect animals developed in the same medium, and persist immutably in these same animals when transported into another medium. The influence of these, being powerless to change their specific organization, only introduces into it slight and superficial modifications. Consequently, this specific organization, being fundamentally unalterable, depends on an internal cause which is itself unalterable; from which it follows that, both in animals and plants, there exist true species, not by a single type, but by infinitely numerous types, which become involved and linked together in proportion as the organisms, increasing in perfection, become more complex.

To prove the development of the diversity of types in the same medium, I shall select the Fauna of the *Tourtia,* so well appreciated by M. d'Archiac.

"What strikes us at once," says that illustrious geologist*, "in the examination of this Fauna, which is still so imperfectly known, the elements in our possession having only been collected at three or four points, is the prodigious development and the almost infinite variety of the type of the *Terebratulæ.*

"Of these we have determined and described forty-eight species. Of this number thirty-four, or nearly three-fourths, are new; and there are, besides, more than twenty equally well-characterized varieties. This genus of itself includes nearly one-fourth of all the species that we know in the *Tourtia;* and when we consider the small thickness of this bed, and the restricted space in which it is deposited, we cannot but be astonished *that a single organic type,* after probably a very short lapse of time, should present in the combination of its forms, or of its dimensions, so manifest a proof of the admirable fecundity of nature, that it might lead us to doubt of the reality of the species considered in itself."

Among fossil Vertebrata, the Glyptodons, which flourished at the period of formation of the Subapennine stage of the Pampas of Buenos Ayres, in which the remains of these animals are found exclusively, reproduce the same fact, although in a much less degree; and hence the necessity of well-characterizing the species, however difficult this may be. In fact, if anatomical investigation applied to creatures which no longer exist presents in some respects an attractive interest, it also sometimes exposes us momentarily to certain zoological confusions, which cannot always be avoided.

The fragments of several extinct and unknown animals, of the same group and the same size, reach us, collected together without order, in the same layer of soil. If each skeleton were complete, nothing would be easier than to bring together these disjointed organs, and to reestablish the same natural relations which formerly united them into a single living whole. The difficulty commences when each of them is represented only by a bone, a different organ. Then the naturalist cannot escape the danger of describing as belonging to the same species organs really pertaining to several, except by falling into another error, that of describing a single species under several names. In this alternation of two causes of error, both difficult to shun, I found myself in the comparisons which I propose now to bring before the Academy.

In my first note on the Carapace of *Glyptodon ornatus* I

* "Rapport sur les fossiles du *Tourtia,*" Mém. de la Soc. Géol. de France, 2e série, tome ii. p. 291.

mentioned that a fragment of the dorsal column had been found adherent to its inner surface, but not in its proper place (see *ante*, p. 45). This fragment commences at the articulation of the third dorsal vertebra, and includes twelve vertebræ soldered together; except the number of vertebræ thus united, it presents nothing in its general configuration that has not already been described by Huxley, and especially by Burmeister in *Glyptodon clavipes*.

The number of vertebræ is easily counted by the number of apertures seen in the bottom of the two vertebral channels. These apertures gave passage to the posterior branches of the spinal nerves, and also to venous canals. The median crest in front is cut off very obliquely, thin and trenchant; it was nowhere articulated or even in direct contact with the carapace. Each lamina of the twelfth vertebra of the bone is produced in front into the bottom of each vertebral channel above the lamina of the eleventh, by an apophysis (at least ?) three centimetres in length. On each side, this apophysis is held in a sort of mortice, formed by two vertical surfaces, depending from the arch of the eleventh vertebra. There is synostosis; but this must no doubt be ascribed to age.

The laminæ of the twelfth vertebra present analogous mortices behind; these, no doubt, received the apophyses of the following vertebra in the same manner.

Between this point and the vertebræ soldered together to form the sacrum, there exists a gap, which is the more to be regretted, because, the hinder part of the skeleton having, in this individual, remained in its normal relations to the carapace, the integrity of the vertebral column would have enabled us to appreciate the true relations of the neck and head with the margin of the cephalic emargination.

In seeking for the bones of the neck, I met with one which, although not belonging to the same individual, appeared nevertheless to be referable to the same species. The articular surfaces seemed constructed to coincide; the posterior part of the voluminous apophysis, which surmounts the vertebral ginglymus, was hollowed by a narrow furrow exactly in relation to the anterior oblique and trenchant extremity of the median crest of *Glyptodon ornatus*.

But the skeletal constitution of the neck was not the same here as in *Glyptodon clavipes*. In place of the trivertebral and pentavertebral bones, named by Huxley and myself, I found two bones, each consisting of four vertebræ. The articulation separating them, the mechanism of which I have already had the opportunity of describing in *G. clavipes*, instead of existing between the fifth and sixth cervical vertebræ, occurs between the fourth and fifth. The names of trivertebral and pentavertebral bones, evidently cannot serve to designate these two tetravertebral bones; for the sake of clearness and brevity I prefer to adopt the denominations *mesocervical bone* and *metacervical bone*.

The metacervical bone presents the general lineaments of the trivertebral bone of *G. clavipes*. It is only a little longer in proportion to its breadth. The two costal impressions are more oblique. Of the four apertures of conjugation, the last three present the same general arrangement as in *G. clavipes*, and the first is immediately in front of the second.

The articulation which unites the metacervical to the mesocervical bone is closer than in *G. clavipes*. Below, in particular, it leaves no hiatus, even in its extreme movements. The juxtaposed vertebral bodies, instead of being reduced to the condition of a trenchant lamina, measure about five millimetres in diameter. The line which separates them describes a curve with its concavity in front. It is here the fifth cervical pair of nerves that traverses the articulation.

The mesocervical bone corresponds with the pentavertebral bone; it has all its general features, except that it includes only four vertebræ. The ala of the bone, resulting from the coalescence of the transverse apophyses, is comparatively much slenderer than in *G. clavipes*. On the outside it terminates in a narrow, nearly triangular surface. The posterior face of the bone does not exhibit any special aperture for the passage of the vertebral artery.

We have here, therefore, an anatomical structure very similar to that of *G. clavipes*, but to a certain extent displaced, thrown back one vertebra. In this arrangement we cannot, however, see a teratological anomaly: the existence, in the collection of of the Museum, of two identical specimens, does away with any supposition of this kind.

Does the bony constitution of the neck just described pertain to *Glyptodon ornatus*? Everything leads me to suppose so, but the future alone can settle the question.

I hoped to get some light from another dorsal column derived from an individual similar in size to that of which we have the carapace. But this dorsal column was accompanied by the metacervical bone, of which it had been the continuation, and this was a true trivertebral bone analogous to that of *G. clavipes*. But on examining it more closely some differences were found between this dorsal column and that of *G. ornatus*. Thus the anterior extremity of the spinous crest instead of being oblique, thin, and trenchant, is five or six millimetres in thickness, and rises vertically to a great height. The lateral channels are also narrower and deeper.

I consequently found myself in the presence of several (at least two, perhaps three) species of animals of the same size, nearly allied in their organization, but very distinct in the vertebral arrangement of the neck, and all developed in the same medium. Anatomy was enriched by a new fact, and at the same time created a new difficulty in the classification of the fossil cuirassed Mammalia, which is already rather confused.

BIBLIOGRAPHICAL NOTICE.

British Conchology, Vol. III. *Marine Shells, comprising the remaining Conchifera, the Solenoconchia, and Gasteropoda as far as Littorina.* By John Gwyn Jeffreys, F.R.S., F.G.S., &c. London: Van Voorst. 1865.

Each succeeding year brings to us another volume of Mr. Jeffreys's new work on the British Mollusca, which is coming out with praiseworthy regularity. At the present rate of progress two more volumes will be required to complete the subject. We propose to continue the course which was adopted in noticing the preceding volumes, and compare the genera and species here described with those contained in Forbes and Hanley's 'History of the British Mollusca,' which, up to the present time, has been the standard authority on this portion of the marine zoology of our islands.

The following are the generic changes. *Sphenia* of Turton is merged in *Mya,* and *Cochlodesma* in *Thracia. Panopæa Norvegica* is regarded by our author as a *Saxicava* and not a *Panopæa*; but the latter genus is not excluded from our lists, since the little shell figured by Forbes and Hanley (pl. 6. figs. 1–3), but not named (*vide* vol. iv. p. 248), appears here with the name of *Panopæa plicata,* Montagu. The genus *Patella* is divided, and *P. pellucida* is placed in the genus *Helcion* of De Montfort: on the other hand, *Pilidium fulvum* falls into *Tectura* of Cuvier, a name adopted by Mr. Jeffreys instead of *Acmæa* of Eschscholtz. *Capulus,* De Montfort, supersedes *Pileopsis,* Lamarck; and, lastly, the genus *Cyclostrema* of Marryat is adopted in the family of the Trochidæ for the reception of three little shells,—*C. Culterianum,* Clark (=*Skenea Culteriana,* F. & H.); *C. nitens,* Philippi (=*Trochus pusillus,* F. & H.); and *C. serpuloides,* Montagu (=*Skenea divisa,* F. & H.).

The following species, which were admitted in the 'History of the British Mollusca,' are excluded in vol. iii. of 'British Conchology:'—*Corbula ovata, Teredo palmulata,* and *Trochus conulus,* as not being indigenous; *Skenea costulata,* as occurring only in a fossil state; *Pandora obtusa, Thracia villosiuscula, Corbula rosea, Saxicava arctica, Skenea lævis,* and *Patella athletica,* assigned respectively as varieties to *Pandora inæquivalvis* (*P. rostrata,* F. & H.); *Thracia papyracea,* Poli (*T. phaseolina,* F. & H.); *Corbula gibba* (*C. nucleus,* F. & H.); *Saxicava rugosa*; *Cyclostrema nitens*; and

Patella vulgata. In the genus *Littorina, L. fabalis* and *L. palliata* are referred to *Littorina obtusata* (*L. littoralis,* F. & H.), and *Littorina tenebrosa, L. saxatilis,* and *L. patula* are grouped, as Forbes and Hanley suggested they probably should be, under *L. rudis.*

Several Mollusca of much interest are added to the British fauna in the present volume.

Neæra rostrata, Spengler, a form which ranges from the Ægean and Mediterranean seas to the coasts of Norway and Sweden, is admitted on account of a single right valve, dredged in seventy-six fathoms forty miles from the east coast of Shetland.

Teredo pedicellata, Quatrefages, inhabits fir and oak used in submarine and fixed woodwork in the Channel Islands.

Lepeta cæca, Müller. A single specimen has been dredged in the Shetland seas, and a second off the west coast of Scotland.

Trochus amabilis, Jeffreys. A very beautiful new species, discovered among "fine sand, mixed with gravel, in 85 to 95 fathoms, about twenty-five miles N.N.W. of Burra Firth Lighthouse, Unst. The area in which it occurs appears to be limited to a few square miles. I discovered this new and beautiful species in 1861, while in company with my friend Mr. Waller; and we obtained specimens again in 1864 by dredging on the same ground. Living together with it were *Limopsis aurita, Cylichna alba, Buccinopsis Dalei* var. *eburnea,* and other treasures. I do not know any other place, at home or abroad, where it has been found."

Trochus Duminyi, Requien. Found among shell-sand at Bundoran, in Donegal Bay. This is a Mediterranean species, and was first described as a fossil by Philippi, under the name of *Valvata? striata.* It was recorded as British by Mr. Jeffreys, in his "Additional Gleanings in British Conchology" in the 'Annals' of September 1859, as *Skenea striata.*

Although not prepared to acquiesce in all the changes which have now been enumerated, yet with the greater part of them we entirely agree, and shall only here call attention to two of the points in which we venture to entertain a different opinion from that which is maintained in the book before us.

We must enter a strong protest against the uniting of *Pandora obtusa* with its ally *P. inæquivalvis.* Mr. Jeffreys gives the following reasons for the course which he has adopted in treating the former as a variety of the latter species:—"The difference between the typical shell and the variety *obtusa* apparently arises from the nature of their respective habitats—the one being sublittoral, and the other belonging to deeper water. An intermediate form has been taken by Cailliaud on the coast of Brittany, and by M'Andrew at Corunna. On a superficial view, indeed, it would seem as if a valid distinction existed in the length from the beak to the front margin being always greater in *P. inæquivalvis* (or *rostrata*), and on the posterior side in *P. obtusa*; but this only shows that varieties, as well as species, have some character of their own. Such may be expected when the conditions of life vary. The extension of the posterior side in the typical form may be caused by the difference of locality. When the Littoral zone is sandy, the surface is apt to be disturbed by waves and occasional storms, so that the stratum may be of a greater or less thickness at one time than at another: now it is covered by a deposit of material thrown up by the sea; in a few days this cover may be stripped off. In order to prevent its tubes being choked by an accumulation of the imported material, the *Pandora* living between tide-marks gradually lengthens that end of its shell. The variety which inhabits deeper water is not exposed to fluctuations of this kind; it therefore does not require any such provision, and lies undisturbed in its level bed. This may explain the variation in the proportion of length and breadth which is exhibited by the two forms. The difference of thickness in the shells of *P. inæquivalvis* and its varieties also depends on habitation. I am also inclined to think that, with regard to every species living both in the Littoral and Coralline zones, the shell is thicker in the former than in the latter. Examples to illustrate this proposition occur in *Venus gallina* and its varieties *striatula* and *laminosa*, *Mactra solida* and its variety *elliptica*, *Trochus ziziphinus* and its small conical variety, *Buccinum undatum* and its variety *zetlandica*, and in many other species. Experiments made by Dr. Davy, Forchhammer, and Bischoff have proved that the quantity of carbonate of lime held in solution by sea-water, and from which shells are produced, is greater on the coast than in the ocean: it is derived from the land, and brought down to the sea by rivers and streams, the washings of rain, and the action of waves. This fact ought not to be lost sight in discriminating species from varieties, of which the comparative solidity and size are the sole or chief criteria."

Now, surely, there is a great deal assumed here. That convenient little word "*may*" holds a very important place in this argument; and Mr. Jeffreys supposes an instance of wonderfully rapid conformity to requirement when he urges that the posterior extremity of the shell may be lengthened in the course of a few days to prevent the tubes being choked by an accumulation of the shifting material of the sea-shore. We would suggest that the animal might crawl upwards out of the deepening sand somewhat more rapidly than the shell would be likely to grow, and, moreover, that it must not be forgotten that the size and form of the shell depend upon the size and form of the animal contained within it. Again, it is undoubtedly true that a species which has a considerable range in depth, will be frequently found to have its shell much more strongly developed in the Littoral and Laminarian zones than it is in greater depths of water; but this fact does not prove that a thin-shelled, deep-water member of a genus is specifically identical with a stronger-shelled form which invariably inhabits shallower water, and differs from it not only in respect to the substance of the shell, but in many other particulars of structure also; moreover we are not aware that the comparative tenuity of *P. obtusa* has ever been relied upon as of weight in maintaining its specific character. Forbes and Hanley clearly point out the characteristic differences of the two allied species of the genus; and it appears to us that Mr. Jeffreys yields everything when he acknowledges "it would seem as if a valid distinction existed in the length from the beak to the front margin being always greater in *P. inæquivalvis,* and on the posterior side in *P. obtusa*;" for the point of difference here alluded to will be found to be constant and all-important. *In* P. obtusa, *the greatest diameter from the dorsal to the ventral margin is always situated towards the posterior extremity of the shell, whereas in* P. inæquivalvis *it is anterior, or in a line drawn from the beaks.* We have examined more than 600 specimens of *P. inæquivalvis* from Jersey, for the express purpose of finding intermediate gradations between that species and *P. obtusa,* but without meeting with any such specimens; and the more experience we have had of the two shells, the more firmly have we become convinced that differing, as they do, 1st, invariably in form, 2ndly, invariably in habits, and, 3rdly, in geographical distribution, *Pandora inæquivalvis* and *P. obtusa* cannot but be regarded as valid and distinct species.

By far the most interesting portion of the present volume is the graphic and full account of the ship-worm (Teredo), to the history of which the author devotes no less than forty-five pages. The details respecting this genus have evidently been drawn up with especial care, and must be read in their entirety to be appreciated. To attempt to give here partial extracts would be doing the author an injustice. Mr. Jeffreys describes only six species of the genus, whereas, in his "List of the British Species of Teredo," published in the 'Annals' of August 1860, no less than fifteen were admitted. On examining the reasons for this wide discrepancy, we find that *Teredo nana* and *T. subericola* are now regarded as varieties of *T. megotara,* and that *T. bipinnata* of Turton is the same as *T. pennatifera* of Blainville—the former author having assigned in his description the valves of one species (*T. malleolus*) to the pallets of another (*T. pennatifera*). Again, *T. bipartita, T. fusticulus, T. spatha,* and *T. fimbriata* (*T. palmulata,* F. and H.) undoubtedly have no claim to be admitted into our fauna. The valves and pallets of these species have indeed been found in pieces of wood floating in our seas; but those woods have always been of extra-European origin—West-India cedar and mahogany—and the contained Teredines have never been met with alive, the animals having apparently perished in the cold waters of our seas.

We are, however, at a loss to understand upon what principle *T. malleolus* and *T. bipinnata* (*T. pennatifera,* Blainville) are admitted, while *T. excavata* and *T. cucullata* are excluded. These four species occur under precisely similar circumstances, and are frequently found associated together and living in the same pieces of European woods drifted to our shores. We cannot acquiesce in the statement that "the habits of the Teredo are littoral," and that "when they are met with far from land, the piece of wood which contains them has been accidentally detached and carried out to sea by some marine current." On the contrary, the four species just mentioned, though frequently met with in floating balks of timber, have never as yet, we believe, been found in fixed woodwork. They appear, like the

Lepadidæ, with which they so constantly live associated, to be essentially pelagic. The position which they invariably occupy in drift-wood proves that they have attacked the wood while it has been in a floating position; for as the wood floats in the water it will be found that the entrances to the tubes of the shipworms are always on the upper portion, where they are frequently brought into direct contact with the atmosphere, while the more deeply immersed angle of the log is hung with vast masses of barnacles. If the grounds on which those Teredines frequently found living in floating timber drifted to our shores by westerly winds are excluded from our fauna be valid and just, then, all we have to say is that Mr. Jeffreys has established a precedent which, if followed out in other branches of science, would lead us to refuse to admit into our fauna all occasional ornithological visitants, the *Ianthinæ*, *Salpa*, many oceanic Crustacea, *Physalia*, *Velella*, *Diphyes*, &c., and all the Lepadidæ except *Scalpellum vulgare*. We commend to Mr. Jeffreys's notice the following observations of Mr. Darwin upon the genus *Lepas*, which presents us with an exact parallelism to Teredo:—"The species abound over the Arctic, temperate and tropical parts of the Atlantic, Indian, and Pacific Oceans, and are always, or nearly always, attached to floating objects, dead or alive. The same species have enormous ranges; in proof of which I may mention that, of the six known species, five are found nearly all over the world, including the British coast, and the one not found on our shores (the *L. australis*) apparently inhabits the whole circumference of the Southern Ocean."

In conclusion, we will only add that the more we see of 'British Conchology,' the more do we recognize the value of the work both to conchologists and Tertiary palæontologists, and the more confidently are we able to commend it to our readers. And now, Mr. Jeffreys, we shall for the present wish you good-bye, looking forward with especial interest to the appearance of your next volume, and anxious to learn what you are going to do with those horribly tormenting *Odostomiæ*, over the study of which we poor conchologists have so often strained our eyes, and racked our brains, and scratched our heads in the agonies of perplexed doubt! We will not say, "Woodman, spare *that* tree," but rather, "Don't be afraid of the pruning-knife."

MISCELLANEOUS.

Capture of Muscicapa parva *at Scilly.*

To Dr. J. E. Gray, F.R.S. &c.

Sir,—It may be interesting to you to know that another example of *Muscicapa parva*, very nearly in the same state of plumage as its predecessor at Scilly, was captured on Sunday week, at Trescoe Isle, Scilly. The variation in its plumage consists in the scapularies and wing-coverts being more decidedly bordered with rufous. This, I think, shows it to be a bird of the year. I expect it breeds in Britain.

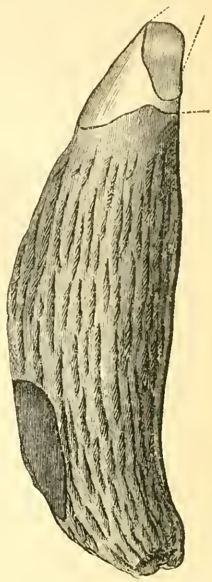
Yours obediently,

Penzance, Nov. 14, 1865. Edward Hearle Rodd.

On the Canine Teeth of Thylacoleo carnifex (*Ow.*). By Prof. M'Coy.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,—I beg to enclose you a rough pen-and-ink sketch of the exact natural size of one of two canine teeth of *Thylacoleo* found, with part of the jaw and teeth of *Nototherium Mitchellii* (on which it had probably been feeding), on the surface of Mr. Bell's station, Murchill, not far from Geelong, in this colony of Victoria. As hitherto only the molars and back part of the skull of *Thylacoleo* have been known, the discovery of the great canine is of much interest. The transverse section of the crown is rotundato-oblong, having two long nearly parallel lateral boundaries, and the anterior and posterior faces obtusely rounded, the anterior a little larger than the posterior; the great fusiform bony root is very coarsely marked with short, irregular, interrupted longitudinal sulci, and narrow ridges about a line in thickness. The specimen is nearly 5 inches long and 1 inch 5 lines wide at about the middle of the fusiform, compressed, gently incurved root. The crown is worn down obliquely almost to the base, only about an inch of it remaining.



The specimens have been presented, through Dr. Greene, to the Melbourne National Museum; and I shall shortly figure them in the Decades I am preparing of the recent zoology and palæontology of Victoria.

I remain, Gentlemen, yours, &c.,

Melbourne, Aug. 24, 1865. Frederick M'Coy.

Ægeon Alfordi.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,—A second specimen of *Ægeon Alfordi* was found here on August 24th by Mr. Mundie, 93 Richmond Road, Dalston. Amongst other favourite haunts, I showed him a ledge of rocks stretching into the Roads under the Garrison Hill, and here, with many of the more common species, he found one Anemone which was new to him. He examined this treasure carefully with a lens, and found it to be exactly like *Ægeon Alfordi* in form, and also in colour on base, column, and disk; but the tentacles, instead of being "satiny green throughout with a faint line of grey on the outer edge," were of a lustrous satiny green on the back, whilst the front was marked as in those of *Bunodes Ballii*, with bars and dots of opaque white on a ground of neutral tint, this tint brightening into a lovely rose-colour at the tip. I described this specimen to Mr. Gosse, and he judged it to be a *variety* of *Ægeon Alfordi*, and advised me to write you an account of it. This specimen seems at least to make another link between the *Antheadæ* and *Bunodidæ*. The Anemone still lives in the possession of Mr. Mundie.

I have had to change my opinion about the quantities of *Aiptasiæ* around these islands. Their very great number soon made me think that I had been mistaken. I sent some specimens to Mr. Gosse, and he imagined them to be *Aiptasiæ*, but they did not recover the journey sufficiently for him to be sure about it. I have had no accommodation for them to disport themselves fully, and consequently I was misled by a general resemblance. I must conclude now, that though there are probably *Aiptasiæ* to be found here, yet they certainly do not exist in the numbers I imagined, but I have mistaken the grey *Antheæ* for them. I hope you will enter this in your 'Annals' as soon as possible, lest Anemone-fanciers should be tempted to our distant retreat by false hopes.

St. Mary's Parsonage, Isles of Scilly, November 4, 1865.

Sincerely yours,
D. P. Alford.

On the Nest of the Ten-spined Stickleback. By W. H. Ransom, M.D.

Although it has long been known that the three-spined and fifteen-spined Sticklebacks build nests—the former on the ground, and the latter among weeds—no one has yet described, so far as I am aware*, the nest of the ten-spined Stickleback, or *Gasterosteus pungitius*, so common in our ditches, and well known by the name of Tinker, from the black nuptial livery of the male. I was fortunate enough, in 1854, to have a nest built by a little Tinker in my aquarium, and I found that its position resembled that of the fifteen-spined species. Last spring I was able more carefully to witness this interesting fact. On May 1st, 1864, a fine black male *G. pungitius* was put into a well-established aquarium of moderate size, in which he soon became at home, but did not build any nest for three days. I then supplied him with two ripe females of the same species. Their presence at once roused him to activity, and he soon began to build a nest of bits of dirt and dead fibre and of growing confervoid filaments, upon a jutting point of rock among some interlacing branches of *Myriophyllum spicatum*—all the time, however, frequently interrupting his labours to pay his addresses to the females. This was done in most vigorous fashion, the male fish swimming, by a series of rapid little jerks, near and about the female, and even pushing against her with open mouth, but usually not biting. After a little coquetting, if she be ripe, she responds and follows him, swimming just above him as he leads the way to the nest. When there, the tables are turned, the gentleman now coquets, he seems not to

* Since my paper was read, I have discovered that Mr. Charles Strange described the nest of the Tinker in 'Once a Week,' vol. i. p. 145. There is also a figure accompanying the communication, but that appears to be the nest of the three-spined Stickleback. Mr. Couch, in his 'History of British Fishes,' now in course of publication, remarks that he has never seen the nest of the Tinker.

know where it is, will not swim to the right spot, and the female, after a few ineffectual attempts to find the proper passage into it, turns tail to swim away, viciously chased this time by the male. When he first courts the female, if she, not being ready, does not soon respond, he seems quickly to lose temper, and, attacking her with great apparent fury, drives her to seek shelter in some crevice or dark corner. The coquetting of the male near the nest, which seems due to the fact that he really has not quite finished it, at length terminates by his pushing his head well into the entrance of the nest, while the female closely follows him, placing herself above him, and apparently much excited. As he withdraws she passes into the nest, and pushes quite through it, after a very brief delay, during which she deposits her ova. While she is in the nest, the male, in some impatience, pushes his snout against her tail, and as she passes through he also enters, fertilizes the ova, and then makes his exit at the opposite side. At once he proceeds seriously to attack the female and to drive her to a safe distance; then, after patting down his disturbed nest, away he goes in search of another female. In this case both the females spawned in his nest, and it is quite likely that more would have done so had I supplied them. The nest was built, and the ova deposited, in about twenty-four hours.

My Tinker continued to watch day and night; and during the light hours he also continued to add to his nest, which at first was a rather hurried and imperfect structure. After eight days I put a ripe female three-spined Stickleback into the tank with him. At once he paid court to her, and solicited her most palpably to accompany him to the nest; this, however, she obstinately refused, and he drove her away in real anger. During the night following she deposited her ova in another part of the tank among the weeds. This unwillingness of the female seems to be the sole cause of our finding no hybrids naturally, as artificially it is not difficult to get a cross between *G. leiurus* and *G. pungitius*. As the time approached for the eggs within the nest to hatch, the Tinker was even more constant in his attention to it. About the tenth day, before I could see any young Sticklebacks, he began, by mistake, to catch some young Perch, which just then were hatched in the same tank, and to project them into his nest. In order to be quite sure, I took some young Perch from another batch in a dish with a pipette, and put them into the tank near his nest. I saw him at once seize them, put them into his nest, and fan them afterwards with great apparent affection; this attention was, however, not appreciated; for the fry of the Perch are very erratic and wandering in their habits, and they swam out immediately with a skipping sort of motion. About the twelfth day young Sticklebacks were visible, but they seemed quite still, resting here and there upon the fibres of which the nest was built; none of them, as yet, seemed to have any errant desires, and not one of them wandered or gave their anxious parent any real trouble. About this time the Tinker was occasionally seen to visit and to inspect rather frequently another spot in the tank; and on the following day (the 14th) he began there to build another nest, this time free from any rockwork, and just in the middle of the tank, where a few branches of *Myriophyllum*, *Chara*, and *Anacharis* crossed each other; these he connected by an accumulation of interlaced, decayed, and growing fibres of confervæ, which he broke off or collected from neighbouring parts. When the fibres were added to the nest, he generally pushed them into the nest with his snout, but did not, so far as I could see, agglutinate them with a viscid secretion, such as I have seen the three-spined Stickleback do. When he brought bits of dirt, he was content to project them into or upon the mass of fibres which formed the nest. By dint of great industry, in about forty-eight hours he built a large well-formed nest, about the size and shape of a full-sized walnut, with a central aperture passing almost but at first not quite through it, in a direction nearly horizontal. During all this time he never interrupted his labours for, and care of, the young fry in his first nest, but continued both to catch the young Perch, and to watch and fan the nest; and after a few days he had to catch and bring back his own young ones when they began to wander. About this time his labours were incessant during the light hours; and although he seemed to take no food, he looked well. I then (the fifteenth day) put two ripe female ten-spined Sticklebacks into the tank; he courted them with great vigour; but as they did not respond, he drove them into the most distant and obscure corners with great ferocity: he then set to work with greater vigour than ever to enlarge and beautify his nest, and in the course of the following day the females deposited their ova in it so that they were easily seen, from the favourable position of the nest with regard to light. For three days more he continued his care of both nests, and caught indiscriminately young Perch and young Sticklebacks and put them indifferently into either nest. By the eighteenth day from the deposition of the ova in the first nest, and the sixth after hatching, the Stickleback fry were independent, and roamed in search of food; and from this date the parent took no more notice of them. I neglected to note whether the ova deposited in the second nest hatched safely; but I have reason to think that they did, as about a fortnight later I saw some very young Sticklebacks in the tank. This instance of the failure of instinct is remarkable, as the Tinker was almost starving in the midst of plenty. I am not aware that anyone has hitherto noticed the simultaneous building and tending of two nests by any of the *Gasterostei*; it would be interesting to ascertain if this be an exceptional fact, or limited to the ten-spined species. One would hardly expect it among the three-spined Sticklebacks, as they can and do enlarge their nests very considerably, so as in the nest of one male to receive, fertilize, and protect the spawn of several females. It is well known that the female Sticklebacks spawn more than once in a season; but it is not known, so far as I have read, how many times they spawn, nor how many times the males build; there will probably be a relation between the two. The observation here given shows at least two consecutive generations. This repeated ripening of ova in one season is doubtless connected with their large comparative size, and their consequent small number, as compared with those of other osseous fishes.—*Transactions of the Midland Scientific Association.*

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END OF THE SIXTEENTH VOLUME.

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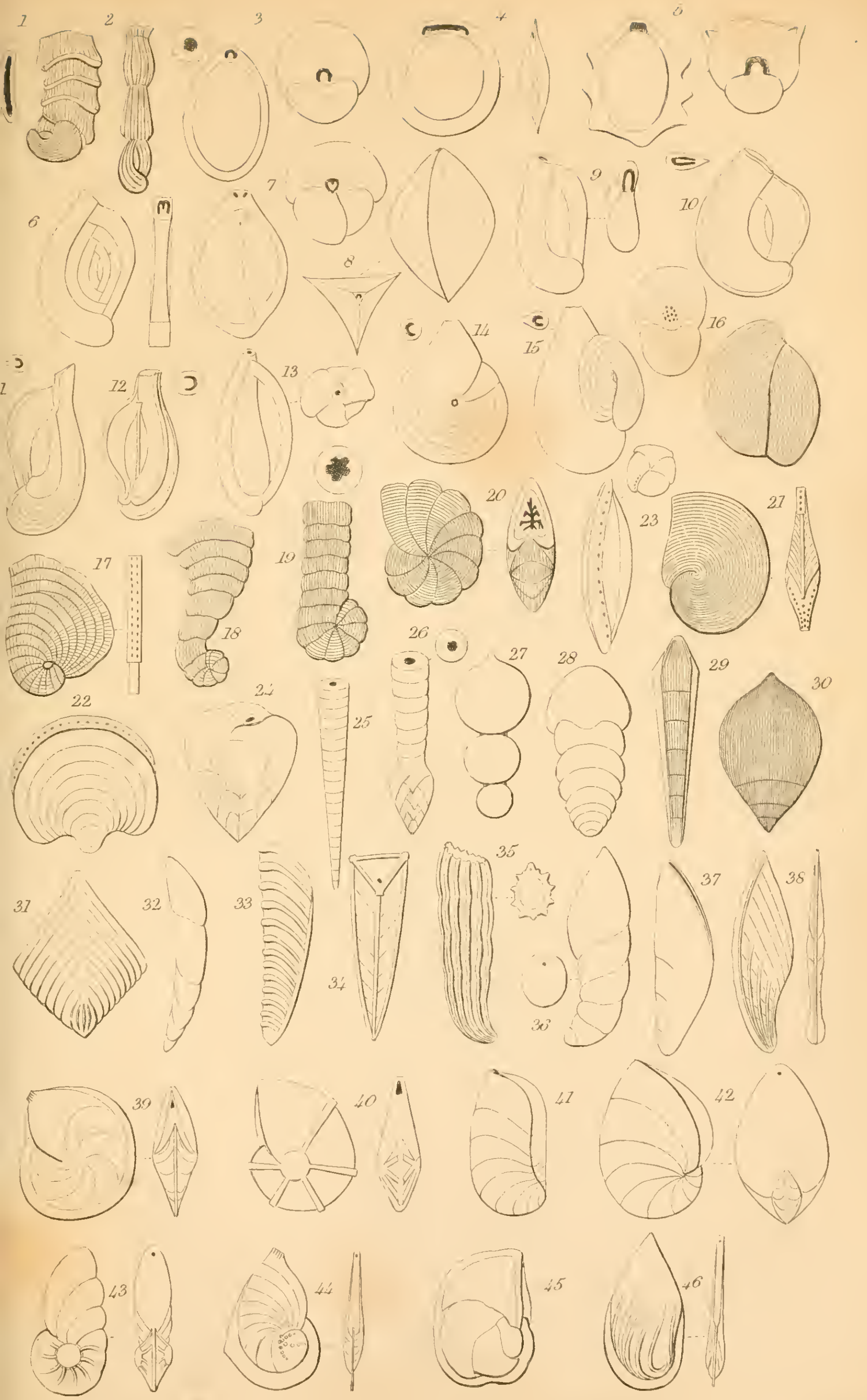
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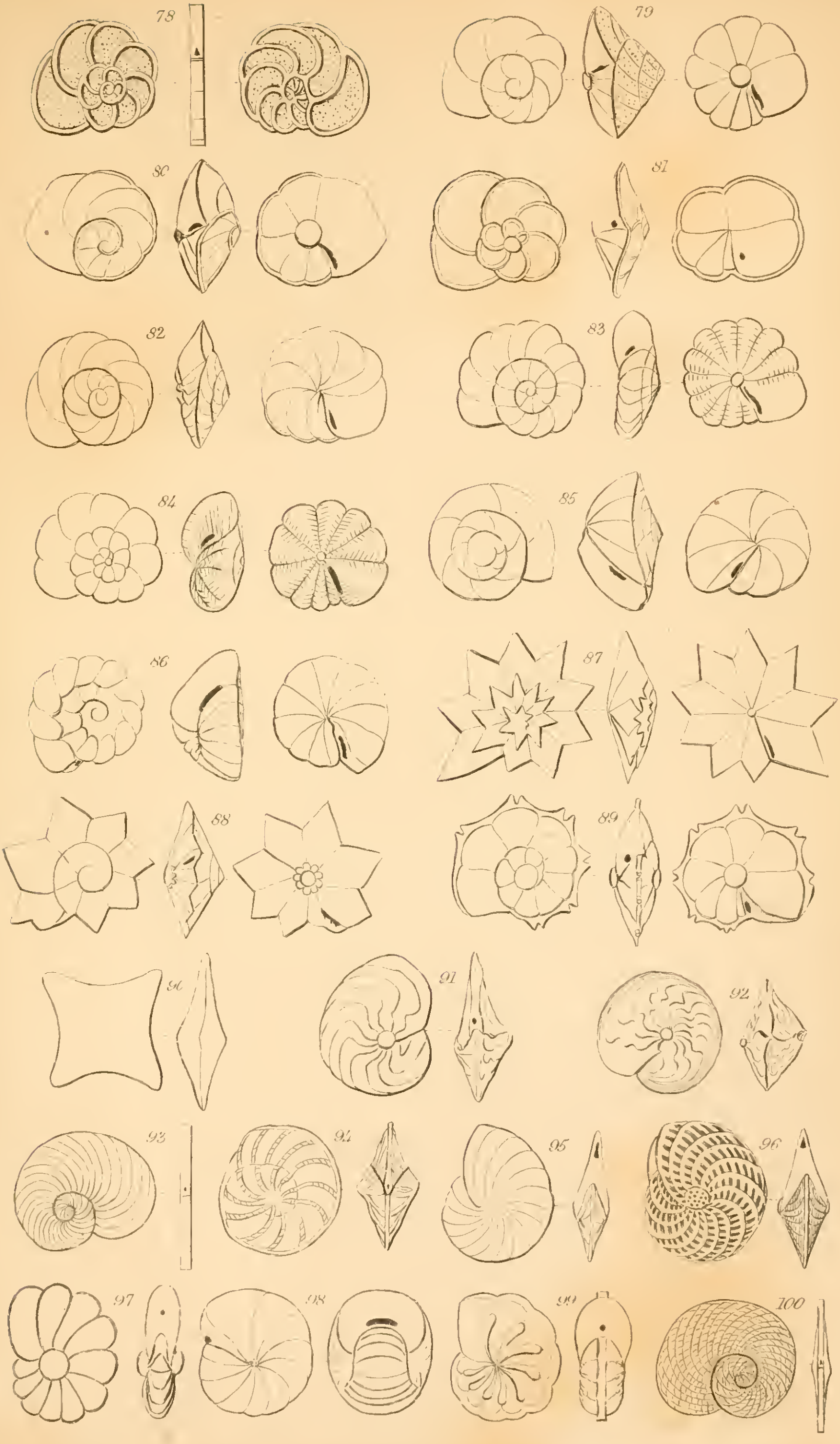
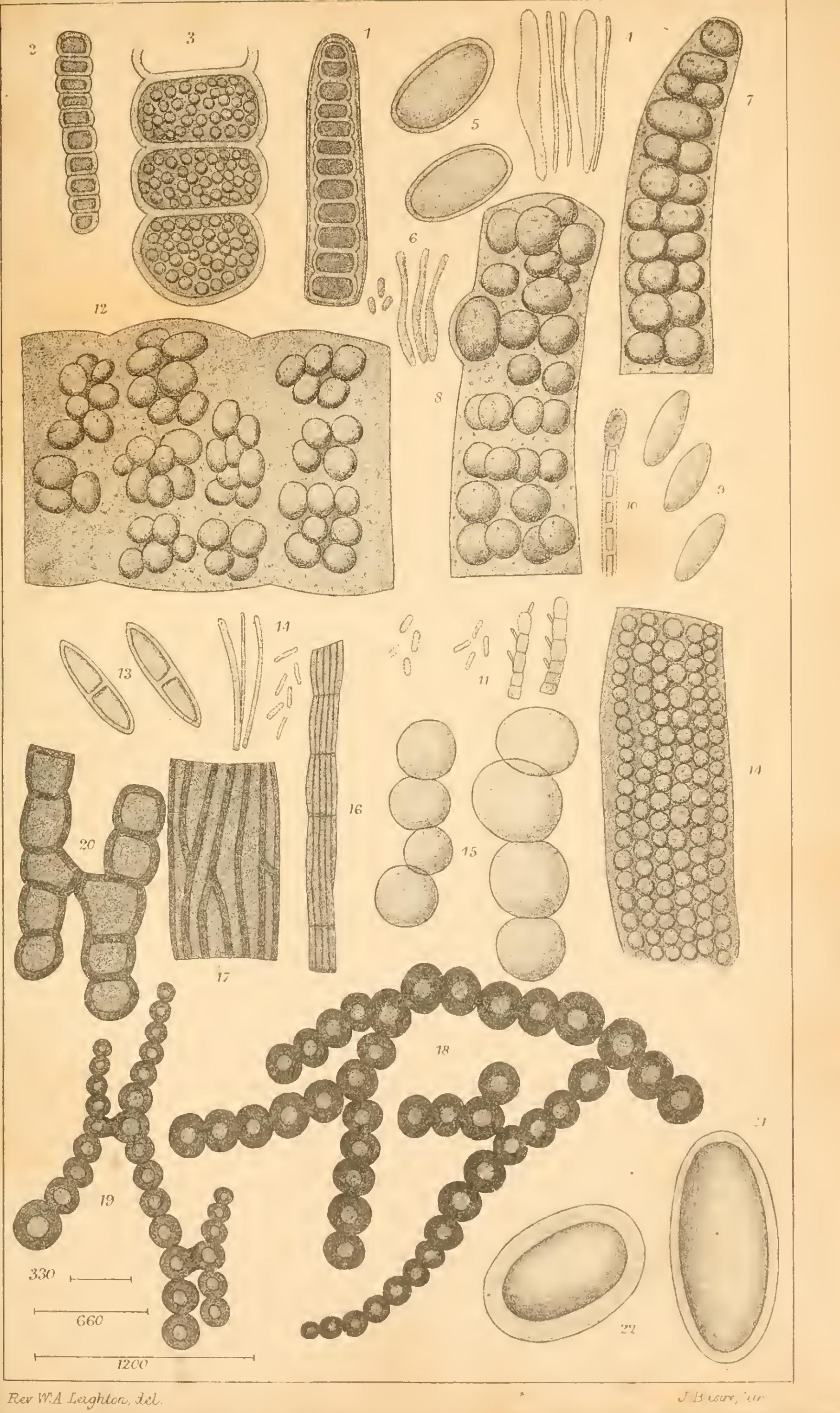
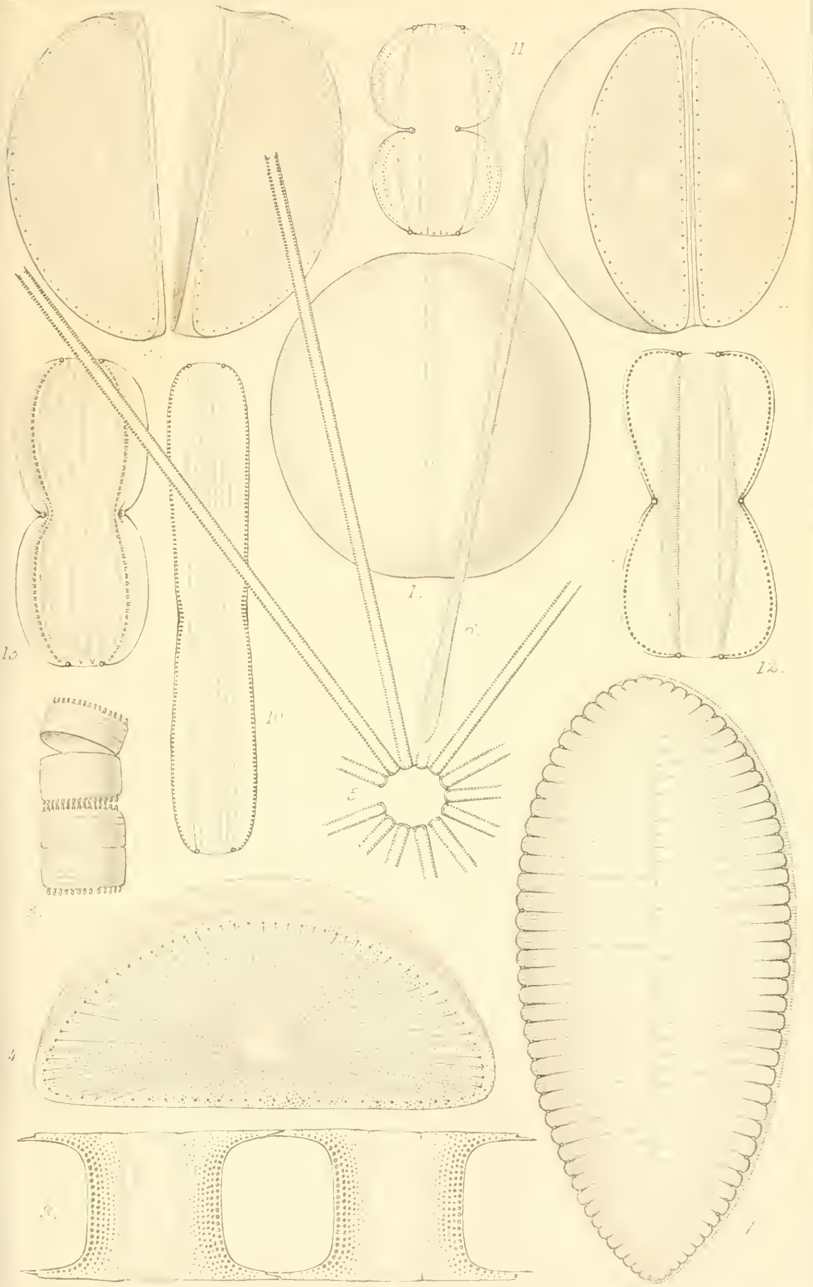


H. B. Brady del.

J. Basire sc



Rev W. A. Leighton, del. J. Basire, lith.



Index on p. 7.

J. Basire sc.

Cheekhooks and their sacs.

" their hard parts, plaits hooks.

Tongue.

αα Salivary glands.

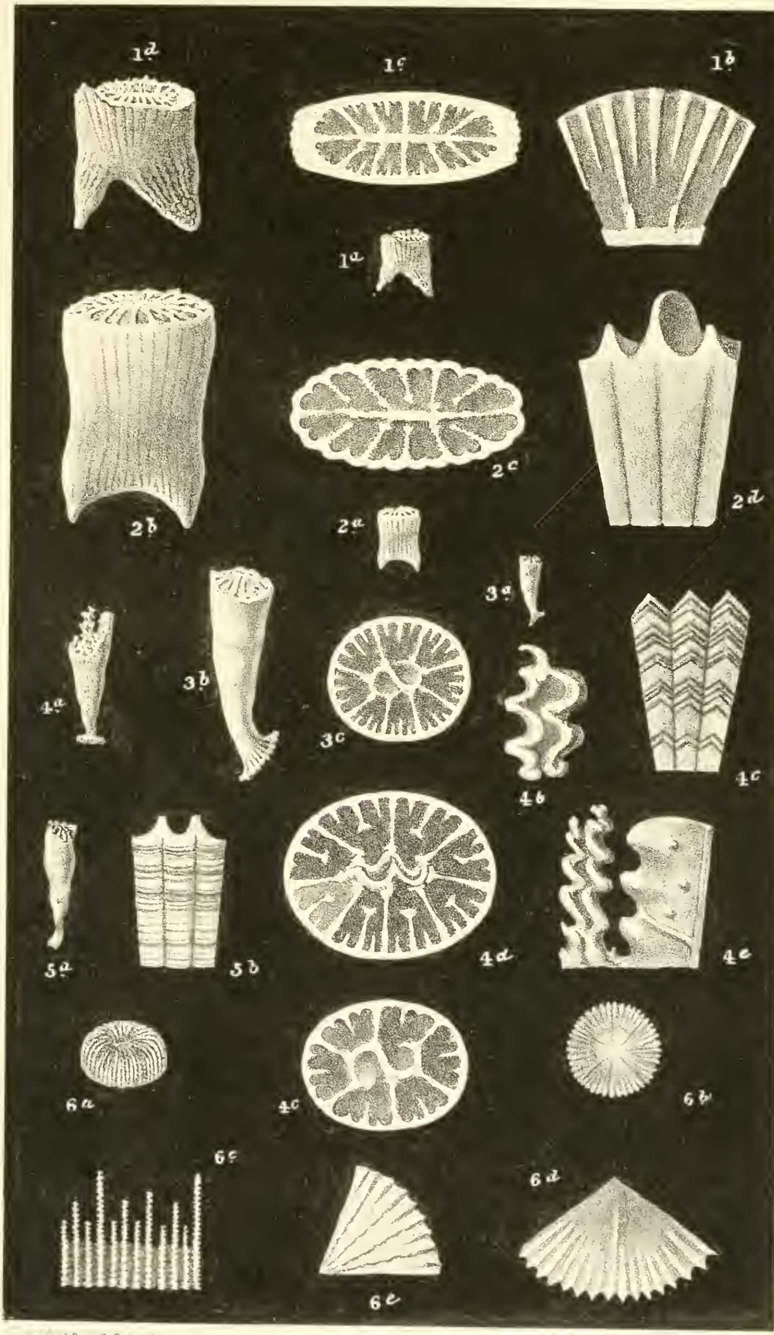
Intestinal Channel

Feet and epipodium

Telum.

A Suctorial Stomach

Egeon Alderi.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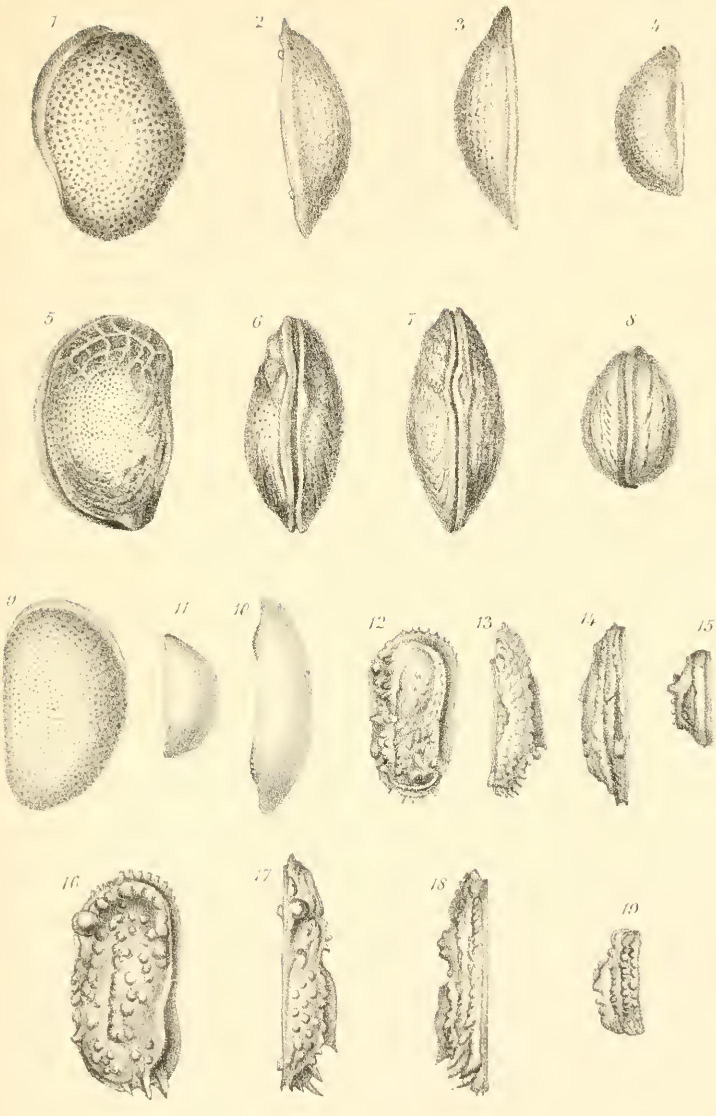
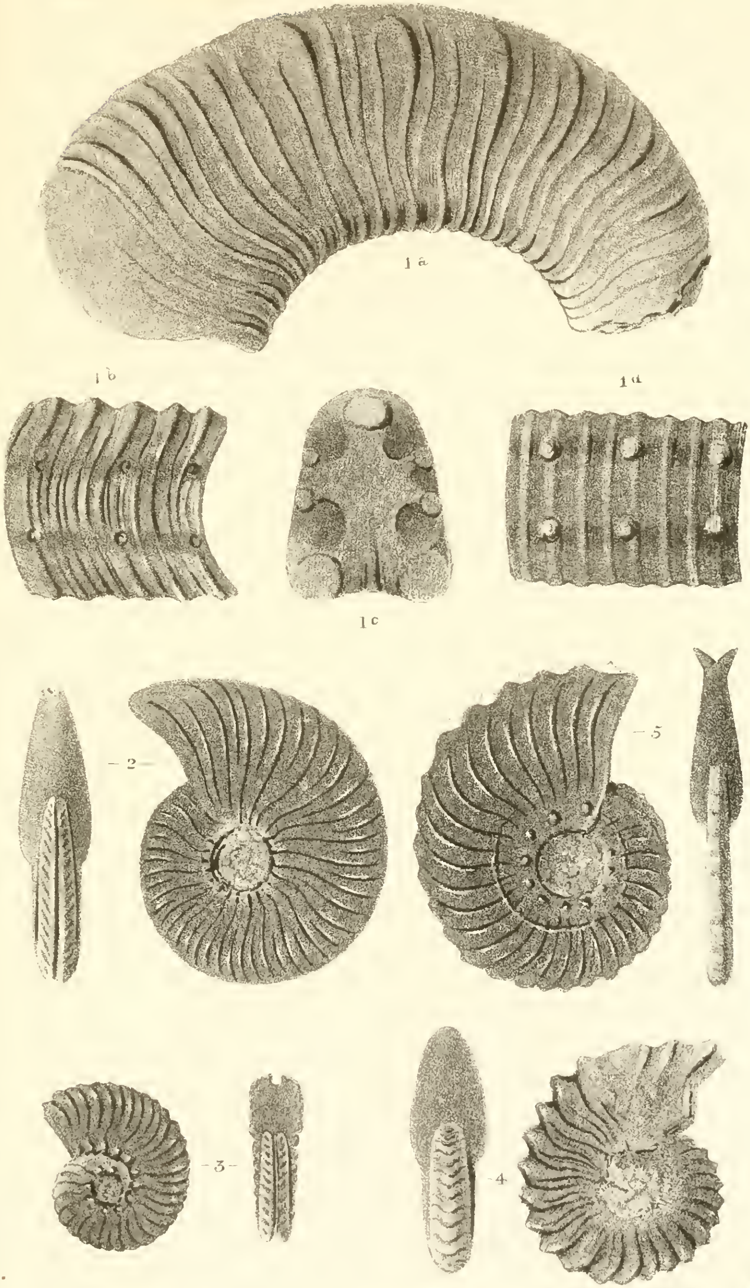


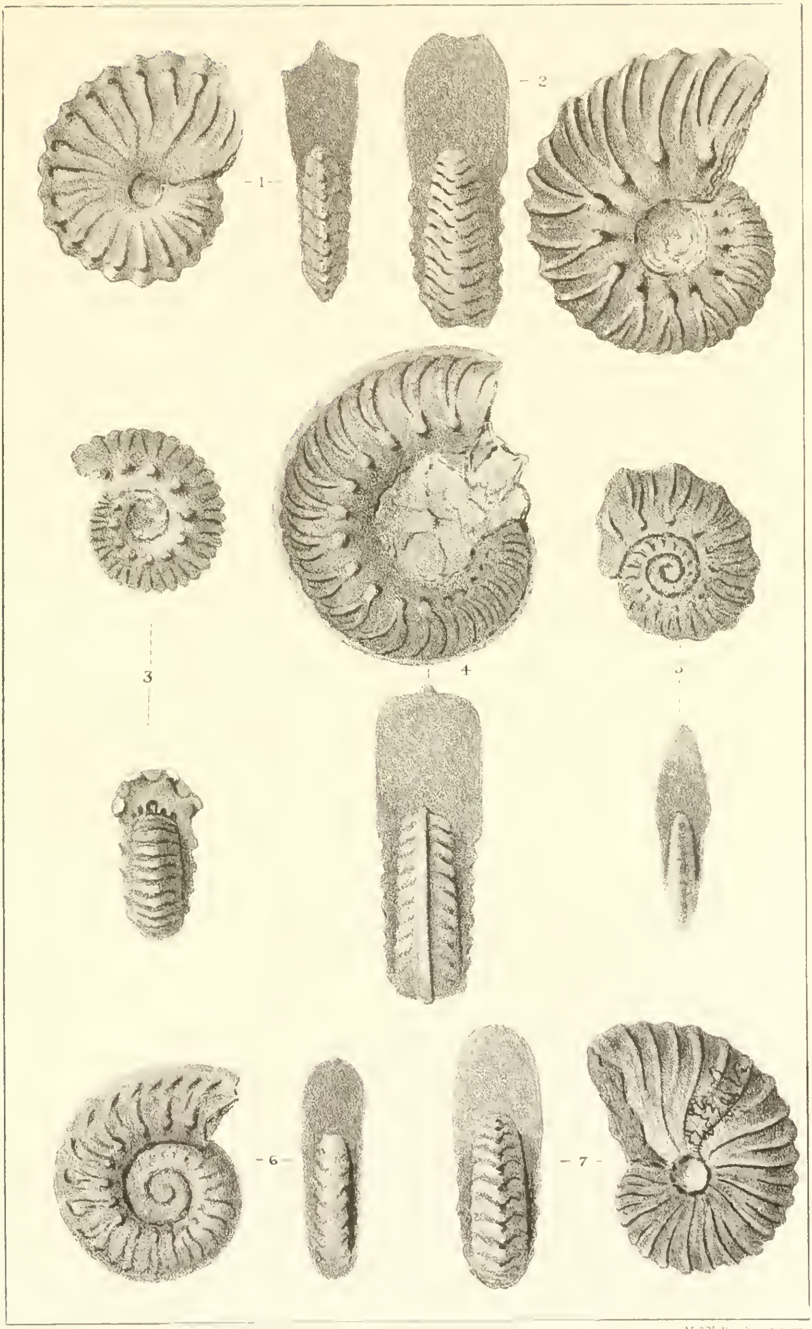
G. S. Brady del. T. West lith.

W. West imp.



De Wilde lith. ad nat.

M & N Hanhart imp.



[illegible] lith ad nat

M & N Hanhart imp

Fig. 1.

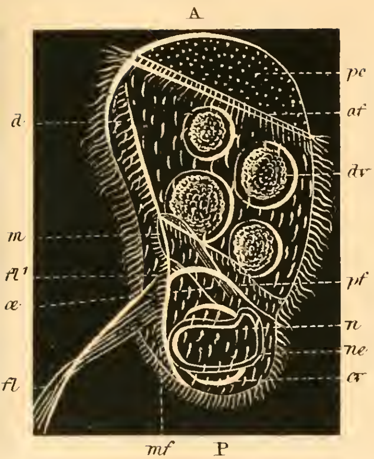


Fig. 2.

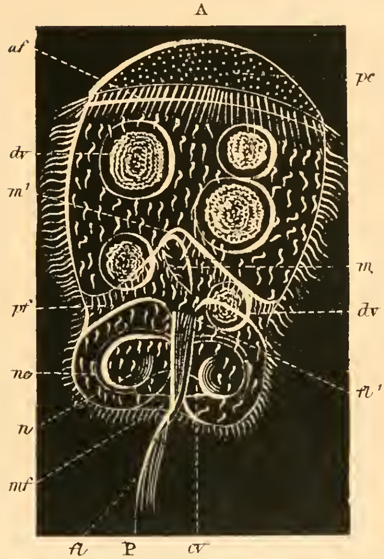


Fig. 3.

Fig. 4.

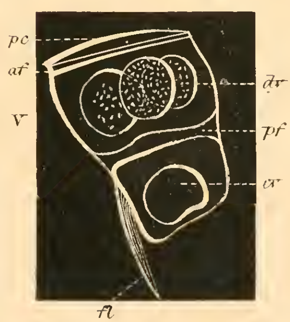


Fig. 5.

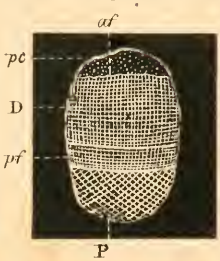
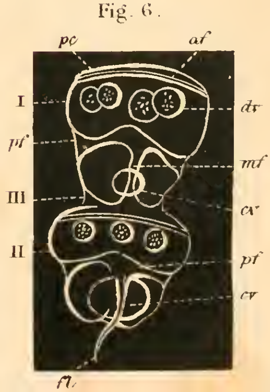
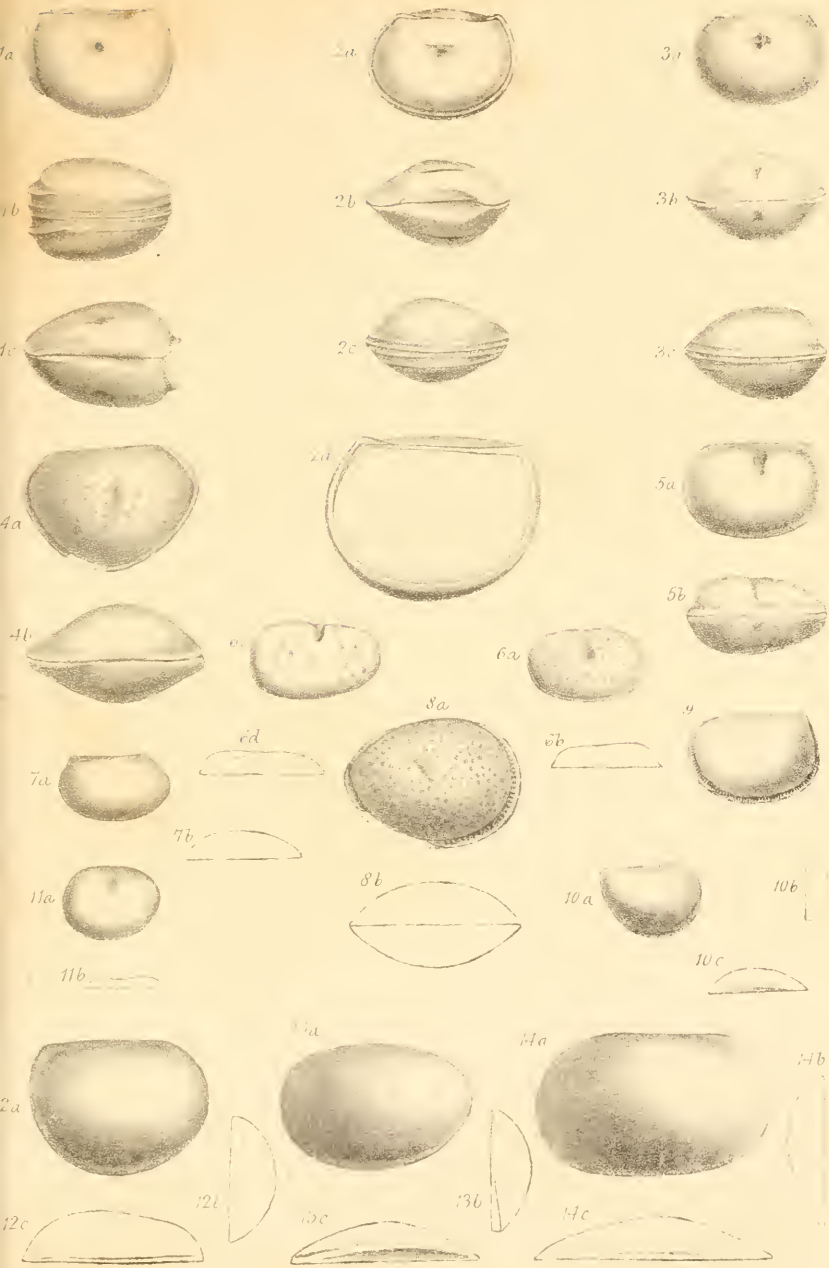


Fig. 7.

Fig. 6.





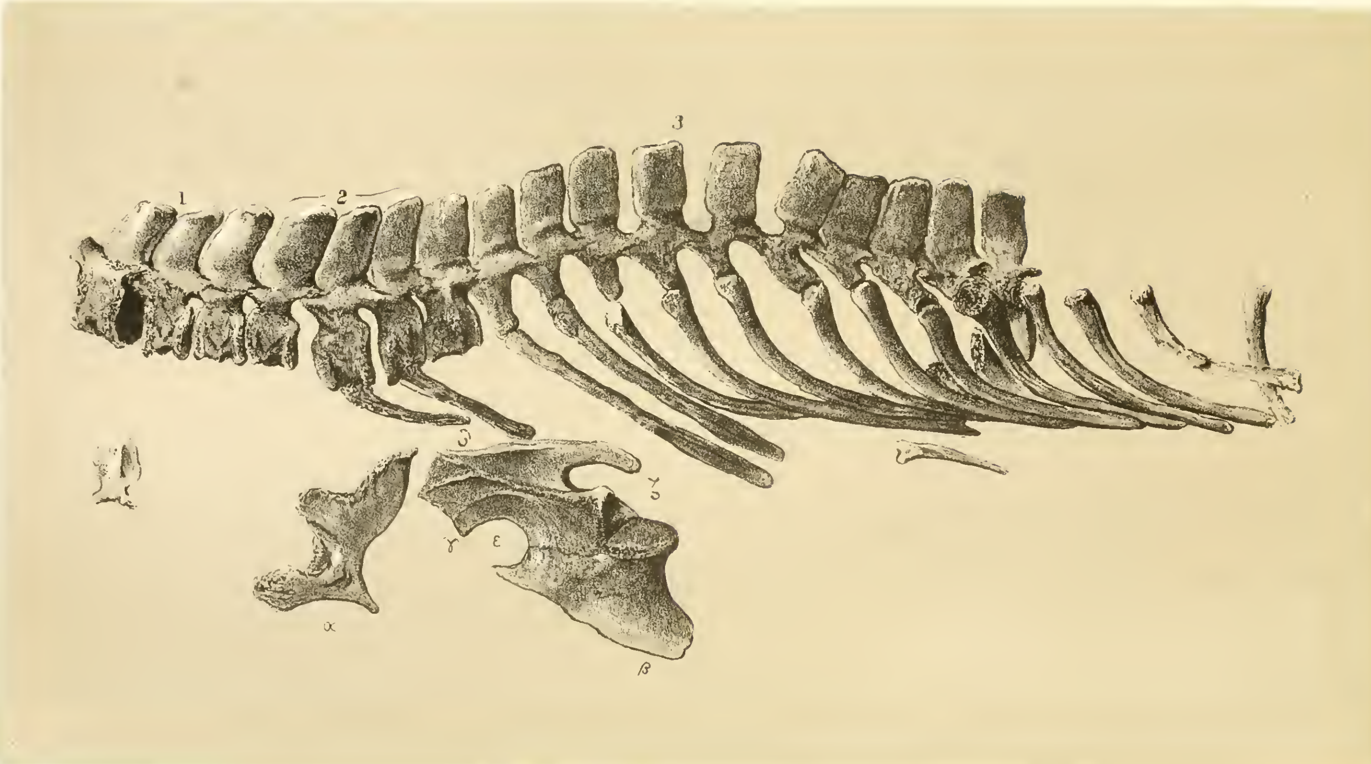
H. B. Holl & G. West del.

W. West imp.

Silurian Entomostraca.

De Wild lith

Hanhart, Imp[t]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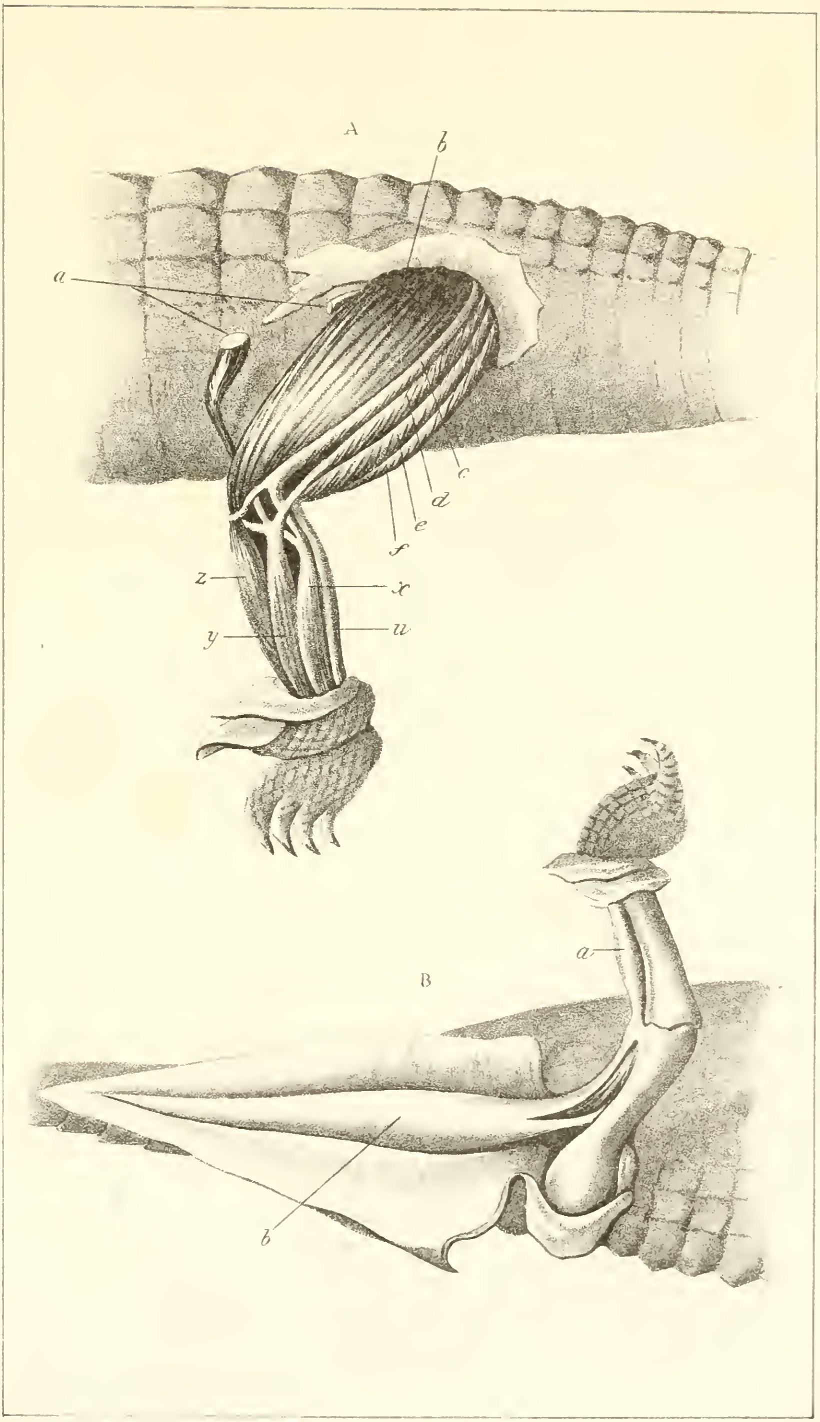

De Wilde lit.

M & N Hanhart, imp.