156

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I

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'MAGAZINE OF BOTANY AND ZOOLOGY,' AND OF LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

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1848.

"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.

. . . . 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.

CONTENTS OF VOL. II.

[SECOND SERIES.]

NUMBER VII.

NUMBER XI.

Page

NUMBER XII.

PLATES IN VOL. II.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY

[SECOND 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. 7. JULY 1848.

I.—*On some new Fossil Fish of the Carboniferous Period.* By Frederick M'Coy, M.G.S. & N.H.S.D. &c.*

M. AGASSIZ, besides the few carboniferous fish he has figured and described, gives a long list of manuscript names of fishes of this formation in the 3rd vol. of his 'Poissons Fossiles,' but being unaccompanied by any definitions or figures, it gives no information of the characters of the species, nor even secures their priority to the author; however, of the thirty unpublished species which he there names from the carboniferous limestone of Armagh, I have, through the kindness of Capt. Jones, R.N., M.P., been enabled to study the original specimens, and become well-acquainted with all except the *Cladacanthus paradoxus* and *Cricacanthus Jonesii,* of which I could learn nothing: admitting those twenty-eight then as already established, I can state that they are quite distinct from any of the following species.

I have great pleasure in acknowledging my obligations to Capt. Jones, not only for much valuable information on the fishes of this period, and access to his collections both in London and Dublin, but for the loan of many of the most interesting species described below, which I was thus enabled to draw and

* Read, and drawings of all the species exhibited, before the Cambridge Philosophical Society, June 5th, 1848.

examine at leisure. To Mr. Griffith of Dublin I am also indebted for the loan of some interesting forms from the lower carboniferous shales of Ireland. The Rev. W. Stokes of Caius College, Cambridge, allowed me to select a large suite of new and interesting forms from his Armagh collections, and having given me the opportunity of drawing and describing them, they were deposited in the collection of that University, whence I have also described a few species from the Derbyshire limestones collected by Mr. W. Hopkins, F.G.S. &c. To the Rev. Prof. Clark of Cambridge, and also to Mr. Anthony of Caius College, Cambridge, I am infinitely indebted for the use of their magnificent microscopes, and for the kindness with which they took the trouble to make microscopic sections for me of the new genera; without their most valuable aid I could not have presented the internal microscopic structure of those forms.

Cœlacanthi.

Holoptychius (Ag.).

When we look to the large number of species of this genus now known in the old red sandstone, all characterized by thick, bony longitudinally plaited scales, and the largest of them having but small conical teeth, sulcated at the base, and then compare them with those large compressed teeth in the carboniferous shales, such as the *H. Hibberti* (Ag.), of which Prof. Owen formed his genus *Rhizodus*, and the nearly allied, if not identical, *H. Portlocki* (Ag.) of the Irish shales, with their associated large, thin, rotundo-quadrate scales having the minute reticulated structure of *Glyptolepis*, I think it would be desirable, instead of considering the genera *Holoptychius* and *Rhizodus* synonymous as they are now held, to retain both generic names, but restricting each to such forms as those above noticed. In this point of view the following is the only true *Holoptychius* I have yet seen from the carboniferous limestone.

Holoptychius Hopkinsii (M'Coy).

Sp. Char. Scales elongate, narrow, elliptically pointed, very thick, convex; exposed portion strongly enamelled, covered with numerous thick, rounded, slightly flexuous, anastomosing, longitudinal ridges; concealed smooth portion deeply bifurcate, generally bent laterally at a considerable angle with the exposed portion. Length of enamelled portion 6 lines, width 3 lines.

The thick, narrow form and strong longitudinal ridges of the surface distinguish this species easily from its congeners. It abounds in some parts of the black impure beds intercalated between the carboniferous limestone and overlying shale of Derbyshire, from whence the specimens described were collected by W. Hopkins, Esq., who presented them, with a suite of fossils from that district, to the University collection at Cambridge. I have great pleasure in dedicating it to one who, as a mathematician, and as an observer in the field, has so materially advanced the science of geology.

Isodus leptognathus (M'Coy).

I provisionally apply the above name to a dentary bone of a Ganoid fish apparently allied to *Glyptolepis*. It is destitute of ornament, about 2 inches long and $3\frac{1}{2}$ lines deep at the broad end; it is slightly curved and tapers a little to a rounded extremity at the anterior end; the upper margin is minutely roughened and contains about thirty nearly equal teeth, nearly their own length apart, conical, about one line long and half a line wide at base; the upper portion is smooth and the base coarsely fluted as in *Rhizodus*, of which it also possesses the important internal character of the medullary cavity being conical and simple in the upper or smooth part of the tooth, and as it approaches the base abruptly branching into several root-like processes, one corresponding to each of the external flutings: from *Rhizodus* however the genus is distinct by the teeth being of nearly uniform size (not of *two* distinct sizes), and by the section of each tooth being circular instead of elliptical with cutting edges.

From the yellow sandstone shale of Moyheeland, Draperstown (Ireland).

(*Col.* Mr. Griffith at Dublin.)

Centrodus (M'Coy), n. g.

(Etym. *κέντρον*, *galli calcar*, and *ὀδοὺς*, *dens*.)

Gen. Char. Tooth simply conical, gradually tapering, slightly curved backwards, apex pointed, section circular throughout; medullary cavity large, conical, simple, so wide at base that the tooth is reduced to a thin edge; surface even, very finely striated longitudinally. Microscopic structure:—exceedingly fine calcigerous tubes radiating directly from the pulp-cavity towards the periphery, near which they terminate in numerous very minute calcigerous cells, beyond which is a narrow clear layer bounded by a definite dark line, outside of which is a coating of glass-like enamel, without perceptible organic structure under a power of 300 diameters.

Externally these teeth slightly resemble *Rhizodus* (Ow.), but are distinguished by their circular section, and wide, *simple* pulp-cavity, which latter distinguishes it from nearly all palæozoic teeth except the old red sandstone genus *Cricodus* (Ag.), from which it is known by its more slender conical form, and wanting the strong longitudinal ridges of the surface, as well as possessing the distinctly defined enamel layer, which has all the appearance of having been secreted by a distinct organ, and is quite different from the condensed dentine which forms the false enamel of most fish-teeth.

Centrodus striatulus (M'Coy).

Sp. Char. Tooth about half an inch long and $1\frac{1}{2}$ line in diameter at base; conical, gradually tapering to the pointed apex, with a slight backward curve; about one-fifth of the surface towards the apex perfectly smooth; the remainder, under the lens, is minutely and irregularly striated longitudinally.

This remarkable tooth, the only species I as yet know of the genus, seems to present all the characters, external and microscopic, of a true Saurian reptile; and when we compare it with Herman von Meyer's genus *Pistosaurus*, for instance, of the Laineckerberg Muschelkalk and other allied Saurians, the resemblance is such as to caution geologists against laying too much stress on the supposed first appearance of reptiles in the magnesian limestone, when drawing a line which would separate this group from the palæozoic rocks below.

Common in the bituminous carboniferous shale of Carluke, Lanarkshire.

(*Col.* Cambridge University.)

Colonodus (M'Coy), n. g.

(Etym. *κῶλον*, *ilia*, and *ὀδοὺς*, *dens.*)

Gen. Char. Tooth elongate-conic, very gradually tapering, section round near the base, becoming trigonal towards the apex; front even, sides impressed with short, alternating, transverse, wrinkle-like furrows; enamel-like surface smooth, highly polished, longitudinally marked with few, distant, minute impressed striæ; it terminates obliquely at the base, the edge being slightly notched or wrinkled; base forming a short, slightly dilated round disc, placed obliquely to the axis of the tooth, and extending farther behind than in front, truncated below and of a coarse osseous texture: medullary cavity about one-third the diameter of the tooth, cylindrical, from which, under the microscope, the flexuous, distant calcigerous tubes are seen to radiate directly to the surface, towards which they become gradually finer and closer.

This tooth is not unlike a bit of small intestine tied at the end, being nearly cylindrical, smooth, glossy, and slightly wrinkled transversely along the sides. In general external character it approaches most to *Dendrodus* and *Rhizodus,* but is destitute of the longitudinal flutings towards the base, which are so intimately connected with the internal structure of those teeth; the *transverse* wrinkling of the sides is also a strong external difference. The fine longitudinal scratch-like striæ of the surface resemble what we see in the enamel of *Suchosaurus,* &c. It is its internal microscopic structure which most perfectly distinguishes it from its allies, for by its simplicity it is at once widely removed from *Dendrodus*; and from *Rhizodus,* which it most nearly approaches in structure, it is distinguished (besides the differences in external conformation) by the much greater coarseness of the calcigerous tubes, and the greater space of blastema separating them: the difference is still greater towards the exterior; for while, in *Rhizodus,* the coarse tubes of the dentine terminate abruptly near the surface, ending in a layer of minute calcigerous cells, from which the infinitely finer and closer, straight tubes forming the enamel-like surface take their origin; in *Colonodus* the loosely flexuous calcigerous tubes are four or five times their diameter apart, and as they approach the surface they gradually become finer, a little straighter, closer and more numerous; but there is no layer of cells, no abrupt line of separation between the coarse tubes of the body of the tooth and the fine ones of the surface. The simplicity of its microscopic structure, and the simple round base distinguish *Colonodus* from central cusps of *Cladodus* (Ag.).

Colonodus longidens (M'Coy).

As there is but one species yet known, it is not possible to separate clearly the specific from the generic characters. However, the specimen on which those observations have been made is an almost perfectly straight, cylindrical tooth, the apex being unfortunately wanting, but enough remains to show that towards the extremity the anterior face becomes flattened so as to give an obscurely trigonal section; there are two alternating rows on each side of about thirteen or fourteen short transverse furrows, forming between them obscure wrinkles; the whole surface to the naked eye seems smooth and highly polished, but under a low power the fine, impressed, rather distant longitudinal sulci become visible. The whole tooth seems directed backwards at a considerable angle from its round bony base, and the inferior termination of the enamel-like portion is therefore very oblique to the axis of the tooth, being considerably lower in front than behind, the edge seeming of considerable thickness from a sharp constriction being immediately under it all round, beneath which again the osseous base thickens to form a little peltate mass. The length of the portion preserved is 10 lines, width at base 3 lines, broken extremity at the above length $1\frac{1}{2}$ line.

From the red carboniferous limestone of Armagh.

(*Col.* Capt. Jones, R.N., M.P.)

Placodermi.

I provisionally propose to establish a distinct family under the above name, to include those Ganoid fish of the palæozoic rocks having the head and body encased in a series of odd or central, and of subsymmetrical or lateral, bony, variously tuberculated plates of large size. It might probably include all the genera described by Agassiz in his 'Monog. du Syst. Dévon.' &c., under the title *Cephalaspides,* except *Cephalaspis,* to which that family-name might be retained, the other genera having no obvious affinity with it; in addition to these, the present group will conveniently embrace the genera *Bothriolepis, Asterolepis* and *Psammosteus,* which, although widely separated from the former by Agassiz and placed by him in his family of Cœlacanths, are so obviously and closely allied to some of them (e. g. *Chelyophorus, Coccosteus,* &c.), that they cannot be separated either by general appearance or any points of structure with which we are acquainted; while they differ, on the other hand, from the other *Cœlacanthi* by the body not being covered by imbricating scales. The teeth are conical and plicated at the base.

Osteoplax (M'Coy), n. g.

Gen. Char. Dermal plates large, flat, osseous, polygonal, with straight sides; surface irregularly and minutely wrinkled, with scattered pores. Microscopic structure:—vertical section showing large, distant, cylindrical, branched, vertical tubes (? Haversian canals) terminating in the pores of the surface; the spaces between these tubes containing numerous oval bone-cells, rather more than their own length apart, from each of which short radiating branches extend on all sides, about six to the length of a corpuscle. Horizontal section:—large, circular, distant openings of the vertical tubes, with numerous intervening minute, radiated, Purkinjean cells, the tubuli of which do not anastomose with those of the adjoining cells in either section. One species.

Osteoplax erosus (M'Coy).

Sp. Char. Bony plates 1 to 2 inches wide and about 1 line thick; edges square; surface with close, short, irregularly flexuous smooth grooves visible to the naked eye, and with distant, irregularly scattered oval foramina.

The remarkable bony plates to which I have given the above name vary in the number of their sides and the amount of the angles at which they meet; but the sides are always straight, and the surfaces flat and of uniform thickness. It is clear, from their form, that they cannot belong to the head, but must be viewed as dermal bones, covering some part of the body of a mailed fish. Of known genera they can only be compared with *Psammosteus* of the old red sandstone, to one species of which, the *P. meandrinus* (Ag.), the resemblance is particularly close, but the ridges of the surface are smooth in the present species and crenulated in the former. The two genera are well-distinguished by the internal microscopic structure, *Psammosteus* being composed of horizontal layers of large irregular cells, while *Osteoplax* has well-developed radiated bone-corpuscles.

Not uncommon in the schists belonging to the base of the carboniferous series at Cultra, Hollywood, county Down, Ireland.

(*Col.* Cambridge University.)

Psammosteus granulatus (M'Coy).

Sp. Char. A thin, shagreen-like expansion closely covered with nearly uniform hemispherical smooth tubercles, less than half their diameter apart (two in the space of a line), the base of each surrounded by a circle of minute granules.

This is an irregular fragment of rough shagreen-like integument, measuring about $2\frac{1}{2}$ inches in length and $1\frac{1}{2}$ inch in width; it is exceedingly thin. The species is closely allied to the *Psammosteus arenatus* (Ag.) of the Riga old red sandstone, but is distinguished by the tubercles having no sort of linear arrangement, and the granules surrounding the base are proportionably larger and rounder, not seeming like stellular denticles as in that species.

The specimen is from the fine black shale of the yellow sandstone (or lowest portion of the carboniferous system) of Kesh, river Banagh, county Fermanagh, Ireland.

(*Col.* Mr. Griffith.)

Psammosteus vermicularis (M'Coy).

Sp. Char. Surface covered with very minute conical tubercles, about six in the space of a line, irregularly placed, but averaging their own diameter apart, isolated, or two, three or four confluent to form small, irregularly twisted, vermicular ridges; the sides of the ridges and base of the tubercles denticulated with angular radiations (as in *P. arenatus*).

The specimen described is a reniform, convex plate, rather more than half a line thick, 1 inch 9 lines long and 1 inch wide, most probably belonging to the side of the head; not exactly agreeing with any bone I know in shape, but most like an operculum. The under surface is smooth (except the nucleus), the outer surface closely sculptured as above-mentioned. This species has the crenulations of the *P. arenatus* (Ag.), but the irregular, minute, and frequently confluent granules of the *P. undulatus* (Ag.); it is most nearly allied to the latter species, but the asperities, besides being crenulated, are smaller, more irregular, and the confluent ones more twisted and vermicular. The minute microscopic structure resembles that of *Psammosteus* generally, that is, four or five dense horizontal layers at the surface, beneath which the substance is composed of large irregular cells, about half their diameter apart, but irregularly arranged in the blastema.

From the yellow sandstone shale of Fallaghloon, Maghera, Ireland.

(*Col.* Mr. Griffith at Dublin.)

Chelyophorus Griffithii (M'Coy).

The specimens to which I give this name consist of a small jawbone, resembling the glossohyal in shape, about $11\frac{1}{2}$ lines long, obtusely pointed at the anterior end, and gradually increasing to nearly 2 lines in depth towards the posterior extremity, which is abruptly acuminated or wedge-shaped; the upper edge shows seven or eight small, curved, smooth conical teeth, their length rather more than twice their width, and the distance between them rather greater than their length; the surface of the margin has three or four rows of slightly elongate, closely-placed tubercles; towards the middle and lower part of the bone the tubercles elongate into short ridges, arranged in lines, which meet at an angle of 45° along the middle of the side, the angle pointing backwards on the posterior half, and forwards on the anterior half, so as to have a confused rhombic space at the middle of the bone; all the ridges and tubercles are glossy, very closely placed, and finely crenulated at their margins. The second specimen is a bone probably from the side of the occiput, resembling the portions of *Chelyophorus Verneuili* (Ag.) in figs. 17 and 18. pl. 31*a* of Agassiz, Monog. Old Red, &c.; the granulation of the sculptured portion is rather more distinct, forming lengthened tubercles in one part and subparallel ridges in another, and all minutely crenulated on the sides. The sculpturing of the two specimens is identical in character, both with each other and with the old red *Chelyophori*, differing from the *C. Verneuili* principally in the crenulation of the side of the tubercles.

They are both from the lowest carboniferous shales of Cultra, Hollywood, county Down, Ireland.

(*Col.* Mr. Griffith at Dublin.)

Coccosteus? carbonarius (M'Coy).

Sp. Char. Mesial (ventral?) plate very narrow; sides converging at an acute angle, apex rounded; mesial keel obtusely rounded, height in the middle one-fourth of the width; surface closely covered with rounded polished tubercles, varying from one-fourth to one-half of a line in diameter (generally the latter), each surrounded at its base by a little, closely applied, milled, or radiatingly sulcated collar; the intervening flat space faintly striated, and generally traversed by a small, smooth ridge which winds irregularly between the more distant tubercles.

The character of the sculpturing determines the reference of this species to either *Coccosteus* or *Asterolepis,* but as no lozenge-shaped plate similar to the central inferior one of *Coccosteus* has yet been demonstrated in *Asterolepis,* I think the reference, with a mark of doubt, to *Coccosteus* is most correct, a view which is also strengthened by the small size of the tuberculation. The genus has not hitherto been found out of the old red sandstone. The specimen above described being perfect only at one end, might be taken for the pointed posterior extremity of the dorsal plate of a *Coccosteus*; but as there is no indication of the little fossa invariably found near the termination of the mesial keel of that plate, it most probably belongs to the under side of the body. The prominent circle at the base of the tubercles, like the spine-basis of a *Cidaris,* strongly reminds us of the *Asterolepis speciosa,* but the tuberculation is very much smaller. The inter-tubercular salient line or ridge does not occur in any *Pterichthys, Coccosteus* or *Asterolepis* I am acquainted with. A second specimen, a portion of a flat plate from some other part of the body, shows the same size of tubercles and style of ornament, but rather more crowded in some parts and with wider spaces in others; one or two of the tubercles also, instead of being smooth and polished, show a faint, flexuous radiating striation from the centre to the thickened milled base. The width of the ventral plate at $1\frac{1}{4}$ inch from the point is only 1 inch, the sides converging straight to the apex from this distance.

Both examples are from the carboniferous limestone of Armagh.

(*Col.* Capt. Jones, R.N., M.P.)

Asterolepis verrucosa (M'Coy).

Sp. Char. Surface of plates closely covered with prominent, oval, conical tubercles, averaging from one-third to one-half of a line in diameter, and less than half their diameter apart, each radiatingly sulcated from the apex to the margin, the deep sulci forming between them usually fourteen strongly defined, rough ridges from the apex, each of which is again divided by a short sulcus at its base; tubercles abruptly defined from the flat surface on which they rest; intervening surface with minute radiating striæ.

The specimen examined of this, which is one of the rarest ichthyolites of the mountain limestone, is an irregular fragment about $1\frac{1}{4}$ inch long and 5 lines wide; it is impossible to suggest what part of the body it belonged to. The genus has not been recorded before in the carboniferous limestone.

From the same locality and in the same collection as the last.

[To be continued.]

II.—*Notice of a new species of* Antrophyum. By R. K. Greville, LL.D. &c.*

[With a Plate.]

In addition to the two new species of ferns (*Oleandra Sibbaldii* and *Grammitis blechnoides*) recently communicated to Professor Balfour by Dr. Sibbald from the island of Tahiti, I have now to submit the description of a third to the Botanical Society. The discovery of this plant is an additional proof how much remains to be done in an island where numerous collections have been made, but which is evidently still rich in undescribed productions. It is to be hoped that Dr. Sibbald will have an opportunity of revisiting Tahiti under more favourable circumstances, and that he will add largely to his collections, especially of ferns and mosses.

The interesting fern which forms the subject of this short notice belongs to *Antrophyum*, a genus having undivided, more or less lanceolate fronds, in which the sori form continuous grooved lines on the simply reticulate venation. *Antrophyum* is thus nearly allied to *Hemionitis*, from which, it must be confessed, it scarcely differs, except in the simplicity of the frond, for the grooved sorus is a somewhat variable character.

There is however another genus, *Polytænium* of Desvaux, which has been separated on, as it appears to me, more slender grounds. In that genus the sori are not reticulated, but form

* Read before the Botanical Society of Edinburgh, 11th May, 1848.

uninterrupted parallel lines, connected however by non-soriferous veins.

The plant I am about to describe seems to do away with such a distinction; for in it the sori are parallel, uninterrupted, and might be described as remotely forked rather than reticulated, and so seldom does *any* division in the sorus take place, that it is sometimes simply continuous for two or three inches together.

Antrophyum Grevillii (Balfour in herb.); fronde sessili, late lineari-lanceolata, inferne præcipue attenuata, soris approximatis, parallelis, longissimis, villosis, remote furcatis.

I cannot find any described species of *Antrophyum* which at all corresponds with Dr. Sibbald's specimens. The fronds are tufted, ten to eighteen inches in length, fully an inch broad in the widest part, from whence they become insensibly narrower towards the base, which however never passes into a true stipes, although there is for the space of two or three inches an obscure midrib. The sori, which constitute the most remarkable feature, are so approximated as to be not more than a line apart, forming twelve or more uninterrupted lines, which sometimes divide at very remote intervals, but scarcely ever anastomose. The capsules, which are similar to those of the other species of the genus, are almost quite concealed by the mass of ferruginous hairs which arise along with themselves from the soriferous vein.

EXPLANATION OF PLATE I.

Fig. 1. *Antrophyum Grevillii*, nat. size.
— 2. A portion of the frond, showing the groove and soriferous vein.
— 3. A capsule with some of the ferruginous hairs.
— 4. Seeds.

III.—*A Description of some new Species of Fishes from the Sea surrounding the Island of Barbados.* By Sir Robert H. Schomburgk, Ph.D., Member of the Imperial Academy Nat. Curios. &c.*

It is much to be regretted that we do not possess as yet a systematical description of the fishes which inhabit or frequent the sea surrounding the West Indian Archipelago. If we consider that this group of islands extends from the Orinoco to East Florida, over more than eighteen degrees of latitude, namely from 9° to 27½° north, and over twenty-seven degrees of longitude, the interest attached to this great expanse of sea may be conceived. It is true we find occasionally a description of some so-

* Reprinted from the 'History of Barbados.'

litary specimens from the West Indies in the works of Catesby, Bloch, Schneider, and in the great systematical work of Cuvier and Valenciennes, but I am not aware that there exists a local marine fauna of any of these islands which might assist in the compilation of a more extensive ichthyological work on the West Indies.

The great interest which I feel in this science induced me, during my late sojourn in the island of Barbados, one of the group of the West Indies*, to make a collection of such fishes as are found in the sea which surrounds it, and in which I was most materially assisted by C. K. Bishop, Esq., of Orange Hill in Barbados. The greater number of these fishes were determined by Professor Dr. Müller and Dr. Troschel of Berlin, and have been published, with others which I collected, in my 'History of Barbados†.' The species and varieties which are enumerated or described amount to one hundred and twenty. It is evident that this list contains only a small portion of the finny tribe of the surrounding sea, and I doubt not that if some ichthyologist were to dedicate himself to this district alone, he would quadruple that number. Indeed the fishes described in my work do not even contain all the species which were collected in Barbados, as a number which were procured after my departure arrived too late to be forwarded to Berlin, and I presented this collection to the British Museum. The distant hope that Dr. Troschel would visit London in the course of the last summer prevented me from taking any further measures for their determination.

When the systematical arrangement of the numerous treasures of the ichthyological department of the British Museum is once entrusted to some good ichthyologist, and a description of the new genera and species is combined with it, (and I have been given to understand there are some hopes of seeing this accomplished,) it will then prove much easier to compile a marine fauna of the West Indian Archipelago, to which the present enumeration of the fishes around Barbados may prove a useful contribution.

As my 'History of Barbados' possesses only local interest and is not likely to fall into the hands of naturalists generally, I avail myself of the greater publicity of the 'Annals of Natural History' to present herewith a description of the new genus *Caprophonus*, and of such species of known genera as Professor Müller and Dr. Troschel considered to be new among the collection, or where

* The position of Bridgetown, the city of the island, is in latitude 13° 4′ north and longitude 59° 37′ west from Greenwich.

† 'The History of Barbados, comprising a geographical and statistical description of the island; a sketch of the historical events since the settlement, and an account of its geology and natural productions.' London, Longman, Brown, Green and Longmans, 1848, pp. 665–678.

the specimens slightly deviated from former descriptions. I beg to observe, that to the descriptions of these two distinguished ichthyologists inverted commas have been affixed for the sake of distinction. The trivial names are those by which the fish is known to the fishermen in Barbados.

I. ACANTHOPTERI, *Müller*.

Fam. Percoidei, *Cuv.*

Serranus impetiginosus, Müll. et Tr. nov. spec. Rock Hind. D. 11+17 : A. 3+8.

"The body of the fish is covered with round dark-coloured spots of the size of a pea. They are less numerous on the fins and the snout; a larger oblong black spot embraces the three last spines, and the first soft ray of the dorsal fin; another spot of similar size and colour is behind the dorsal fin on the back of the tail."

Serranus ouatalibi, Cuv. et Val. Hist. Nat. des Poissons, ii. p. 381. Yellow Velvet Fish. D. 8+16 : A. 3+8.

"The upper jaw is covered with numerous little scales; this fish does not belong therefore to Cuvier's group of 'the Merous.'"

Serranus guativere, Cuv. et Val. *l. c.* ii. p. 383. Yellow Velvet Fish. D. 9+15 : A. 3+9 : P. 17.

"Upper jaw scaly, preoperculum with a concavity above the angle, operculum with three flat spines. The prevailing colour of this fish is yellow; from the bony part of the dorsal fin extends a broad black spot to the anal fin; on the head and upon the sides of the body are a few white shining dots surrounded by darker circles, and on the back of the tail two black spots: the caudal fin is truncated. The colour of the upright fins seems to have been red; the rhombic pectorals and ventrals are yellow."

Plectropoma monacanthus, Müll. et Tr. nov. spec. Jew Fish (?). D. 11+19 : A. 3+9 : P. 16.

"This fish is distinguished from all other species of the genus *Plectropoma* by a single strong spine in front of the angle of the preoperculum: the colour is brownish with darker spots upon the sides, and some roundish spots of a lighter colour on the belly; the pectoral fins are rounded." It lives in shallow waters along the coast.

Centropristes auro-rubens, Cuv. et Val. *l. c.* iii. p. 45. Plump-head Snapper.

"The species from Barbados possesses strong spines on the lower margin of the preoperculum."

Centropristes macrophthalmus, Müll. et Tr. nov. spec. Brass-scale Snapper. D. 10+11 : A. 3+8 : Length one foot*.

"The breadth of the suborbital bone, under which the upper jaw can be hid in a great measure, is equal to half the diameter of the eye. The eye is larger than the space between the eyes, and amounts to a third of the length of the head. The bone over the eye is compressed. The colour is red with numerous darker spots upon the sides of the body and the angles of the scales. The last ray of the dorsal and anal fin is elongated. It resembles in a great measure *Serranus filamentosus* of Cuv. et Val. (*l. c.* vi. p. 508), which must be removed from the genus *Serranus* and added to *Centropristes*, where it will occupy a place near the species above described. This observation refers likewise to the following."

Centropristes oculatus, Müll. et Tr. *Serranus oculatus*, Cuv. et Val. *l. c.* ii. p. 266. Bream or Brim.

The species of this genus are abundant in the sea around Barbados. They are used as food, although they cannot be compared to the "Black Harry" of the Americans, which belongs to this genus, and is one of the most esteemed for the table.

Priacanthus boops, Cuv. et Val. *l. c.* iii. p. 103. Goggle-eye Snapper (?). D. 10+13 : A. 3+13.

"The Barbados specimen has perpendicular bands on the back, and several dark spots between the rays of the perpendicular fins. A specimen which the Berlin Museum received from the Museum in Paris, shows also traces of coloured bands."

Fam. Mænides.

Gerres Zebra, Müll. et Tr. nov. spec. Shad. D. 9+10 : A. 3+7.

"The snout is short, the eye large, the preoperculum without denticulation. The colour is silvery, steel-blue above; five or seven vertical bands give it some resemblance to *G. subfasciatus* of Cuv. et Val. The height of the body is a third of its length, and contains $2\frac{1}{2}$ times the length of the second and third spine in the dorsal fin, and three times of the second spine in the anal fin."

The Barbados Shad, although, properly speaking, a sea-fish, is frequently found in ponds, where they are preserved, and increase considerably in size and improve in taste.

* By a misprint in the 'History of Barbados,' p. 666, the length is erroneously stated as one inch.—R. H. S.

Fam. Squamipennes, *Cuv.*

Pempheris Schomburgkii, Müll. et Tr. nov. spec.* Hatchet Fish.

It is the opinion of Müller and Troschel, "that this species differs from *Pempheris mexicana* of Cuv. et Val. which is found in the Pacific Ocean. It agrees in form with the other, but the West India species has a spine less in the dorsal fin."

Fam. Scomberoidei, *Cuv.*

Caprophonus, Müll. et Tr. nov. gen.

"This interesting new genus agrees with *Capros* in general, but it may be distinguished from it by a single series of teeth in the upper and lower jaw; by the roughness of the maxillary, and by the three spines of the anal fin, which form a fin separate from that of the soft rays."

Caprophonus Aurora, Müll. et Tr. Hatchet Fish (?). D. 8+34: A. 3+32: V. 1+5. (B. 5.)

"The body is much compressed, and the height nearly equals the length. The profile from the highest part of the back to the mouth shows two depressions; the anterior is situated before the eyes, the other near the summit of the back. The anterior line of the profile has almost a rectangular direction toward the posterior line. The profile of the belly is circular. The head forms one-third of the whole length of the fish, excluding the caudal fin. The mouth is a little protractile, and nearly vertical when closed, and the lower jaw forms the end of the mouth. The intermaxillary is inserted into a deep incisure at the front, and its hinder apophysis separates the two maxillaries. The genus *Capros* has not that incisure at the front, and the two maxillaries meet together in such a manner that the apophysis of the intermaxillary is inserted under the maxillaries. Both jaws are armed with a single row of close-set small conical teeth. The large eyes are in the middle of the height of the body. The distance of the eye from the snout and from the other eye is equal to the diameter of an eye. Over each eye is a point from which lines radiate on all sides. The posterior margin of the preoperculum is rectilineal and nearly vertical; the lower margin is rounded and armed with rough teeth. The nostrils are near the eyes. The dorsal fin begins on the summit of the back, with a very short pointed spine; the second spine is three times larger than the first, the third spine is five times larger than the second, and is

* Professor Dr. Müller and Dr. Troschel have had the goodness to describe this new species under the above specific name. While I recognise the kindness which dictated this distinction, I feel reluctant to be the herald of the honour bestowed upon me.—R. H. S.

contained five times in the height of the body; it is thick and streaked longitudinally on its sides, and rough on the anterior side. The other spines are shorter, and decrease in size successively. The spines of the dorsal fin are eight in number; the soft part of the fin contains thirty-four rays nearly equal in size; they are covered on the base with scales, and cannot be put down. A membrane joins the three spines of the anal fin, but they are not united with the soft part of the fin, and form therefore a separate fin; the first of these spines is the largest. The soft anal fin has thirty-two rays similar to the soft rays of the dorsal fin. The pectoral fins are attached to the body at two-fifths of its whole height. The ventrals contain a very strong streaked spine; the soft rays are rough on the internal side in front and on the external side behind. The caudal fin is truncated. The scales are large and armed with small spines on the uncovered part, as in *Capros*. The lateral line ascends at first abruptly parallel to the profile in front, makes an angle beneath the summit of the body, descends rectilinear to the tail and follows it horizontally. The colour of the fish is red; the length of the specimen six inches, the height five inches."

Fam. MUGILOIDEI, *Cuv.*

Acherina stipes, Müll. et Tr. nov. spec. Loggerhead Fry. D. 5−1+9 : A. 1+12.

"This species agrees with *A. Boieri* of Risso in form, largeness of the eyes, and in the position of the dorsal fin over the end of the ventrals. The head is broader than the diameter of an eye, and flat above. From the snout extend two furrows backwards; on each side of the upper surface of the head is a sharp undulated edge, forming the upper margin of the orbit. The teeth are numerous and distinct on both jaws, and on the palate: the caudal fin is forked."

Fam. GOBIOIDEI, *Cuv.*

Clinus pectinifer, Cuv. et Val. *l. c.* xi. p. 574. Rock Fish or Rocker.

"There are two varieties of this species; the sides of the body of one have a reticulated appearance, and those of the other are barred with six perpendicular bands, which extend to the superior margin of the dorsal fin. The anal fin is likewise marked by six perpendicular bands."

Clinus capillatus, Cuv. et Val. D. 18+8 : A. 2+19 : P. 14 : V. 3 : C. 12. Yellow-fin Rock Fish.

Gobius Bishopi, Müll. et Tr. nov. spec. Rocker.

"This new species belongs to that group of the genus *Gobius*, of which the upper rays of the pectoral fins end in numerous threads, and approaches perhaps nearest to *G. soporator* (Cuv. et Val. *l. c.* xi. p. 56). The profile is somewhat inclined, and the cleft of the mouth is therefore oblique as far as under the eye. The space between the eyes is scarcely equal to a diameter of the eye. On both jaws is a band of villiform teeth; those in the outer row are stronger and larger. Both dorsal fins are of equal height; the last ray of the second is not elongated; the caudal fin is rounded. The prevailing colour is a yellowish gray, with four large dark spots like broad bands: several irregular spots of smaller size are beneath them, and there are likewise some on the tail: length four inches*."

Fam. FISTULARES.

Aulostoma coloratum, Müll. et Tr. *Trompetero colorado*, Parra, p. 65. t. 30. f. 2. Shallow-water Trumpeter. D. 9–25 : A. 26 : P. 16.

"This beautiful fish has much the resemblance of *A. chinensis* of Cuvier (*Fistularia chinensis*, Bloch, t. 388); and Bloch and Schneider observe in the 'Systema,' that it lives in the Indian and American Ocean; but the above species from Barbados is without doubt different from the true Chinese *Aulostoma*. Both species agree that the maxillary is marked with a black band, that on the nostrils are found two black spots, and in the presence of a black longitudinal band in the front of the dorsal and anal fin in about the middle of the height; however the specimen from Barbados, instead of being covered with brownish spots as the Indian species, shows white spots on the sides of the head without any brown ones, with the exception of three brown spots, which form a longitudinal row on each side of the head. On the back are on each side two rows of black spots; on the sides of the body seven narrow white longitudinal bands; and on the belly beneath, in the middle, is a row of black spots, occupying the second half of the space between the pectorals and ventrals."

II. ANACANTHINI, *Müll.*

Fam. PLEURONECTIDES, *Cuv.*

Rhombus ocellatus, Agass. et Spix, Pisces Brasil. p. 85. t. 6. Flounder or Plaice. D. 95 : A. 74 : P. 12 : V. 6.

This fish belongs to the Turbots, and "agrees in general with the description and the figure of Agassiz and Spix, and likewise

* At my request, Professor Dr. Müller and Dr. Troschel named this new species after C. K. Bishop, Esq. of Orange Hill in Barbados, to whose indefatigable assistance I am indebted for the greater part of this fine collection of fishes.—R. H. S.

in the number of rays. The ventrals have on each side six rays; the upper margin of the upper eye, and the lower margin of the lower eye are ornated with little threads: the length of the fish is nine inches." It is a very delicate fish.

III. PHARYNGOGNATHI, *Müll.*

Fam. Labroidei cycloidei, *Müll.*

Cossyphus bodianus, Cuv. et Val. *l. c.* xiii. p. 103. Yellow Coat Chub. D. 12+10 : A. 3+12 : P. 16.

"The species from Barbados has a black spot in front of the dorsal fin; the basis of the membrane between the spines of the dorsal fin is orange-coloured, and the angle of the ventrals is of a brimstone colour."

Julis maculipinna, Müll. et Tr. nov. spec. Dog Chub. D. 9+11 : A. 3+11 : P. 13.

"This fish is distinguished from all American species of the genus *Julis* by its colour. On the dorsal fin, between the fifth and seventh spine, is a black spot, and in the middle of the soft part of the same fin is a longitudinal band, the colour of which cannot be discerned, as the specimen is preserved in spirit. Beneath the lateral line extends on each side a large dark band (probably of violet colour) from the head to the caudal fin, with a spot of the same colour under it, situated in about the middle of the body. A blue band extends from the snout through the eye to the operculum, and above it is another shorter band of the same colour extending from the snout to the eye: both bands are united, forming a V. On the nape are three transverse bands of the same colour, and the cheeks are marked by three white bands. On the base of the pectorals is a little black spot; the caudal fin is truncated."

Fam. Labroidei ctenoidei, *Müller.*

Glyphisodon taurus, Müll. et Tr. nov. spec. Dove-tail Fish. D. 12+12 : A. 2+10.

"The teeth are notched. The cleft of the mouth does not reach the eye; on the angle of the mouth the suborbital bone is nearly as large as the diameter of the eye; the space between the eyes is nearly equal to one and a half diameter of an eye. The profile is less steep than in *G. saxatilis*, and the five vertical bands are less distinct in the present species. Its length is seven inches."

Pomacentrus leucostictus, Müll. et Tr. nov. spec. D. 12+15 : A. 3+13. Black Pilot. Beau Gregory.

"This species agrees with *P. fuscus* of Cuv. et Val.; it distinguishes itself however by numerous white dots, which are especially abundant beneath the dorsal and above the anal fin, where one is placed on each scale."

In the younger specimens the white dots are much more distinct, and this may have induced the fishermen to give them the name of Beau Gregory; the full-grown specimen is called Black Pilot.

Fam. Scomberesoces, *Müll.*

Exocœtus Roberti, Müll. et Tr. nov. spec. The common Flying Fish. D. 11 : A. 12.

"This species resembles the *E. cyanopterus* of Cuv. et Val., but it differs in the dorsal fin, which is much lower and of one colour; the pectorals are diaphanous and dark-coloured, and on the inner part near the base is a large white spot."

The Flying Fish are too well-known to demand a special description. The common Flying Fish (*E. Roberti*) is so abundant in some seasons of the year about Barbados, that they constitute an important article of food, and during the season a large number of small boats are occupied in fishing. They are very delicate and tender; some experiments have been made to preserve them by salting and smoking, and with perseverance I have no doubt that they would prove successful. Such large numbers are occasionally caught that they meet with no sale and are thrown away, or used as manure.

IV. PHYSOSTOMI, *Müll.*

Fam. Clupeoidei, *Cuv. et Müll.*

Alosa apicalis, Müll. et Tr. nov. spec. Red Ear Pilchard. D. 18 : A. 17.

"The lower jaw surpasses the upper in length; the maxillary reaches to the first third of the eye, and the diameter of that organ is larger than half the size of the head. The scales are large, forming nine rows on each side of the body; they are silvery, and each scale is marked on the belly with a copper-coloured spot. The point of the snout above and beneath is black; on the front there is a small black longitudinal band, and over each eye a black spot.. The point of the dorsal fin, and the posterior edge of the forked caudal fin are black; the ventrals are attached under the middle of the dorsal fin."

Alosa Bishopi, Müll. et Tr. nov. spec. The Sprat.

"This species agrees in some points with the former; it has however a black spot behind the operculum which is not to be observed in the *A. apicalis*, and the dorsal fin is without the black mark. It possesses likewise, like *Alosa tyrannus* of De Kay (Zool.

of New York, iv. p. 258. t. 13), the indistinct dark longitudinal lines; but the eye of the Barbados species is larger, its diameter being equal to half the height of the head. There are eleven rows of scales on each side of the body; the ventrals are fixed under the middle of the dorsal fin; the caudal fin is forked. Length four and a half inches."

This species has been named in honour of Mr. Bishop.

The Sprats are much esteemed in the West India islands. A species called the Yellow-tailed Sprat proves unfortunately poisonous at certain periods of the year in some of the islands, chiefly among the Leeward and Virgin islands.

V. PLECTOGNATHI, *Cuv.*

Fam. Balistini.

Monacanthus tomentosus, Bloch, var. *α*, Systema, ed. Schneider, p. 467. Cuckold or Horned Coney Fish, *Hughes*. D. 1 + 35 : A. 30 : P. 13 : C. 12.

"This fish, which has been considered a variety, is without doubt a different species." It is much used as food, and when well-stuffed and baked considered a delicacy. It resembles the following in its general appearance.

To this section belongs likewise a remarkable fish, which appears to be identical with, or a closely allied species of *Triodon bursarius*, Reinv. It possesses a dew-lap nearly as long as the body, which it is able to inflate. I received a specimen from Barbados, which is at the British Museum.

Fam. Gymnodontes.

Tetrodon (*Cheilichthys*) *pachygaster*, Müll. et Tr. nov. spec. Jug Fish. D. 10 : A. 9 : P. 15 : C. 9.

"This new species of *Tetrodon* is smooth all over, of a light brown colour, with darker spots on the back. The space between the eyes is equal to two diameters of the eye, and the space to the top of the snout is of a similar extent. The nostrils are nearer to the eye than to the snout, and they are papillary with two apertures. The dorsal fin stands before the anal; the caudal is truncated, but the upper and lower points are somewhat elongated. Length fourteen inches." It is very scarce around Barbados.

VI. PLAGIOSTOMI, *Cuv.*

Fam. Squalidæ.

Carcharias (*Prionodon*) *obscurus*, Müll. et Henle, Plagiostomen, p. 46. Puppy Shark.

"The denticulation of the upper jaw is a little more robust on the base than on the top in the Barbados species."

IV.—*Letters from* J. MacGillivray, Esq., *Naturalist to H.M. Surveying Ship Rattlesnake,* Capt. Stanley, R.N. (Communicated by Professor Edward Forbes.)

H.M.S. Rattlesnake, at sea, May 3, 1847.

My dear Sir,

As we expect to reach the Isle of France tomorrow, and as I have a case of specimens ready to go by the first ship, I now proceed to write an accompanying letter giving a brief account of our voyage up to the present time.

We sailed from Plymouth on December 11th, 1846, and after a quick passage of seven days reached Madeira, not sorry to have escaped from the sharp commencement of an English winter. Knowing that unless by dredging I need expect nothing new during a visit to a place carefully searched by resident zoological collectors, I was annoyed to find that the depth of water and the nature of the bottom required for the working of the dredge a more powerful boat than I could procure. During various excursions on shore I attended chiefly to the land shells, and obtained twenty-three species* (exclusive of an *Ancylus* and a *Lymnæa*) at various elevations up to the Pass of the Corral, 2700 feet above the sea, where single species of *Achatina, Clausilia* and *Pupa* were found under stones along with coleoptera of the genera *Scarites* and *Pimelia*. The ferns (*Adiantum Capillus-Veneris, Davallia canariensis,* &c.) about the dripping rocks would, to a botanist, have made ample amends for the small number of plants in flower; yet many butterflies (*Colias Edusa, Cynthia Cardui,* and a *Vanessa* like *V. Atalanta*) were flitting about; but the lizards, which in the month of April I had seen basking in great numbers upon every wall, had not yet awoke from their winter's sleep.

Leaving Madeira we sighted Palma, and passed between St. Jago and Mayo, so close to the latter that various insects (especially an *Acrydium* and a fine blue *Æshna*) paid us a visit and were detained. We crossed the line on January 13th with the usual ceremonies attending the introduction of upwards of a hundred novitiates at Neptune's levee. In lat. 2° N. soundings were tried for with 2600 fathoms (or very nearly three statute miles) of line without success. In this neighbourhood also I procured specimens of a British storm petrel (*Thalassidroma Bullockii*), the occurrence of which in such low latitudes would have surprised me had I not known (from Mr. Gould) that *Th. Wilsoni* was common to both

* Among them were *Bulimus decollatus, Clausilia deltostoma, Bulimus lubricus, Pupa anconostoma, Helix maderensis, H. undata, H. cellarius, H. nitidiuscula, H. polymorpha* and *H. pulchella*.

hemispheres. The former was rather abundant in the region of calms and variables extending across the equator between the limits of the trade-winds. While within the tropics we had the usual accompaniments of dolphins, flying-fish, physaliæ, velellæ, &c., but the towing-net produced very little.

Daybreak on January 23rd found us off Cape Frio, and in the afternoon we anchored in the noble harbour of Rio de Janeiro. I shall not trespass upon your patience by giving my first impressions of the New World, or dilating upon the magnificence of the scenery. Landing upon the shores of the American continent, I was not so much struck with the richness of the vegetation as with the exuberance of animal life.

Many of the walks about St. Salvador are doubly interesting to the naturalist from the great beauty of the scenery and the variety of animal productions. My favourite one led me along the aqueduct supplying the city from the Corcovado mountain, a distance of a league. Here the number of species of Lepidoptera and the frequency of gorgeous colouring and great size are among the first things to attract one's attention. Of these the *Heliconii, Hesperiæ* and *Erycinæ* are the most numerous, some of the first gaudily painted with red, yellow and black. One of the commonest butterflies, *Peridromia Amphinome,* possesses the singular habit of frequenting the trunks and limbs of trees, where it is difficult of detection while resting with expanded wings, the variegated upper surface of which often resembles the lichen-covered bark. The air was usually filled with the harsh grating cries of large black *Cicadæ,* here nearly as noisy, though not so numerous, as in New South Wales.

"Et cantu querulæ rumpent arbusta Cicadæ."

Birds were scarce, indeed I saw only one humming-bird; nor was I so fortunate among the land shells as I had anticipated. The pretty *Bulimus Gravesii,* King (see App. to Voy. of Adventure and Beagle), and another [R. 80] * of larger size, are usually found creeping up the trunks and lower branches of trees, and I found a colony of King's *Helix translucens* upon a wall concealed by rank vegetation. *Helicina sordida,* King, occurred once upon a low Mimosa bush, and with this I may conclude; for, even with the kind assistance of Mr. King, I could muster only fourteen species of land and three of freshwater shells.

I anticipated some good results from dredging and was not disappointed. Being unable to procure a boat from the ship, I was obliged to content myself with one from the shore manned by four negro slaves, who, after all, could scarcely keep the

* The numbers refer to specimens. With the aid of Mr. Hanley I have identified some of the mollusca mentioned.—E. F.

dredge moving. No sieves had been furnished by the dock-yard, nor, although I ransacked the Rua d' Ouvidor from one end to the other, could I obtain the requisite materials for making one. In this dilemma I procured a wire-gauze dish-cover and a machine for washing rice in, both of which Huxley and myself found to answer capitally. We dredged in Three Fathom and Botafogo bays in from three to five fathoms, sand. Among the results are a fine *Scutella* with notched and perforated margins [R. 155 to 159], a boring *Modiola* [R. 102] *, three species of *Dentalium* [R. 76] †, and others of the genera *Nucula, Oliva, Ancillaria, Subula, Fusus*, &c., in all about forty-five species of mollusca ‡. But the most interesting acquisition was a fish of that most anomalous genus *Amphioxus*. It appears to differ from the European species in the relative position of the anus, the only distinction I can observe, judging from brief descriptions. Besides the specimens in my general collection, I inclose some in a small bottle which I beg you will transmit to our friend Prof. Goodsir, who has so admirably described the structure of this singular fish. Huxley, with his usual industry and success, has been working away at it, and pointed out to me distinct hepatic and generative systems, neither of which Goodsir mentions. The spermatozoa were quite distinct. We found the *Amphioxus* in from five to two fathoms in sand of various degrees of coarseness; it has exactly the habits of the *Ammocœtes* in Britain, burying itself in the sand and moving through it with extraordinary rapidity.

A visit to the market at Rio will repay the collector. He ought to go early in the forenoon when the fishing-boats come in and are drawn up on the muddy shore. These are long canoes hollowed out of the trunk of a tree managed by one or two men. The variety of fish is considerable and constantly varies. The most plentiful kinds were a small *Clupea* [S. 15], and an *Engraulis* [S. 18] with a broad lateral silvery band. Here and there are large baskets filled with loathsome land-crabs covered with black slimy mud, along with others containing large and handsome *Lupeœ* [C. 50 and 51], and a fine *Palemon* [S.]. Among the articles exposed for sale I was surprised to see small sharks of various kinds, and cuttle-fish (*Octopus*) [S. 36], and *Loligo* [S. 2].

In St. Salvador, the capital of an extensive empire, a city containing 250,000 inhabitants, there is little for a stranger from Europe to admire. On landing he is apt to turn up his nose at the stench and filth which he encounters under a tropical sun,

* *M. cubitus*, Say.

† One of these is the tube of an Annelid.—E. F.

‡ Among the mollusca were *Oliva micans*, *Solen Sloanei*, a new *Lucinopsis*, and a new *Nucula* and some other new shells.

and seeks in vain for grandeur or architectural beauty in the palace, the churches, and the other public buildings. He may occasionally smile at such oddities as an omnibus drawn by six mules, and be amused by observing the motley hue of the passengers in the crowded streets; but he turns away in disgust when he sees gangs of negro slaves performing the work of beasts of burthen, and that they are treated worse than such is shown by the frequency of iron masks and collars. When one finds that the Brazilians have degenerated from the parent stock—

"Lusian slave, the lowest of the low,"—

he cannot place them very high in the list of nations. For the state of morals among the "Bravo gente Braziliero," one fact speaks volumes. When a bill for the legitimation of all natural children throughout the empire was introduced, it was opposed on the ground that, if carried, it would completely break up many of the principal families by giving publicity to the great frequency of incestuous intercourse among them. The force of the objection being admitted the bill was at once withdrawn.

We left Rio on February 2nd, and while hove to outside the entrance I got a haul with the dredge in thirteen fathoms, which produced a small *Terebratula* [R. 103]*, and a minute univalve [R. 105], the genus of which I could not determine. During our passage to the Cape of Good Hope, which, from unfavourable winds, occupied a period of seven weeks, I was surprised at the entire absence of *Daption capensis* and *Diomedea melanophrys*, two of the commonest oceanic birds which I had on former occasions met with abundantly in the South Atlantic. Of the three albatroses which occurred, *D. exulans* was seldom absent, but *D. fuliginosa* and *D. chlororhyncha* (both on one or two occasions very numerous) left us in the meridian of Greenwich. One young bird of the first-named species followed the ship for twenty-four days, during which time we had gone over a distance of 2700 miles. *Procellaria conspicillata* was met with two days after leaving the coast of Brazil, and continued with us until within a day's sail of the Cape, when it was replaced by its analogue *P. æquinoctialis,* which even enters False Bay and attends upon the fishing-boats. *P. Atlantica* and *P. mollis* occurred throughout, and were occasionally seen in great numbers; *P. leucocephala* paid us an occasional visit; and Prions were sometimes seen at a distance, but I could not identify the species. Of the storm petrels, *Th. leucogaster* occurred nearly every day, sometimes in considerable numbers, and solitary individuals of *Th. Wilsoni* were

* *Terebratula rosea*; the first time its true locality has been noticed. The univalve seems new.

observed in our wake on several occasions. A very fine *Puffinus* [B. 6], apparently a new species allied to Gould's *Pro. flavirhyncha*, was found generally distributed across the South Atlantic, between the meridians of 28° W. and $1\frac{1}{2}$° E. longitude; and on two successive days, while approaching Tristan d'Acunha, myriads of these birds passed the ship to the westward, apparently coming from that island. A few days afterwards, while 480 miles from the nearest land, a strange tern [B. 15] came on board and was added to the collection. Our daily practice of heaving to to ascertain the temperature of the water at considerable depths (150 and 350 fathoms) permitted me to obtain a boat whenever the sea was sufficiently smooth to admit of lowering one with safety, and I was thus enabled to procure specimens of many of the *Procellariadæ*. On one of these occasions the jolly-boat was swamped and turned over keel up. Fortunately we all escaped either by reaching the life-buoy or clinging to the boat until relieved; but my best gun, having none of the natatorial properties of the birds it was intended to destroy, went down to the realms of Father Neptune, where I can only hope it may prove useful in developing the "young idea" of the juvenile members of his family.

On our passage across the South Atlantic, the towing-net afforded a rich harvest on more than one occasion. While nearly becalmed in lat. 34° 40′ S. and long. 4° W. the sea was found teeming with marine animals. Great numbers of a small *Physalia, Velella emarginata*, two species of *Ianthina** [R. 175, 176, and S. 43, 44], two of *Glaucus* [S. 42], and one of *Pneumoderma* [S. 40], were among those taken. Nor ought I to omit a beautiful silvery blue *Idotea* [C. 6] which swims on the surface like a *Gyrinus*, and along with *Ianthina* preys upon the *Velella*. Attached to the cartilaginous skeleton of one of these last I also found several blue *Anatifæ* [R. 177]. When in about 14° E. long. I was much pleased to meet with, among other pelagic crustacea (*Phrozini* [C. 34, 35], &c.), three species of *Alima* [C. 38, 42, 43], a genus remarkable for its singular glassy transparency. Here also occurred numerous examples of *Hyalea inflexa*, making, with the large *H. tridentata* (which was found generally distributed) and *H. longirostra* (taken off Rio), the third of the genus in my collection.

The Rattlesnake arrived at the Cape of Good Hope on the 8th of March, and this made my third, and I hope my last, visit to that colony. We did not sail until April 10th, our stay being protracted by a succession of south-easterly gales, which impeded the survey of Simon's Bay. The weather, and the difficulty of

* *Ianthina globosa* and *I. exigua*.

procuring a boat, prevented me from dredging as often as I could have wished. As it was I met with very indifferent success. Some curious crustacea came up—species of *Leucosia, Macropodia, Hymenosoma, Inachus*?, &c.; but the mollusca were very few in number, consisting chiefly of solitary representatives of *Bullia, Nassa, Turritella, Tellina* and *Turbo**. The rocky shores of False Bay furnished very little variety of shells, although the detritus on the beach shows that many fine ones exist there. The *Patellæ* are the most numerous, and some attain a large size. In the pools I procured a few *Asteriadæ*, and an *Echinus* [R.] remarkable for the variety of colours (from deep blue to sandy gray) which it presents. Two species of *Comatula* were also found, but I had no fresh water at hand into which to plunge the specimens, consequently they broke up into small fragments before I reached the ship.

In the neighbourhood of Simon's Town the slope of the sandstone range, stretching between Cape Point and Table Mountain, extends as far as the shore, which, when not sandy, is formed by projecting masses of syenite. There is consequently little level ground and scarcely any susceptible of cultivation, the whole being thinly covered with bushes of *Proteaceæ* and *Ericeæ*. *Mesembryanthemum edule* is the prevailing herbaceous plant on the sandy flats, and harbours a small *Helix* [R. 192]. A *Cyclostoma*†, two *Helices*, and a *Pupa* are abundant about the roots of bushes, but nearly all my specimens were dead. Birds are numerous; every clump of flowers attracts numbers of beautiful sun-birds, chiefly *Cinnyris chalybea*, and in the Admiral's garden I was pleased to see a number of the pensile nests of a kind of *Ploceus* dangling from the fir-trees. Baboons (*Papio cynocephalus*) are plentiful on the hills, which also harbour numbers of the *Hyrax capensis*, and on the low sandy grounds *Bathyergus maritimus* burrows like a mole, and the pretty little *Mus Pumilio* forms long runs among the bushes.

One day I ascended Table Mountain, for the double purpose of stretching my legs and of procuring some *Helices* which I had found near the summit in 1842. Scarcely a plant was in flower—even the ferns were nearly all burnt up, but the patches of *Leucodendron argenteum* looked as fresh as ever. Here and elsewhere at the Cape I have often been struck with the strong resemblance between the vegetation of the barren, sandy and stony tracts, and that of similar spots in Australia. The extensive ge-

* Among these were *Nassa pallida, Bullia lævigata, Turbo Sarmaticus, Trochus merula, Purpura laginula, Patella pectinata, Patella monopsis, Tellina pulchella* and *Cardita concamerata*.

† *C. Listeri*.

nus *Protea* supplies the place of the *Banksiæ* of New Holland, in which country the *Ericeæ* of Southern Africa are admirably represented by the beautiful family of *Epacridæ*. The geology of the mountain has, I dare say, been often described. The junction of the granite with the superincumbent sandstone is exposed in the bed of the rivulet, and the latter rock assumes all the gradations between fine-grained quartzose sandstone and a conglomerate of quartz pebbles of moderate size. The path suddenly opens out upon the summit after leading up a ravine walled in by fine mural cliffs. The summit (3500 feet in height) is nearly flat and almost devoid of vegetation. While overlooking Cape Town and admiring the beautiful regularity of the streets, with my legs dangling over a precipice of 1200 feet, I amused myself with watching the gyrations of a pair of vultures (*V. Kolbii*), from which, like the soothsayers of old, I rather prematurely drew a good omen, for I was unsuccessful in my search after the shells. On my way down I found a freshwater crab (*Thelphusa perlata* ?) [C. 101] in the rivulet at an elevation of 2000 feet.

We were all heartily tired of Simon's Town long before quitting it—for my part I never left a place with so little regret. The weather was too boisterous to be agreeable, the zoology of the place was already well-known, and we were tired of hearing the interminable "Caffre war" dinned into our ears from morning to night as an excuse for high prices and various kinds of extortion worthy even of Sydney in its halcyon days of convictism.

H.M.S. Rattlesnake, at sea, October 12th, 1847.

My dear Sir,

Having now entered upon the most important part of the voyage, I am anxious to bring up my correspondence with you, as five months will elapse before I shall again have an opportunity of writing. We sailed yesterday from Sydney in company with our tender the 'Bramble' schooner, and expect to return in the end of February to refit for the second cruise—one of twelve or eighteen months—to the N.E. and N. coasts of New Holland, New Guinea, and the islands in the Arafoura Sea. At present we are going into Moreton Bay, thence to proceed to Port Curtis, on the shores of which the lately-formed and almost as quickly abandoned colony of North Australia was founded by Lieut.-Colonel Barney.

I last wrote you from Mauritius of date May, per barque 'Rambler,' by which vessel I also sent most of the specimens collected up to that time, catalogues of which I now inclose. During the thirteen days which we spent at Port Louis the time passed very agreeably, and it is one of the few places which I ever left with regret.

One morning I walked out to Pamplemouse, a village seven miles distant, for the joint purpose of visiting the Botanic Garden, and collecting a few flowers from the tombs of "Paul and Virginia" for some album-keeping friends at home. The shady walks, the rivulets and ponds of water in the garden are unexceptionable, and for solitary rambles and the holding of merry picnic parties these cool retreats are admirably adapted, but I looked in vain for any indication of botanical arrangement. In a coffee grove adjoining "Les Tombeaux" I procured numbers of a small *Helix* [R. 354], and the fine but common *Achatina Mauritiana*. The latter burrows in the earth during dry weather, but some heavy rain which had fallen during the night brought it out in great numbers. In a brook by the road-side I found a decollated *Pirena* [R. 359], and a neighbouring pond furnished specimens of *Melania Amarula*.

Another day I paid a visit to the summit of La Pouce, which rises in a pinnacled form to the height of 2600 feet. The view from the summit is magnificent, embracing nearly the whole of the island. From this spot a good view of the coral reefs may be obtained; the pale green of the shoal water is separated from the deep blue of the ocean by a line of snow-white surf. Here are some luxuriant tree-ferns, fifteen to twenty feet in height, which an English botanist would scarcely recognise as generically identical with his delicate *Cyathea fragilis*. On the shoulder of the mountain I procured eight species of land shells, *Caracolla Mauritiana*, and some *Helices* and *Pupæ*. A steep cliff covered with brushwood facing Wilhelm's Plains is resorted to by tropic birds (*Ph. æthereus*), many of which I saw wheeling along the face of the precipice several hundred feet below me.

I anticipated great success from dredging in Port Louis, but, during a day's work, only two live species of mollusca of any consequence, a *Mitra* and a *Pleurotoma**, were procured. Outside the margin of the coral reefs which fringe the entrance of the harbour, and to which a person may walk at low water, one finds a zone of loose blocks of living *Meandrinæ*, *Astrææ* and other massive corals, among which dredging is impracticable; to this succeeds a belt of dead shells and small fragments of coral; and the remainder of the channel is tenacious and unproductive mud. Although well-aware of the productiveness of this beautiful island in marine objects, I was yet unprepared for the sight of upwards of 100 species of fish, which I frequently witnessed of a morning in the market of Port Louis. Many of them, especially among

* *P. variegata.*

the *Labridæ,* are of the most gorgeous colours, but the most skilful taxidermist would fail in retaining them. I had the pleasure of being shown by M. Lenard a collection of about 400 coloured drawings intended to illustrate a work on the ichthyology of the island, upon which he has been engaged for many years.

After a monotonous voyage of five weeks and a half, unenlivened by the sight of a single sail, we reached Hobart Town on June 25th. When in lat. 40° 45′ S. and long. 123° 26′ E., Capt. Stanley tried for deep sea soundings, having previously got in readiness an invention of his own for detaching the weight (eight 32 lb. shot) upon its reaching the bottom, thus enabling him, if successful, to bring up a small ball-lead with whatever the arming might come in contact with. Unfortunately, however, just as everything appeared to promise success, the line was carried away without apparent cause, after 3500 fathoms (or a trifle less than four statute miles) had been let out. Meanwhile I had been shooting from the jolly-boat and procured several additions to my collection ;—*Procellaria leucoptera, P. macroptera, Prion Turtur* and *P. Banksii,* and some others of the *Procellariadæ,* sixteen species of which interesting family I have already procured and preserved. I am indebted to Mr. Gould's paper "On the *Procellariadæ*" in the 'Annals and Mag. of Nat. History,' and to other information derived from him, for the means of discriminating nearly all the species met with, and during the voyage I have daily noted down their occurrence. The tables thus formed, which I now send to the distinguished author of the 'Birds of Australia,' will assist him in determining the geographical distribution of the members of the family.

Our stay in Van Diemen's Land was but short, and I devoted the greater portion of it to making a long excursion, as, during my former visit, I had been very little inland. It is probable that on our return from the second cruise the ship will refit at Hobart Town, in the event of which I shall lose no time in proceeding at once to the place which I have selected as likely to afford novelties—the Western Tiers and the Lake Country—having been kindly promised every assistance from several friends who have out-stations in that wild district.

After a short passage (during which I procured Gould's *Thalassidroma Nereis*) we reached Sydney. Here the 'Bramble' and 'Castlereagh' surveying schooners, left out by my old friend the 'Fly,' had been awaiting our arrival for many months. Both were paid off; the latter was sold, and the former recommissioned by Captain Stanley as tender to the 'Rattlesnake.' I shall not try your patience by entering upon any description of a place so well-known as the capital of Australasia, but take you at once into "the bush."

Among the excursions which I made was one of sixteen days' duration to Broken Bay and Brisbane Water, chiefly for the purpose of obtaining a small kangaroo, closely allied to *H. Thetidis*, of which a skin had been shown me in Sydney. Although unsuccessful in the main object of my search, I was yet much pleased with the excursion as a reminder of former bush life and a training for future work on the N.E. coast. Among other matters of interest I may allude to the enormous accumulations of dead shells of a large *Arca* [R. 402] *, which at first sight may be mistaken for raised beaches. These heaps are often twenty feet or more in depth and several hundred yards in length, covered with a stratum of earth supporting the largest *Casuarinæ*. This shell had for ages constituted the principal food of the Aborigines, who were once so numerous that a settler still alive has seen 300 of their fighting men assembled at one time, while at the present moment there are not more than ten in the district, and in a few years the tribe will be extinct. Here also are some of those magnificent "brushes," portions of which remind one of an Indian jungle. *Eucalypti* of enormous size, and gigantic fig-trees form a canopy above, while below the dense underwood is bound together into a tangled and almost impenetrable mass by creepers and parasitic plants mixed up with cabbage-palms and tree-ferns. A kind of churchyard dampness pervades the atmosphere of these gloomy solitudes, and the silence is broken only by the cooing of the wonga-wonga (*Leucosarcia picata*), or the loud and startling note of the *Psophotes crepitans*. These brushes are the haunts of the *Menura* and satin-bird, also of several species of kangaroo. The dead logs harbour two kinds of *Helix* [R. 386 and 388] † and numbers of coleoptera. One cannot help noticing the powerful influence exercised by insects and their larvæ upon the destruction of fallen timber in these brushes; on the other hand, no sooner does a tree fall into the water than the *Teredo* and a small crustacean [C. 183] effect a lodgement, and in a few months its internal structure resembles that of a honey-comb. Having been provided with a light dredge which could be worked by two persons (although my back has scarcely even now recovered from the straining it received in consequence), we made use of it on several occasions in some of the creeks and also in the main channel, but the weather prevented us from passing the surf in our frail skiff and dredging in Broken Bay. A very few shells, and only two kinds of *Asteriadæ*, were all that we obtained.

The best shell obtained by dredging in Port Jackson is *Trigonia pectinata*, of which I have sent a fine series. It is exceedingly

* *Arca trepezizia*, Desh.

† *Helix Georgiana* and another.

local, as all mine were found in a space not larger than the ship on a bottom of coarse sand and dead shells. *Myochama anomioides* occurred abundantly on *Trigonia,* also on a *Pectunculus,* and a *Struthiolaria.* Huxley has worked out the anatomy of *Trigonia,* and figured the animal in his usual masterly manner. The perseverance and skill which he has shown in his anatomical researches will give a great additional value to the zoological results of the voyage. There is abundance of work on board for three or four naturalists, but, having been unassisted to make collections in all the departments, my duties too often merge into those of a mere collector and preserver of specimens.

Natural history, unlike everything else, does not appear to make much progress in Sydney. The temporary, small, and crowded museum has been steadily merging into a state of chaos ever since I first saw it in 1842. Many of the once-valuable specimens—for example, those collected during Mitchell's first expeditions—are in a wretched state of decay. The adjuncts *impennis, calva,* &c. might with propriety be attached to the labels of some of the birds; in a few instances even the stuffing is visible. A new and more suitable building is in progress, and it is to be hoped that with its completion a better state of things will be introduced.

You have probably heard of the Bunyip, an extraordinary aquatic animal whose existence is attested by the Aborigines of the interior. Some months ago the cranium of a monstrous foal was sent down to Sydney as the head of this animal, and since then the head and neck of another hydrocephalic foal have been prepared by a bird-stuffer of the place, and exhibited in his window to gaping hundreds as a nondescript shot while emerging from a pool of the Lachlan, a river of the interior. Leichhardt's second expedition (in which he proposed to cross from Moreton Bay to Swan River) has totally failed, as has also a subsequent attempt to connect his discoveries with those of Sir Thomas Mitchell's. A working collector accompanies Mr. Kennedy at present in the interior, tracing out the Victoria River of Mitchell.

Moreton Bay, November 1, 1847.

During our passage to this place, I one day, when a little to the southward of Cape Byron, caught four species of mollusca in the towing-net, a *Creseis,* a *Litiopa,* and two others of genera unknown to me. One of these [R. 476]*, about the eighth of an inch in diameter, resembles *Ianthina* in form, and also in having a vesicular float, but differs from that genus in being furnished

* It is quite new and most interesting.

with a horny, undulated, concentric operculum, a siphon, and four large fimbriated tentacula. The foot, which is large, is convertible into a concave boat-like disc above the shell. The inclosed sketch will give you some idea of its appearance, but unfortunately the float (which is three or four times larger than the shell, and is composed of twenty to thirty vesicles) had become detached in the specimens which I reserved for examination, so that I could not figure it in connexion with the animal. Is this not a new genus?

I have been much pleased with our two weeks' stay at Moreton Bay. Everywhere one sees signs of its proximity to intertropical Australia, although only in 27° 15′ S. latitude. *Pandanus pedunculatus* makes its first appearance here, and among the birds, *Attagen Ariel* and a few others appear to have here their southern limits. I one day landed, at low water, upon a large, flat surrounding mud-island, and was surprised to find it a reef of dead coral, chiefly madrepores. Under the loose blocks I picked up the same crustacea which occur on all the reefs to the northward. My last two days here shall be devoted to dredging, but the tides are so strong that I do not anticipate much success. We sail on the 4th for Port Curtis, and this letter goes in a box of specimens which I intend shall be forwarded from Brisbane to Sydney thence to you. Although I have a good many large jars filled with specimens in spirits, ready for transmission, I shall keep them until my return to Sydney, when there will be enough of them to fill a large box. In hopes of being able in April next to communicate satisfactory results of our first cruise,

Believe me to remain, yours very truly,

John MacGillivray.

Prof. E. Forbes, &c. &c.

V.—*A Supplement to "A Synopsis of the British Rubi."* No. II. By Charles C. Babington, M.A., F.L.S., F.G.S. &c.*

Some apology may be necessary for the publication of a second Supplement to my 'Synopsis of Rubi,' in which several new forms are proposed as varieties of recognized species, and one supposed new species is described. It probably will be said of these, as it has been of former descriptions of *Rubi*, that they are only portraits of individuals, not accounts of species or even varieties. In answer to this it may be stated, that several of the plants to which those remarks referred, although originally noticed in one spot (not as single plants, but a crowd of them), have since been found in other and distant parts of the kingdom.

* Read before the Botanical Society of Edinburgh, 11th May, 1848.

As an illustration—*R. Salteri* found originally in the Isle of Wight was noticed by me at Llanberis in North Wales, in the summer of 1847;—*R. Borreri* has occurred in several new localities;—*R. Babingtonii* grows in Shropshire and Caernarvonshire.

The only plant, amongst those now first published, which I have been unable to refer to any described species, exists as scattered but very numerous individuals throughout a district of several miles in extent.

I am far from claiming for those plants which I call species or varieties respectively an absolute right to that rank, and that only; but merely place them in such a position as the information at my command leads me to think their proper rank and position. The time will doubtless come when botanists will be in possession of sufficient knowledge of *Rubi* to group them into real, not supposed species; but it is only by the careful and long-continued study of forms that such knowledge can be obtained. The definition of forms is the first step, the combination will be the second. Cultivation from seed is one of the most valuable modes of obtaining a true knowledge of these plants. This has now been done to some extent by persons well-acquainted with the described plants, and several others are about to undertake it; such experiments conducted by others are of little value.

4*. *R. affinis* (W. & N.); caule suberecto arcuatove anguloso glabriusculo, aculeis validis paululum deflexis declinatisve, *foliis* quinatis utrinque viridibus subtus sericeo-pubescentibus *basi planis apicem versus subundulatis* grosse crenato-cuspidato-serratis, foliolo terminali cordato vel cordato-ovato cuspidato infimis petiolatis, *paniculæ* compositæ foliosæ superne *tomentosæ ramis* cymosis *erecto-patentibus* aculeis infra deflexis, sepalis a fructu reflexis longe acuminatis.

R. affinis, *Rub. Germ.* 18. t. 3; *Arrh. Rub. Suec.* 25; *Fries, Summa Veg. Scand.* 165; *Lees in Steele Handb. Bot.* 58?; *Leight. in Phytol.* iii. 73, not *Fl. Shrop.* 226.

Stems mostly suberect, sometimes elongated and arching, angular or even furrowed, purple, with or without a few hairs. Prickles confined to the angles of the stem, large, strong, a little deflexed or declining, from a dilated compressed purple base, tip yellow, or wholly yellow. Leaves digitate-quinate, thin, dull green and distantly pilose above, rather paler tomentose and with silky pubescence beneath; midrib beneath with a few short stout hooked prickles becoming longer and generally more hooked on the petioles. Terminal leaflet cordate, cordate-ovate, or cordate-orbicular. Lower pair of leaflets slightly overlapping the intermediate pair.

Flowering shoot surrounded at its base by scales which are white with silky pubescence. Branches of the panicle ascending and together with the summit of the rachis pilose and tomentose. Prickles large from a broad compressed base, numerous; the upper ones slender nearly straight and declining. Sepals densely tomentose hairy and white on both surfaces; strongly reflexed from the black fruit.

Shawbury Heath and other places in Shropshire, *Rev. W. A. Leighton.* Great Cowleigh Park near Malvern, *Rev. A. Bloxam.* The Torrents near Dolgelly; and the Wrekin, Salop, *Mr. Lees.* Glen Falloch and Loch Eil in Scotland; and Llanberis in North Wales.

Obs. 1. A form of this species is sometimes found with more slender nearly straight and declining prickles, leaves pubescent not tomentose beneath, panicle thyrsoid with simple or few flowered branches, and fewer smaller and more slender prickles. This is possibly the result of shade.

Obs. 2. This plant is allied to *R. cordifolius,* but in that species the leaves are flat and less coarsely serrate, the barren stems always arching and the prickles on the panicle and flowering shoot all straight and declining. It is often very like *R. plicatus,* but the panicle of that plant wants the under coating of tomentum, its barren stems have slender prickles, the scales at the base of the flowering shoot are fuscous; and, as well-observed by my friend Mr. Leighton, the sepals of *R. plicatus* are "scatteredly hairy on the outside, chiefly at the base and apex, the white tomentum with which the inside is entirely lined forming only a narrow white line on the margins." *R. nitidus* also resembles *R. affinis,* but is distinguished by its coarsely and doubly serrated leaves and the patent or divaricate branches of its panicle.

Obs. 3. Some difficulty attends the determination of the plant described as *R. affinis* by Mr. Lees. A specimen from Great Cowleigh, so named by him for the Rev. A. Bloxam to whom I am indebted for it; one from the Wrekin, and another from near Dolgelly, both named *R. vulgaris,* for which my thanks are due to Mr. Lees himself, are *R. affinis.* A specimen received from Mr. Lees as *R. affinis* and gathered between Dolgelly and Trawsfynydd, North Wales, seems to be a state of *R. macrophyllus.* When characterizing *R. affinis* for Steele's Handbook, he placed it amongst the species with stems "arching and rooting at the extremity," but my observations lead me to consider that the suberect section is its true place.

8. *R. corylifolius* (Sm.!); caule decurvato vel procumbente teretiusculo glabro, *aculeis subulatis rectis tenuibus,* foliis quinatis subtus mollibus pallidioribus marginem versus undulatis planis vel decurvatis, foliolo terminali rotundato-ovato cordatove, *infimis subsessilibus intermediis incumbentibus,* panicula subcorymbosa, *se-*

palis ovatis a fructu reflexis, *stylis virescentibus, toro oblongo pedunculato.*

R. corylifolius, *Sm. Fl. Brit.* 542 ; *Eng. Bot.* 827 ; *Arrh. Rub. Suec.* 16 ; *Bab. Man.* ed. 1. 95, ed. 2. 98 ; *Syn. Rub.* 12 ; *Fries, Summa Veg. Scand.* 168.

R. affinis, *Bab. Man.* ed. 1. 93.

R. affinis γ, *Leight. Fl. Shrop.* 226.

R. sublustris, *Lees in Steele Handb.* 54.

Stems long, usually glabrous. Prickles moderate. Petioles deeply furrowed above with nearly straight prickles beneath. Panicle rather pyramidal than corymbose ; branches corymbose, few-flowered, the lower ones often elongated and spreading ; prickles long, straight, slender, declining, with a bulbous base ; hairs ash-coloured. Primordial fruit oblong ; torus manifestly stalked, leaving a clear space between the lowest drupe and the calyx. Base of the filaments and styles pink. Petals oblong, pinkish or white.

It is believed that the above will be found an improvement upon the character which I formerly gave for *R. corylifolius.*

Obs. Since this paper was communicated to the Society Mr. Leighton has published elaborate descriptions of what he considers as four varieties of *R. corylifolius* (Phytol. iii. 159), and has kindly informed me by letter to which of them several of the specimens in my collection belong. He also suggests that my *R. incurvatus,* described below, may be his *R. corylifolius β,* but with that opinion I cannot altogether agree, since his plant is characterized by a stem "green and slightly tinged with reddish purple," whilst the true *R. incurvatus* has the dark purple stem of his varieties γ. and δ.

I have no doubt that the figure published under the superintendence of Smith (Eng. Bot. t. 827) represents *R. corylifolius a. sublustris* (Leight.), not his γ. *Smithii,* and that he had the same plant in view when writing the 'Fl. Brit.,' but that the *R. corylifolius* of the 'Eng. Flora' is purposely so described as to include plants with much more angular stems. Two plants from near Bath, named *R. corylifolius* by my friend Mr. Borrer, than whom no higher authority exists, belong apparently to the variety δ. *intermedius* of Leighton.

The strongly angular stems of the plants included under Mr. Leighton's varieties γ. and δ. have always appeared to me to separate them from the true *R. corylifolius,* i. e. from his varieties *a.* and *β,* although the latter has slightly angular stems. They also have much less, or not at all, subulate prickles, but rather compressed ones. Arrhenius remarks of *R. corylifolius* (the plant of Smith), "caulis sterilis teres, versus apicem angulatus, ... viridis, sub sole rubescens."

Doubtless during the present summer Mr. Leighton will examine his plants with reference to the form of the primordial fruit, the torus, the styles, and the direction of the edges of the leaves, and determine by means of these (according to my views) highly important characters the rank of the four forms which he has described. A careful examination of the dried specimens of them to which I have access has not enabled me to form a confident opinion upon them; but it is my firm belief that *R. incurvatus* is quite distinct from *R. corylifolius*; neither do I suppose that it is synonymous with either of Mr. Leighton's varieties of that plant, although some of the individuals included by him under more than one of them will perhaps be found to belong to it.

8*. *R. incurvatus* (n. sp.); caule arcuato anguloso glabriusculo pilosove, *aculeis validis* rectiusculis horizontalibus declinatisve, *foliis* quinatis coriaceis subtus tomentosis viridi-albis *marginèm versus incurvatis undulatisque,* foliolo terminali cordato-ovato acuminato, infimis breve petiolatis intermediis dissitis vel incumbentibus, paniculæ angustæ ramis brevibus corymbosis, *sepalis ovatis attenuatis* a fructu hemispherico reflexis, *stylis dilute carneis, toro ovato sessili.*

Stem arching, angular, slightly furrowed, purple, nearly glabrous or with scattered patent hairs. Prickles purple with a yellow tip, hairy, much-enlarged and compressed at the base. Leaves shining above, soft and greenish white beneath; their doubly crenate-dentate-apiculate margins turned upwards in a remarkable manner and wavy; midrib and petioles with strong hooked prickles with yellow tips; lower pair of leaflets oblong, shortly stalked, either overlapping or distinct from the obovate intermediate pair; terminal leaflet cordate-ovate, acuminate, on rather a long stalk; all acute. Petioles flat above or very slightly furrowed. Stipules linear.

Flowering shoot rather long, surrounded at its base by short scales white with silky pubescence, purple, hairy with patent hairs. Prickles strong, deflexed, purple with yellow tips, hairy. Leaves ternate, pilose above, pale green and hairy beneath; leaflets nearly equal, obovate or oblong, lateral ones lobed on the lower edge; petioles and midribs with small hooked prickles. Stipules linear or linear-lanceolate. Panicle narrow, compound, tomentose and pilose, with yellow setæ shorter than the hairs; prickles long, declining or slightly deflexed, rather slender; branches short, corymbose, the two or three lowest axillary, distant, the upper ones approximate, all patent; the upper half or two-thirds of the panicle ultra-axillary; occasionally the lowest branch is prolonged and forms a subsidiary panicle as in *R. cory-*

lifolius; bracts trifid, broad. Sepals ovate or lanceolate, attenuated into a rather long linear point, woolly on both sides, ashy within, greenish externally; reflexed from the fruit but their points turned upwards, at that time tinged with red at the base within. Petals broadly elliptical, clawed, pink. Styles flesh-coloured. Primordial fruit hardly more than hemispherical; torus quite sessile, the lowest drupe adpressed to the base of the calyx.

Common in the valley of Llanberis, Caernarvonshire.

Obs. 1. The position of this plant appears to be almost exactly intermediate between *R. corylifolius* and *R. cordifolius*, but, as it seems to me, is quite distinct from either of them. In look it greatly resembles the former, but in character is far more nearly allied to the latter. The almost terete stem, slender bulbous-based prickles, rugose leaves with flat or decurved edges, furrowed petioles, oblong primordial fruit remarkable for its stalked torus, and the greenish styles, distinguish *R. corylifolius*. The flat edges of the leaves, furrowed petioles, panicle with rather numerous setæ, oblong primordial fruit and pale green styles, are the chief distinctions of *R. cordifolius*.

Obs. 2. It is probable that some of the plants referred to in Obs. 3, under *R. corylifolius* in my 'Synopsis of Rubi,' belong to the present species, but the great difficulty of determining several of the characters from the dried and pressed plant prevents me from noticing them any further in this place. I strongly suspect that some of the bushes named *R. rhamnifolius* (second form) by Mr. Leighton will prove to be *R. incurvatus*: indeed it can scarcely be doubted that a specimen from "the Flash near Shrewsbury" so named by him and marked as "*R. rhamnifolius* forme ordinaire" by Esenbeck, is *R. incurvatus*, although it has the pale reddish purple stem of *R. corylifolius* β (Leight.). A plant gathered at "Lyth Hill near Shrewsbury" by Mr. Bodenham, and named *R. leucostachys* by Mr. Lees, to whom I am indebted for it, seems also to be *R. incurvatus*.

Obs. 3. It is not without much hesitation that I now describe a supposed new species of *Rubi*, as I cannot but suspect that it is already named and described by some of the botanists who have published upon this genus. After a careful study of the descriptions of *Rubi* contained in British, and more especially continental works, I have been quite unable to detect this plant, and am therefore reduced to the necessity of imposing a new name upon it. Had there been only two or three bushes of it, I should have passed it over as an anomalous form of one or other of its allies; but when I find it occupying by its number a prominent place amongst the brambles in the valley of Llanberis, throughout a distance of five or six miles, I am led to the conclusion that it is really a distinct form constituting what, in this genus, we consider as a species. The characters of the living plant are so conspicuous as to distinguish it at a glance from the other brambles amongst which it grows. It will probably soon be found in other places.

11. *R. leucostachys β. vestitus.*
R. villicaulis α. et δ, *Bab. Man.* ed. 1. 95.
R. Leightonianus, *Bab. Ann. Nat. Hist.* xvii. 240, *Man.* ed. 2. 101.

The following observations quoted from a letter (dated Oct. 26, 1847) addressed to me by my friend Mr. Leighton, appear to prove indisputably that my *R. Leightonianus* is only an extreme state of *R. leucostachys.* He deserves credit for the pains which he has taken to elucidate this subject, but I must deplore that his acuteness has been so successful in this particular case, for he has thereby frustrated a proposed commemoration of himself and his labours. This is a remarkable instance of the advantage of carefully distinguishing and describing forms, as thereby attention is drawn to them and a better knowledge of the limits of species attained. If typical specimens of *R. leucostachys* and *R. Leightonianus* were alone seen, probably no botanist would doubt their distinctness; but when we trace *R. leucostachys* changing, in shady places, into *R. vestitus,* and that in denser shade acquiring the very thin large remarkably dentate and pale leaf of *R. Leightonianus,* we become convinced that only one variable species is before us. This conclusion is additionally enforced by the concurrent variation in the prickles. In the autumn of 1847 I was led to suspect that *R. Leightonianus* would be proved to be only an extreme state of *R. leucostachys,* from a difficulty which occurred to me when endeavouring to distinguish it from *R. vestitus* in a dense wood in Herefordshire. Shortly afterwards I received Mr. Leighton's remarks, accompanied by a series of specimens, and my suspicions were converted into certainty.

Mr. Leighton remarks as follows:—"If you examine the barren stem of *R. leucostachys β. vestitus,* growing in rather exposed situations, you will find the prickles on the middle and upper portions large, equal, fully developed, and confined to the angles or nearly so; but on the base of the stem the prickles are much more numerous, smaller, and scattered on all sides. The leaves have dense white tomentum on their under surface; and the prickles on the petioles are hooked and strong.

"On young plants, or those growing in shady woods, especially if moist, the barren stem presents throughout much the appearance of the base of the same part in exposed plants in its greener colour, and the inequality, slenderness and scattered position of the prickles. The leaves also are thinner and green on both sides, and the whole plant is destitute of that tawny colour which is peculiar to it when exposed. The prickles on the petioles are straight or nearly so.

"If you examine similar plants on higher and drier but still shady spots, the barren stem is found to have the same appearance as in the plant of moist places, but with a manifest tendency to more equality and regularity in the prickles. The under surface of the lower leaves is green, that of the upper ones has a whiter appearance. The prickles on the petioles are slightly curved or hooked, but a few are straight."

I am indebted to Mr. Leighton for a specimen from near Shrewsbury, in which the barren stems from the same bush have the small scattered slender prickles of *R. Leightonianus* in one part, the strong, equal and regularly distributed ones of *R. leucostachys* on another, and also several intermediate states. It may be safely added, in the words of Mr. Leighton, that the above "fully proves *R. Leightonianus* to be only a state of *R. leucostachys β. vestitus* growing in shade."

24. *R. hirtus,* W. et N.

α. hirtus; caule subtereti, foliis magnis quinatis inæqualiter mucronato-serratis, foliolo terminali ovali cuspidato, panicula tomentosa, sepalis vix aciculatis.

R. hirtus, *Rub. Germ.* 95. t. 43.

β. Menkii; caule subanguloso; foliis mediocribus quinatis vel ternatis inæqualiter et grosse mucronato-serratis, foliolo terminali ovali-lanceolato, panicula hirta, sepalis aciculatis.

R. Menkii, *Rub. Germ.* 66. t. 22.

γ. foliosus; caule anguloso sparsim piloso, foliis mediocribus quinatis inæqualiter mucronato-dentatis, foliolo terminali cordato acuminato, panicula hirta ad apicem foliosa, sepalis paululum aciculatis.

R. foliosus, *Rub. Germ.* 74. t. 28.

I have nothing to add concerning *var. α.* and *β*; *var. γ.* is now published for the first time. It grows in Hartshill Wood, Warwickshire, where it was discovered by the Rev. A. Bloxam, and to whom is also due the credit of determining its identity with the *R. foliosus,* Weihe. It does not quite agree with that plant, for in the 'Rubi Germanici' the stem is stated to be hairy, the terminal leaflet ovate cuspidate and finely serrate (but scarcely so represented on the plate), the panicle almost without setæ at the summit (according to the description, but many are shown in the figure), and the calyx without setæ or aciculi. In other respects the English plant agrees well with the description and figure of that found in Germany.

Obs. I am now convinced that the variety of *R. Radula* formerly referred by Dr. Bell Salter and myself to *R. foliosus* (Weihe) is not the plant intended by that author, which (whatever may be thought of the claims of my *R. hirtus* γ. *foliosus*) seems to be very closely allied to *R. Menkii* (Weihe).

25. *R. glandulosus*, Bell.

ε. *rotundifolius*; caule subanguloso piloso setoso, aculeis parvis multis, *foliolo terminali rotundo* cuspidato basi subcordato inæqualiter *duplicato-cuspidato-dentato*, prope basin mucronato-serrato, paniculæ hirtæ aculeis multis tenuibus rectis declinatis setis brevibus multis ramis paucis brevibus ascendentibus apiceque paucifloris.

Barren shoot rather angular with small numerous yellow prickles; hairs and setæ abundant, the latter very short. Leaves mostly ternate, thin, opake, with scattered hairs above, ashy and pilose beneath; terminal leaflet nearly round but slightly narrowed below, in one of my specimens it is considerably narrowed below; lateral leaflets unequally bilobed (or rarely divided into separate leaflets); all wavy at the margin; petioles armed like the stem. Hairs on the flowering shoot and panicle long, setæ mostly short and sunken amongst the hairs, prickles rather long and very slender; leaves ternate; branches very few, very short; sepals lanceolate with an attenuated point, setose, acicular, reflexed (?) from the fruit.

In small quantity in the same plantation with *R. glandulosus* γ. *rosaceus* and δ. *dentatus*, near Twycross, Leicestershire, *Rev. A. Bloxam.*

25*. *R. Güntheri*, Weihe.

β. *pyramidalis*; caule procumbente, *foliis* supra subglabris opacis: *marginibus deflexis*, *paniculæ pyramidalis* apice et ramis racemosis rachide recta rigida.

Stem quite prostrate, conforming itself to the inequalities of the ground, angular, not furrowed, greenish purple; prickles rather numerous, short, strongly declining or slightly deflexed, their base thick; hairs few; aciculi and short setæ rather numerous. Leaves ternate, or very rarely quinate-pedate, the edges bent downwards, green on both sides, opake with strongly impressed veins and scattered hairs above, paler and with yellowish hairy veins beneath; leaflets nearly equal, terminal one obovate-cuspidate with a subcordate base, lateral leaflets similar but narrower and unequal or lobed on the lower margin; all irregularly strongly dentate-serrate-apiculate; general and partial petioles and midribs armed beneath similarly but less strongly than the stem; stipules linear, hairy, setose.

Flowering shoot surrounded at its base by brown scales clothed with ash-coloured silky pubescence, long, very hairy, with rather numerous short and a few longer declining prickles; aciculi and setæ short, few, except at the upper part of the shoot and amongst the flowers. Leaves ternate; leaflets nearly equal, obovate-cuspidate, green and hairy on both sides with paler veins beneath; general and partial petioles armed like the shoot but with more numerous aciculi and setæ; the one or two uppermost leaves occasionally simple, ovate or cordate or lobed. Panicle very long, with several axillary racemose ascending branches and a long ultra-axillary pyramidal summit with patent or divaricate branches which are few-flowered and racemose below and one-flowered above; the whole remarkably pyramidal and very stiff; general and partial rachis and peduncles nearly or quite straight, very hairy, with slender straight yellow prickles and numerous purple setæ. Petals obovate-lanceolate, narrow, greenish white, widely separated. Styles pale green, pinkish below. Sepals lanceolate with a long setaceous point, ashy, downy, prickly, setose, green within, lying close to the fruit and either patent or forced back by it. Primordial fruit oblong, others shorter.

Valley of Llanberis, N. Wales, in great plenty. August.

Obs. This beautiful and conspicuous plant agrees so nearly with *R. Güntheri* that I think it best to consider it as a form of that species, but have thought it advisable to describe it at some length. Its chief differences consist in its very rigid and straight, not wavy, rachis; the divaricate rather than ascending upper divisions of the panicle; greenish white, not pink (?), petals; and more prickly and not truly reflexed sepals. It also much resembles *R. thyrsiflorus*, but has a different appearance owing to the almost constantly single-flowered and spreading upper divisions of its panicle and its narrower petals. Its examination has confirmed me in the opinion formerly expressed that *R. Güntheri* and *R. thyrsiflorus* of the 'Rubi Germ.' are forms of one species. When representing the plants in that work the artist seems to have been provided with a rather weak panicle of the former and a very strong one of the latter, thus causing them to appear more than naturally different.

In our plant the panicle is often several feet long, and its lower axillary branches are exactly like the smaller panicles of less vigorous shoots; the uppermost compound branches resembling the small panicles produced by weak plants.

25**. *R. scaber* (Weihe); caule arcuato subanguloso aspero, *aculeis* subæqualibus *validis brevibus declinatis deflexisve*, aciculis setis pilisque paucis brevissimis, foliis ternatis quinatisve supra pilosis subtus pallide viridibus pilosis inæqualiter apiculato-dentatis, foliolo terminali obovato-cuspidato, *paniculæ* tomentosæ superne ultra-axillaris *ramis divaricatis* subcorymbosis paucifloris, sepalis lanceolatis aciculatis setosis a fructu laxe reflexis.

R. scaber, *Rub. Germ.* 80. t. 32.

Prickles rather numerous on the barren stem, remarkably declining but scarcely deflexed on our plant, short with a thick base, yellow; aciculi, setæ, and hairs rather few, very short, with thick rigid bases, which remaining on the old stems give the file-like roughness to them for which this and the plants allied to *R. Radula* are remarkable. Leaves ternate or "quinate-pedate," opake and deep green with scattered hairs above, much paler but green with more numerous hairs beneath; lateral leaflets very strongly lobed, each lobe oval and cuspidate, upon a short ascending stalk; terminal leaflet obovate and cuspidate with a cordate base; all irregularly and rather doubly apiculate-dentate; general and partial petioles and midribs (both primary and also those of the lobes of the lateral leaflets) armed beneath with short thick yellow hooked prickles, the petioles also having rather numerous but extremely short aciculi setæ and hairs, the midribs with longer hairs but apparently without setæ or aciculi; stipules linear setose and hairy.

Flowering shoot surrounded by silvery scales, hairy, setose, with prickles like those of the barren shoot but smaller; upper part of the peduncles more setose (setæ purple), with a few aciculi, more hairs, an under coating of ash-coloured wool, and more slender and less deflexed prickles. Lowest and uppermost leaves simple, broad, rather cordate, deeply lobed; the others ternate with unequally oval or ovate lateral leaflets, the terminal leaflet obovate-acuminate and considerably narrowed below; all apiculate dentate, pilose and green on both sides, paler beneath. Panicle broad and relatively short, somewhat pyramidal; lower branches axillary, ascending, long, racemose-corymbose, few-flowered; upper ones ultra-axillary, divaricate, nearly corymbose, only three-flowered on my specimens (as they are also represented in the 'Rubi Germ.,' but not racemose as on that plate). Sepals lanceolate, woolly, aciculate, setose, greenish externally, loosely reflexed from the fruit. Petals oblong.

In Hartshill Wood, Warwickshire, in a dense thicket of brambles and briars, *Rev. A. Bloxam*. August.

Obs. It is very difficult to determine in which section of the genus this plant should be placed; indeed, its structure shows that the sections characterized from the barren stems are not so absolutely distinct as has been supposed by some writers. The armature of those stems would place it in the scabrous division with *R. Radula*, to the varieties *pygmæus* and *foliosus* of which the peculiar arms of its petioles show some similarity. In other respects it is very different from *R. Radula* and its allies. It seems far more correctly placed in close connection with *R. Güntheri* and *R. glandulosus.* In the 'Compend. Fl. Germ.' (ed. 2) it stands between *R. Güntheri* and *R. Menkii.* Its scabrous stem and very different panicle distinguish it from the former, and the very different prickles of the stem from the latter. From *R. glandulosus,* to the variety *Lejeunii* of which Mr. Bloxam thinks it is allied, the remarkable armature of the stem and the broad pyramidal divaricate panicle appear to separate it.

VI.—*Descriptions of* Aphides. By Francis Walker, F.L.S.

[Continued from vol. i. p. 454.]

Fourteenth Group.

The species of this group feed on grasses and rushes; they have rather flat bodies, short feelers and legs, their nectaries hardly rise above the surface of the body, and they very rarely occur in the winged form.

26. *Aphis Glyceriæ.*

A. Glyceriæ, Kalt. Mon. Pflan. i. 113. 87.

The viviparous wingless female. This insect feeds on the leaves of *Glyceria fluitans,* floating-grass, during the summer and autumn. It is yellowish green, hairy, rather flat, with slight transverse ridges, and gradually increases in breadth from the head till near the tip of the abdomen: there are two dark green, broad, indistinct stripes along the back: the front is concave on either side and slightly convex and notched in the middle: there are no tubercles at the base of the feelers, which are setaceous, yellow, and less than one-third of the length of the body; their tips are brown; the fourth joint is much shorter than the third; the fifth is as long as the fourth; the sixth is longer than the fifth; the seventh is as long as the sixth: the eyes are dark brown: the mouth is yellow and reaches the middle hips; its tip is brown: the legs are yellow and rather short; the feet and the tips of the thighs and of the shanks are brown; the shanks are straight. It has a soft velvet-like appearance, and varies much in colour, being either deep green, or pale green, or yellow, or sometimes mottled with these colours; or it has a reddish tinge, or is reddish yellow, or almost brown; it is adorned with rows of little black dots. The young ones are light fresh green, having the head and the limbs almost white.

The viviparous winged female. This is very scarce: the head and the disc of the chest are brown: the feelers are rather more than one-third of the length of the body; the seventh joint is longer than the fifth: the wings are colourless; the veins and the wing-brands are brown; the rib-vein is rather broad, but widens into a rather narrow brand; the first and the second veins are nearly straight; the third is obsolete at its source, and is very slightly inclined inwards; it is forked soon after one-third, and again at two-thirds of its length; the fourth vein is nearly straight: one wing of the only specimen that I have seen has no second fork.

The oviparous wingless female. This appears in the autumn; it is green, and very much resembles the viviparous female: the feelers are a little more than one-fourth of the length of the body.

The wingless male. It is dull dark yellow, blackish above, and especially towards the tip of the abdomen: the feelers are black, yellow at the base, and more than half the length of the body: the legs are dull yellow; the feet are black. In other characters it resembles the female.

Length of the body $\frac{3}{4}$–1 line; of the wings 2 lines.

Kaltenbach observes that this species feeds also on *Poa annua,* annual meadow-grass, *Phalaris arundinacea,* and *Juncus lampocarpus,* shining-fruited rush, &c.

27. *Aphis littoralis,* n. s.

This species is very abundant in the autumn on the grass of the muddy sea-shore near Lancaster, and the following description is from specimens found on that plant.

The viviparous wingless female. The body is rather flat, somewhat long and narrow, dark green, sometimes but very rarely pale green, not hairy nor bristly, but clothed with a white velvet-like down; it increases slightly in breadth from the head to the tip of the abdomen: the feelers are filiform, yellow, black towards the tips, and about one-fifth of the length of the body: the mouth is dull green with a black tip: the legs are dull yellow, and very short; the feet are black: all the segments of the body are distinct, transverse, and of nearly equal size: it moves slowly, and has much resemblance to the preceding species, whose body however is hairy.

The oviparous wingless female. I have not yet observed any outward difference between this and the preceding form.

The wingless male. It appears with the oviparous female at the end of October, but is comparatively scarce: the body is brown, and slightly increases in breadth from the head till near the tip of the abdomen: the feelers are about half the length of the body, and are shorter than those of the darker brown male of *A. Glyceriæ,* whose nectaries moreover rise a little above the surface of the body, whereas in this species they are even with the same. In the latter part of autumn the habitation of this species is frequently submerged, and its body is often covered with clay.

28. *Aphis hirtellus.*

Atheroides hirtellus, Haliday, Ann. Nat. Hist. 1838, 189.

The oviparous wingless female. The body is yellow, rather flat, nearly linear, shining, tuberculated: there are two faint broken light brown stripes along the back on each side, and a row of black spots between them: the tip of the abdomen is fringed with a few hairs: the feelers are black, yellow at the base, and full half the length of the body: the eyes are dark red: the mouth is pale yellow, and reaches the base of the fore-legs: the legs are pale yellow: there is a light brown ring around each hind-thigh very near the tip; the base of the fore-shanks and the whole of the hind-shanks are light brown; the feet are black.

1st var. Bright pale yellow.

2nd var. Dull buff.

3rd var. Dark brown.

4th var. Pale brown with a buff head.

5th var. Pale yellow, with four rows of pale brown spots along the back.

The viviparous winged female. The body is brown and bristly: the feelers are setaceous, pale yellow, and rather less than half the length of the body; their tips are brown; the third and fourth joints are long and slender; the fifth and the sixth are rather shorter; the seventh is longer and more slender: the mouth is dull yellow: the legs are pale yellow; the feet and the tips of the shanks are darker: the wings are colourless, or very slightly tinged with pale yellow, and are much longer than the body; the wing-ribs, the rib-veins and the brands are pale yellow; the veins are pale brown.

The wingless male. The body is dark brown or almost black: it has longer feelers than the female, and is sometimes only one-third or even one-fourth of the size of the latter. It sometimes pairs with the female of *A. serrulatus.*

Length of the body $\frac{1}{2}$–$1\frac{1}{4}$ line.

1st var. Body very dark blackish green.

Found on grass in the autumn near Lancaster, and near Belfast.

29. *Aphis Cyperi,* n. s.

The viviparous wingless female. The body is spindle-shaped, dull green, and rather flat: the feelers are brown, setaceous, and three-fourths of the length of the body; the fourth joint is about half the length of the third; the fifth is as long as the fourth; the sixth is more than half the length of the fifth; the seventh is much longer than the sixth : the front is convex : the nectaries do not rise above the surface of the abdomen : the legs are yellow, and rather short ; the feet and the tips of the shanks are black ; the latter are straight.

The viviparous winged female. In colour like the wingless female, but the head and the disc of the chest are brown : the feelers are black, and as long as the body : the wings are colourless, rather long and narrow ; the veins and the wing-brands are brown ; the wing-vein begins to widen into the brand just after half the length of the wing ; the brand is long and narrow, and the angle at its tip is very obtuse ; the first and the second veins are nearly straight, remote at their source, but near each other at their tips ; the third vein is obsolete at its source, and is forked after one-third and again after two-thirds of its length ; the fourth vein is very slightly curved.

Length of the body $1\frac{1}{4}$ line ; of the wings $3\frac{3}{4}$ lines.

Found by Mr. Haliday on rushes in the autumn, near Belfast.

Fifteenth Group.

30. *Aphis Eriophori,* n. s.

The viviparous wingless female. The body is elliptical, rather narrow, slightly convex, dark lead-colour, somewhat hairy, and has a spot of white floccus at the tip of the abdomen : the feelers are setaceous, and less than half the length of the body ; the fourth joint is full half the length of the third ; the fifth is rather shorter than the fourth ; the sixth is more than half the length of the fifth ; the seventh is much more slender than the preceding joints, and rather longer than the fifth and the sixth : the eyes are tuberculate behind : the mouth reaches the middle hips : the front is nearly straight, slightly notched, and beset with short bristles : the sides of the fore-chest are slightly undulated : the nectaries are nearly one-seventh of the length of the body : the abdominal segments behind the nectaries are very short : the legs are slender, slightly hairy, and rather short ; the shanks are straight.

Length of the body $1\frac{1}{4}$ line.

The young ones are paler, and their mouths reach beyond the hind-hips.

"Abundant on *Eriophorum vaginatum,* hare's-tail cotton-grass, in a pool near the pass in Wicklow called 'Sally Gap,' 1600–1700 feet high," Aug. 16th, 1847, Mr. Haliday.

Sixteenth Group.

31. *Aphis bufo,* Haliday MSS.

The viviparous wingless female. Found in the beginning of October by the sea-shore near Fleetwood on *Lycopsis arvensis*, the small bugloss; also by Mr. Hardy near Newcastle on *Carex arenaria*, sand reed, and by Mr. Haliday near Belfast. While very young the body is pale green, but most of the abdomen is red: the feelers are pale green, and nearly as long as the body; the tips of the joints are black: the mouth is reddish green, and reaches the base of the hind-legs; its tip and the eyes are black: the legs are red, stout, and rather short. When full-grown the body is oval, broad, tuberculate, hairy, and yellow: there are two rows of larger tubercles along the back: the tip of the abdomen is black: the feelers are black, setaceous, and a little more than half the length of the body; the third joint is yellow: the eyes are black, and each of them being quite divided seems to be double: the mouth is yellow with a brown tip, and does not reach the middle-hips: the legs are short, black, bristly, and remarkably stout, especially the fore-thighs and the middle-thighs and the hind-shanks; the fore-shanks and the middle-shanks are yellow, darker towards the base, and the middle-shanks are also darker towards their tips: the nectaries hardly rise above the surface of the body. The eggs of this species are spindle-shaped, dark green, and thickly covered with white powder; they are fastened along the blades of the leaves, which when dead collapse, and preserve them from injury.

The wingless male. The body is yellow with two longitudinal stripes and with black tubercles: the feelers are longer than the body; the legs are more slender than those of the female; the thighs are yellow with black tips.

Seventeenth Group.

Containing only one species which is wingless in all its forms, and recedes very far from the ordinary characters of the genus.

32. *Aphis serrulatus.*

Atheroides serrulatus, Haliday, Ann. Nat. Hist. 1839, 189.

The viviparous female. Is dark brown or pale brown above, pale red or pale yellow or yellowish green beneath, convex, linear, very long and narrow, somewhat dull and finely rugulose: the front of the head is bristly: the fore-chest and the middle-chest are rather large; the hind-chest is shorter; the propodeon is still shorter; the podeon is as long as the propodeon; the octoon and the following segments are of equal and moderate size; the telum is bristly: the feelers are slightly setaceous, pale yellow at the base, darker at the tips, and about one-sixth or one-eighth of the length of the body: the eyes are black: the mouth is pale yellow or yellowish green and reaches the middle-hips; its tip is black:

the legs are yellow, and rather short; the tips of the shanks and of the feet are darker.

1st var. The feelers are black, yellow at the base, and as long as one-fourth of the body: the mouth is pale red with a black tip: the legs are dull red; the feet and the tips of the shanks are black.

The oviparous female. Appears in the autumn, and does not outwardly differ from the viviparous female.

The male. The feelers are very nearly or rather more than half the length of the body, which is rather shorter than that of the female: the body and the limbs are slightly hairy, and the former is of a pale olive colour: the feelers are black, setaceous, pale yellowish green near the base: the legs are also pale yellowish green; the feet are black; the hind-thighs are blackish towards the base.

Length of the body $\frac{3}{4}$–1 line.

[To be continued.]

VII.—*Observations on* Dr. Mantell's "Reply" *to* Mr. Toulmin Smith's *Account of the* Ventriculidæ.

The remarks of Dr. Mantell in the 'Annals of Natural History' of the present month call for a few brief observations from me. I must always regret a difference of views from any one for whom I have a respect,—and especially with whom I have been in habits of friendly intercourse,—when, but only when, any feeling of reserve or asperity arises out of that difference of views instead of the cordial desire for still further discussion and investigation, and so getting, in the end, nearer to the truth.

Dr. Mantell imputes to me presumption in stating that "the field was an entirely untrodden one and the task a new one," and that "the nature of this class of animals was totally unknown before." I wish to make two answers to this imputation; first, as regards an implied denial of justice to himself; second, as to the matter of fact.

First, as to my notice of Dr. Mantell himself. In pp. 73 and 74 I use the following language. Having named Dr. Mantell's paper in the 'Linnæan Transactions' I add:—"That paper was but one among the many results of the indefatigable labours of its author in a field then little trodden and by few feet. * * It can be no reflection on the Discoverer of the Wealden and First Investigator of the Chalk to show that, amid the multitude of objects which engaged his attention, one was not followed out exhaustively." Again, on entering on the classification, I use, at p. 45, the following words:—"I have been unwilling, out of respect to the many labours of Dr. Mantell in the field of palæontology, to reject, as others have done without assigning any reason, this generic appellation ; * * I am glad that a modification in the meaning of the word enables me to retain a name which will always bring to the inquirer's recollection the long and successful labours of Dr. Mantell." The candid reader may judge from these and other passages whether I have wished to depreciate the labours of Dr. Mantell or his reputation.

Second, as to the matter of fact : the question simply is, *what is knowledge* of a class of animals. I apprehend that "knowledge" of any creature is not merely the sight, or bare handling, or even giving an arbitrary name to a specimen ; it must imply some knowledge of structure and functions, in the same way as Professor Owen justly tells us that "the *knowledge* of the organized beings now called *Polypi*, as members of the animal kingdom, is of comparatively recent introduction" (Comp. Anat. i. p. 81), though these had been seen and handled on the sea-shore for ages. I certainly must repeat the assertion that, previously to the publication of my papers,—papers as to which Dr. Mantell himself has been pleased to say that "the subject has recently been investigated by a gentleman of distinguished ability" (Wonders of Geology, 6th ed. p. 638),—the nature of these beautiful fossils was "*totally unknown*." Neither Dr. Mantell nor any previous writer had ever even suspected the existence of any membrane whatever in the Ventriculidæ. On the other hand, "I have demonstrated that the basis of the Ventriculidæ is a simple unperforated membrane ; that, therefore, the descriptions so long before the world, and so often repeated, are fundamentally erroneous,—the conclusions as to the œconomy of the animal being necessarily, therefore, as fundamentally erroneous" (p. 43 *note*). In addition to this, and other points to which I cannot now allude, I have discovered and described and figured, as existing in this membrane, an entirely new form of animal structure ; of which Dr. Mantell himself has said (somewhat in inconsistency with what he now considers as due to his courteous readers) :—"*Of the accuracy of Mr. Toulmin Smith's beautiful microscopic examination of the intimate tissue of these zoophytes I have no doubt* ; and will only remark that the octahedral form, represented as that assumed by the inosculating fibres of the membrane of the Ventriculidæ, *is a very extraordinary anomaly in animal structures*." (Wonders of Geology, 6th ed. p. 638 *note*.) I think Dr. Mantell's own words, addressed to the very readers whom he now twice assures of his own accuracy, and whom he is so anxious to treat with all due courtesy, are the best testimony that he is doing me injustice.

I am surprised that Dr. Mantell should speak of an "incongruous assemblage" of forms. I might take almost any family of either animal or vegetable kingdom to show the futility of this objection. The Acacias *platyptera, pendula* and *grandiflora* are, for instance, at first sight, almost as incongruous as are *Tubulipora patina, Gemellaria loriculata* and *Halodactylus diaphanus.*

I doubt not that when the first priest of old nailed to the column's head, after the solemn sacrifice was done, the scalp which he had torn off the devoted ram, he thought he knew very well what a ram's head was, and would have pitied any unhappy wight who might have suggested any resemblance between the head and the tail of the beast which had just smoked upon the altar. It has been reserved for modern science not only to suggest but to demonstrate, by one of the most beautiful, most logical, most philosophical, and at the same time most scientifically important trains of investigation that has been ever followed up, that between these so "incongruous" parts there are clear and positive homologies, and that no one can truly "know" either part who does not study those homologies. It has been by treading, though at an humble distance, and, I am fully conscious, with a too faltering step, in the path by which those important truths have been obtained that I have arrived at what Dr. Mantell thinks fit to term "sublime transcendentalisms;" but which, to my mind, constitute, in every branch of science, the main charm, and the most important end, of the pursuit.

In conclusion I may be allowed to say, that it is of little importance to the world what may be Dr. Mantell's *opinion* or my own on the present matter; but it is of importance whether, in pursuing the subject, any fragment of truth has been got at. I had hoped Dr. Mantell would have discussed my facts and arguments, and not "replied" to my conclusions. I hope that he will do so yet. It is only by full discussion, close examination, and careful consideration that the truth or falsity of my conclusions can be tested. Such discussion, examination and consideration I shall be ready and most glad to meet from any one in a fair and cordial spirit. But all hope of truth and all scientific investigation is at an end, if it is to be considered as a "reply" to a long and most carefully conducted train of investigation that, some years before, one or two of the objects whose natural history and relations are thus elucidated had been described in quite a different way; and that, *therefore,*—for that is Dr. Mantell's only argument,—the more recent investigations must be all wrong. I am glad to say that my collection has been already visited by several of the most eminent palæontologists and anatomists of this country; and I know that some of these, who have the most carefully examined the series, are satisfied of the truth of my conclusions. Of the opinion of others I have perhaps no certain information at present; but I will only add, that, to these or any others really wishing to compare the facts or to examine into the nature of this most beautiful and interesting class of fossils, the contents of my cabinet will, after August of the present year, be at all times most freely open for inspection.

J. Toulmin Smith.

Highgate, 16th June 1848.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

May 25, 1847.—" On the structure of the Jaws and Teeth of the Iguanodon." By Gideon Algernon Mantell, Esq., LL.D., F.R.S., Vice-President of the Geological Society, &c.

The recent discovery of the right dentary bone of the lower jaw of an adult Iguanodon with teeth, having enabled the author, with the aid afforded by other specimens, to determine the structure of the maxillary organs of that gigantic herbivorous reptile, the result of his investigations are embodied in the present communication.

The first memoir of the author on the teeth of the Iguanodon was published in the Philosophical Transactions for 1825; but owing to the fragmentary and water-worn condition in which the fossil remains of terrestrial vertebrated animals occur in fluviatile deposits, in consequence of these strata consisting of materials transported from far distant lands, nearly a quarter of a century elapsed before any portion of the jaw with teeth was discovered.

The most important of the fossils described in this memoir consists of the anterior part of the right side of the lower jaw, which was discovered a few weeks since, in a quarry in Tilgate Forest, by Capt. Lambart Brickenden, F.G.S., who with great liberality placed it at the disposal of the author as the original investigator of the fossils of the Wealden.

This dentary bone, which is eighteen inches long, is perfect in the anterior part, but is broken at the hinder extremity, and retains five or six inches of the coronoid bone: the length of the jaw to which it belonged is estimated at four feet. It contains two successional teeth in place, the fang of a third, and the alveoli or sockets for eighteen or nineteen mature molars; the entire number of teeth on each side the lower jaw was about twenty.

The mature teeth, which, when abraded by use in mastication, resemble the worn molars of herbivorous mammalia, appear to have been arranged in a close-set series. The lower teeth had their enamelled striated face parallel with the alveolar plate, and fronting the inside of the mouth; but the upper were placed in a reverse position, that is, with the enamelled facet of the crown external; and the teeth in the upper and lower jaws were arranged subalternate or intermediate in relation to each other, as is the case in the ruminants.

But a still more remarkable character presented by this specimen is the peculiar construction of the anterior part of the lower jaw, which forms the symphysis. This process, instead of being continued round the front of the mouth and beset with teeth, as in all other saurians, is edentulous, and extends into a procumbent scoop-like expansion, very analogous to the symphysial portion of the lower jaw in the Sloths, and especially to that of the colossal extinct Edentata—the Mylodons. Along the external surface of this dentary bone there is a row of very large vascular foramina; and the symphysis also is perforated with numerous openings for the passage of blood-vessels and nerves sent off from the great dental canal. The unusual number and magnitude of these foramina indicate a great development of the integuments and soft parts with which the bone was invested, and also the large size of the under lip.

The upper jaw, of which a considerable portion discovered by the author is in the British Museum, confirms the inferences deduced from the teeth and dentary bone of the lower maxilla.

The author, with the able assistance of Dr. A. G. Melville, instituted a comparison between all the teeth of the Iguanodon to which he could obtain access, and those of recent saurians; and the result of the investigation is detailed. The new light shed on the structure and functions of the dental organs, confirms, in every essential particular, the inferences deduced by the author from the detached teeth alone, in his memoir of 1825; and it also reveals an extraordinary deviation from all known types of reptilian organization, and which could not have been predicated; namely, that this colossal reptile, which equalled in bulk the gigantic Edentata of South America, and like them was destined to obtain support from comminuted vegetable substances, was also furnished with a large prehensile tongue and fleshy lips, to serve as instruments for seizing and cropping the foliage and branches of trees; while the arrangement of the teeth as in the ruminants, and their internal structure, which resembles that of the molars of the Sloth tribe in the vascularity of the dentine, indicate adaptations for the same purpose.

Among the physiological phænomena revealed by Palæontology, there is not a more remarkable one than this modification of the type of organization peculiar to the class of reptiles, to meet the conditions required by the economy of a lizard placed under similar physical relations, and destined to effect the same general purpose in the scheme of nature, as the colossal Edentata of former ages, and the large herbivorous mammalia of our own times.

From the facts detailed, the author is led to consider the specimen described in his memoir of 1841, as being probably the lower jaw of a young Iguanodon (but the true nature of which, from the absence of the crowns of the teeth, was doubtful) belonging to the same family, but referable to a distinct genus or subgenus; and he proposes the name of *Regnosaurus Northamptoni* for that remarkable fossil saurian. The communication was illustrated by several drawings of the specimens described.

ZOOLOGICAL SOCIETY.

Jan. 11, 1848.—William Yarrell, Esq., Vice-President, in the Chair.

The following communications were read:—

1. On the remains of the gigantic and presumed extinct wingless or terrestrial Birds of New Zealand (Dinornis and Palapteryx), with indications of two other genera (Notornis and Nestor). By Professor Owen, F.R.S. etc. etc.

In this memoir (No. III.) Professor Owen confined himself to the description and comparison of the bones of the head and beak, forming part of a very extensive and valuable series collected by Mr. Walter Mantell in a deposit of volcanic sand at Waingongoro, North Island of New Zealand. After enumerating the principal bones, now in the possession of Dr. Gideon Mantell, F.R.S., by whom Prof. Owen had been kindly invited to determine and describe them, and stating the species to which the majority were referable, viz. *Dinornis giganteus*, *D. casuarinus*, *D. didiformis*, *D. curtus*, *Palapteryx ingens*, *P. dromioides*, *P. geranoides*, the author alluded to a form of tarso-metatarsal bone, which had supported a strong back-toe, and resembled the metatarsus of the Dodo, but was shorter and thicker, as apparently belonging to the tibia of the species described in a former memoir (Zool. Trans. iii. 1843, p. 247), to the *Dinornis otidiformis*, but which must belong to a genus (*Apterornis*) distinct from both *Dinornis* and *Palapteryx*. He also stated that the collection contained many bones of seals of the genus *Arctocephalus*, F. Cuv., with a few bones of a dog and of the human subject: the latter had been calcined, and were probably the remains of some cannibal feast of the natives. The uncalcined bones of the seal were in the same state, brittle, absorbent, and of a yellowish brown colour, as the bones of the extinct birds, with which they were associated and appear to have been coeval. Numerous fragments of the shells of more than one kind of egg, the largest surpassing in size the egg of the ostrich, had also been discovered with the bones.

In the present memoir Prof. Owen described the bones of the head and beak. They belonged to four distinct genera of Birds. The largest skull, with a very strong, broad, subelongate and subincurved beak, like an adze, was referred to the genus *Dinornis*. The second in size, with a beak to which that of the Emeu makes the nearest approach, was referred to *Palapteryx*. The third skull, with a beak like that of the *Porphyrio* and *Brachypteryx*, was referred to the same family—'*Rallidæ*'—to which those genera belong; but, through the peculiarities of the cranium, formed the type of a new genus, *Notornis*. The fourth form of beak was referable to the genus *Nestor* in the family *Psittacidæ*.

The cranium of the *Dinornis* presents the family characters of great breadth, and forward inclination of the occipital region, of the vertical plane of the occipital foramen, and of the prominent and pedunculate occipital condyle; but the downward development of the basioccipital and basisphenoid is exaggerated, as compared with the *Palapteryx*, the basis cranii, which is $2\frac{1}{2}$ inches in length, descending abruptly for the extent of 1 inch below the foramen magnum; the condyle is hemispherical as in *Otis*, not a quarter of a sphere as in *Struthio* and *Palapteryx*, nor, as in *Didus*, a transverse reniform tubercle with a median notch above. The foramen magnum is a vertical ellipse, with lateral processes encroaching upon it, as in *Didus*; but in this large extinct bird the upper half of the foramen is narrower and almost pointed above. In *Apteryx* and *Palapteryx* the foramen is widest transversely. The margin of the foramen magnum is broad and excavated in both *Dinornis*, *Otis* and *Didus*, but the upper border ends in the latter genus in a tubercle on each side.

In *Didus* there is a small middle supraoccipital foramen and two lateral ones, but these do not exist in *Dinornis*, *Otis*, or *Palapteryx*: the lateral foramina are present in *Apteryx*.

In the extinct genera and in *Otis* the supraoccipital ridge is well-marked, but defined rather by the subsidence of the occipital surface than the elevation of the ridge above the parietal one.

In no bird is the extent of surface for muscular attachment so great at the back part of the head, or so strongly marked by depressions and ridges, as in the *Dinornis*.

The extension of the surface by the downward thick wedge-shaped development of the basi-occipito-sphenoidal surface, and by its lateral strong backwardly produced ridges, is quite peculiar to the *Dinornis*. An approach to this structure is made by *Otis* in the ridges that connect the sides of the flat basisphenoid* with the paroccipital* processes. In *Palapteryx* the basi-sphenoid is square and flat below, in *Didus* it presents a longitudinal channel bounded by parallel lateral ridges; the sides of the basisphenoid, which incline to these ridges, are slightly concave, have two perforations posteriorly, one above and a little in advance of the other, and form the anterior and internal boundary of the tympanic cavity.

In *Palapteryx*, as in *Didus*, the basioccipital descends and expands into two thick obtuse processes, from which muscles pass to the inwardly-bent angles of the jaw. Internal to these processes are two short tubercles. On each side the base of the occipital condyle in *Dinornis* are three small foramina; in *Didus* two, the outer one the largest.

In *Dinornis*, *Otis* and *Didus*, two foramina, the upper one for the hypoglossal nerve, the lower one for the entocarotid artery, open externally in a deep elliptic depression. The paroccipital is enormously developed in *Dinornis*, and sends a rough thick process from its under part to abut against the lateral basioccipital ridge, where it articulates and sometimes anchyloses with the stylohyal: in *Palapteryx* and *Didus* the paroccipital carries the posterior surface of the skull downwards and outwards in a minor degree than in *Dinornis*, and terminates in a curved convex thick border: its internal surface next

* For the definition of these and other anatomical terms the author referred to his 'Report on the Homologies of the Vertebrate Skeleton' in "Report of British Association, 1846."

the tympanic cavity is cellular in *Didus*. The eustachian outlets open, in both *Dinornis* and *Otis*, above a transverse ridge terminating the basisphenoid anteriorly: this ridge is not present in *Apteryx* or *Palapteryx*. The *Palapteryx* also differs from *Dinornis* in the higher position of the precondyloid holes and their greater separation from the carotid holes, in the minor development of the paroccipitals, the major development of the mastoids, and by the large and single oblong depression, beneath the mastoid, for the single superior condyle of the tympanic bone. In *Dinornis* the temporal fossa is wide and deep, in *Didus* narrow and deep; the alisphenoid is concave where it ascends to coalesce with the mastoid, parietal and postfrontal to form the temporal fossa: the limits of the orbitosphenoid are also obliterated by a similar confluence: in this region of the skull the 'foramen ovale' is preceded in *Dinornis* as in *Didus* by two smaller foramina, and in front of these is the great 'foramen opticum.' The parietals are very broad and short in both extinct genera; but in *Dinornis* there is a median rising where the sagittal suture originally ran, whilst *Didus* shows a depression and foramen here. The mastoid in *Dinornis*, as in *Otis*, sends down two processes, one, the tympanic process, short,—the other, or proper mastoid process, long; this coalesces with the postfrontal in *Dinornis*, not in *Otis*: the base of the mastoid has two articular cavities for the upper condyles of the tympanic bone. In *Didus* the outer side of the mastoid is convex, smooth, but with a slight oblique ridge; it overhangs the tympanic cavity, bending inwards, and sends a short compressed pointed mastoid process in front of the anterior articular cavity for the anterior and upper condyle of the tympanic.

The presphenoid is a deep compressed plate, thickened and rounded below; the palatines abut against it, as in *Didus*, where the fore-part of the pterygoids also rest in part upon the presphenoid. The frontals of *Dinornis* form together a broad hexagonal plate moderately convex, with the cerebral hemispheres indicated by very slight risings: the postfrontals form the depressed lateral angles; the anterior border is emarginate and coalesces with the nasals and premaxillary, without being elevated above them. In *Palapteryx* the frontals are more produced anteriorly before coalescing with the base of the beak. In *Otis* the interorbital part of the frontals is deeply and widely excavated. In *Didus* the frontals are broad and convex, rising singularly above the cranial ends of the nasals and premaxillary, with which they also coalesce. The supraorbital plate presents a rough notch near the fore-part, where in *Dinornis* there is a shallow emargination. In *Dinornis* there is a shallow depression with vascular grooves at the outside of the base of the postfrontal distinct from the temporal fossa: in *Didus* the temporal fossa extends forwards above the postfrontal and forms there a reniform depression, either for a gland, or what is less likely, for a co-extension of the origin of the temporal muscle. The postfrontal is a strong triangular obtuse process, ending freely as in *Palapteryx*, not joined to the mastoid as in *Dinornis*. The orbitosphenoids, indicated by the optic foramina, continue the roof and septum of the orbits by coalescence with the alisphenoids behind, the frontals above, the prefrontals in front, and the presphenoid below: they send a ridge upwards and outwards to the under part of the postfrontals, but do not present that singularly swollen character which is so peculiar in *Didus*; in which also the prefrontals form a large smooth protuberance, like a tumour, at the fore-part of the orbits, and appear on the upper surface of the cranium in front of the antorbital process of the true frontal and external to the lachrymal. The interorbital bony septum is entire in both *Dinornis* and *Didus*; but in the latter it is more than an inch in thickness and cellular, and in this respect more resembles the singular structure of the part in *Apteryx*. The orbits are smaller in *Dinornis* than in the large existing *Struthionidæ* or in *Otis*, but are larger than in *Apteryx*. The olfactory chambers in *Dinornis* are less developed than in *Palapteryx* and *Apteryx*.

The nasal bones in *Dinornis* and *Otis* converge where they overlap the prefrontal (*ethmoide*, Cuv.) in order to join the frontal and include that end of the nasal process of the premaxillary, which is on a lower plane; and, as they advance, they pass beneath that process, coalesce with it and with each other, and terminate in *Dinornis* in a point. In *Didus* the nasals also anchylose with the frontal, where they are separated by the nasal process of the premaxillary, as indicated by the two longitudinal fissures, which, commencing behind at 2 lines distance from the outer border of the anchylosed base of the beak, gain that border at 1 inch 9 lines distance from the frontal, and thus indicate the proportions of the base formed by the anchylosed nasals: the fissure can also be traced as in *Dinornis*, bending inwards upon the under surface of the nasal process of premaxillary, to about 3 inches from the frontal, when the fissure returns back, inclining to the median line, and meets its fellow there. All the outer part of the median stem or base of the beak defined by these linear furrows I regard as the nasals, which thus support the nasal process of the premaxillary.

This process is a broad transversely arched plate, where it joins the maxillary processes to form the anterior or rostral part of the premaxillary; the extent of which, anterior to the external nostrils, is $2\frac{1}{2}$ inches, the whole length of the premaxillary being $4\frac{1}{2}$ inches. Its breadth at the middle is rather more than an inch; the depth of the upper bony beak gradually decreases from its base where it is 1 inch 9 lines, to its apex where it is less than 1 line, but retains a breadth of 8 lines, the edge appearing to have been truncate or very slightly rounded off: the whole upper beak being gently arched to this terminal edge resembles the cooper's adze (*doloire*, Fr.). The palatal surface is broad, very slightly excavated, and bounded laterally by well-defined alveolar ridges: the palatal nostril commences anteriorly 1 inch 10 lines from the anterior border of the premaxillary. In *Didus* the nasal process of the premaxillary presents an elliptic transverse section where it quits the maxillary processes, and diminishes in depth as it retrogrades, becoming depressed and broad where it rests upon and divides the nasals to anchylose with the frontal. Where the nasal and maxillary processes diverge, there is a deep groove externally terminating in a canal directed forwards into the rostral part or body of the premaxillary; this part is subincurved, pointed, rough and with irregular vascular perforations, with a sharp inferior border on each side, and a more concave palatal surface than in *Dinornis*. The long and slender palatines of *Dinornis* coalesce behind with the vomer and in front with the maxillaries; they are concave below, particularly at their back part, by the downward extension there of their inner border. In *Didus* the palatines arch outwards from their posterior attachments, are broad and smooth mesially with a sharp crenate edge above; a thin, outwardly smooth, convex ridge is directed outwards and downwards, and a more angular ridge is directed downwards with an obtuse apex: a groove divides this from the outer ridge: the upper and outer ridge extends to the maxillary; the lower ridge subsides before it reaches the maxillary. The palatines form the boundaries of the naso-palatine aperture, and approximate each other at both their ends, but do not meet. There is a fossa at the outer and near the back part of each palatine, where there is a rough concavity; the rest of the outer surface is convex lengthwise, concave vertically. The boundaries of the maxillary are more readily traceable in *Didus* than in *Dinornis*; but they have coalesced in both, with the palatine, malar and lachrymal behind, and with the maxillary process of the premaxillary in front: the maxillary in *Didus* forms a compressed longitudinal plate of bone with thick rounded borders above and below, and almost touches its fellow, leaving a deep narrow chink between the nasal fossa above and the palate below, closed by the palatal membrane.

The tympanic bone of the *Dinornis* has more a triangular than a quadrate form by reason of the unusually large size of its inferior condyle, which forms its base: the orbital process is a compressed subrhomboidal plate: the lower condyle is not so extended inferiorly in the Bustard (*Otis*); its upper condyle is bifid, as in *Dinornis*. In *Palapteryx* it is single, as in *Apteryx*. In *Didus* the tympanic bone is subquadrate with the four angles produced, and the upper and hinder one bifurcate, forming the bifid condyle for the mastoid articulation: in *Dinornis* the mastoid condyle is also double, with a linear strip of bone between; and behind this the pneumatic foramen, where also similar foramina are situated in *Didus*: in this extinct bird, the orbital process, forming the anterior angle, is compressed and truncate: the outer surface of the bone is smooth and convex vertically; the inner surface is traversed by a sharp concave ridge extending from the inner division of the upper condyle to the anterior part of the inner and lower angle: the anterior division of the inner surface is concave, the posterior one is concave vertically, convex transversely. The antero-posterior extent of the condyle for the lower jaw is little, but greatest at its outer part, where it rests upon the shallow reniform outer division of the concave articular part of the lower jaw: the inner, more ridge-like part of the condyle sinks into a deeper transversely extended depression of the same articular concavity. The tympanic of the *Dinornis* chiefly differs in the great extension, upwards and backwards, of the broad and undivided inferior condyle: there is also an articular surface, on its outer side, for the mastoid process (not present in *Otis*) and another small one on the inner side for the pterygoid; besides the lower and outer cup for the end of the slender zygoma (squamosal).

The inner angle of the expanded articular end of the lower jaw of *Dinornis* ends by a short obtuse process. In *Otis* and *Didus* it forms a strong trihedral process, the anterior and posterior facets meeting a transverse ridge below, which is continued into a compressed plate forming the posterior angle of the jaw. The posterior surface is smooth and slightly concave, semioval in *Dinornis*, deeper and subtriangular in *Didus*.

The outer part of the articular end of the mandible is smooth and convex in *Dinornis*: in *Didus* a masseteric ridge is continued downwards and forwards from the outer overhanging border of the articular cavity to the back and lower angle of the dentary piece, defining, with the posterior border of the dentary, a concave, slightly pitted surface. The surangular in *Dinornis* has a short and low thick coronoid ridge, external to which there is a rough oval surface. In *Didus* the surangular developes a very small coronoid process, and its fore-part is deeply notched: a deeper and more angular notch divides the surangular from the angular piece. This notch receives the lower fork of the dentary on the outside, and the end of the splenial at the inner side. These notches do not exist in *Dinornis*: the surangular, angular and articular pieces have coalesced together in both the extinct birds. Where they join the posterior forks of the dentary piece, a long narrow vacuity is left, which in *Dinornis* is almost divided by a broad bar of bone extending upwards from the angular, but which does not quite touch the surangular. In *Didus* the upper fork of the dentary joins the upper and fore part of the surangular; the notch between the hinder forks of the dentary bounds anteriorly the narrow elliptic vacuity, 15 millimeters long by 3 millimeters deep. A notch also extends forwards, and divides outwardly the symphysial from the ramal part of the dentary: this notch or hole does not exist in *Dinornis*.

The parts of the bones of the beak referred to *Palapteryx* consist of the anterior end of the premaxillary and of the symphysis and part of both rami of the mandible. The premaxillary, by the proximity of the external nostrils to its apex, and by the nasal grooves continued thither on each side from the anterior boundary of the nostrils, resembles that of the large existing *Struthionidæ*, and the Emeu more especially by the slenderness of the nasal process of the premaxillary and the angle at which it rises from the broad and flat maxillary processes. The end of the beak was, however, more obtuse than in the Emeu, and the short symphysis of the lower jaw is more deeply excavated above: it presents, however, the two parallel longitudinal grooves on its under part, as in the Emeu and Ostrich. The lower jaw appears from the remains of one ramus to have been 5 inches or $5\frac{1}{2}$ inches in length, and to have been broader and deeper than in the Ostrich or Emeu: and the cranium by its greater breadth behind, its less depth, its vertical foramen magnum and prominent occipital condyle, the lower position of the basisphenoidal platform, and the marked angle which it forms with the almost vertical basioccipital, concurs with the beak in establishing the generic distinction of the great bird to which it belonged. As the characters which were adduced in a former memoir (Zool. Trans. iii. p. 327) to separate those bones of the extremities that by their more slender proportions approximated the *Struthionidæ* and, by the indication of a small back-toe, the *Apteryx* more particularly, from other bones of corresponding size but more robust proportions and devoid of a back-toe,—led to the former being assigned to the genus *Palapteryx*, and the latter to *Dinornis* proper ;—so the characters which, in the first of the skulls described in the present memoir, show a departure from the struthious type, and in the second skull an approach thereto, clearly indicate the propriety of assigning the one to the genus *Dinornis* and the other to the genus *Palapteryx*. The total length of the skull referred to *Palapteryx geranoïdes* is 6 inches at least; the breadth of the cranium $2\frac{1}{2}$ inches: the bird probably equalled the Emeu in size.

The skull which indicates the third genus of apparently extinct bird (*Notornis*) measures $4\frac{1}{2}$ inches in length, and the cranium is 1 inch 8 lines in breadth. The bones of the beak closely resemble in form and structure those of the Purple Coot (*Porphyrio*), but the occiput is relatively broader, and more inclined forwards as it ascends: the plane of the occipital condyle is vertical, and the basioccipital extends further below the occipital condyle, though less so than in *Palapteryx*. In these characters the *Brachypteryx* or Short-winged Rail of New Zealand more resembles *Notornis*. The articular surface of the tympanic is divided, as in *Dinornis* and *Otis*, into two subcircular cups. The parietal region is singularly flat, the temporal fossæ unusually long, well-defined by ridges extending from the paroccipital to the postfrontal. In the comparatively small *Porphyrio* and *Brachypteryx*, in which, as in all small birds, the cerebral hemispheres, as requiring a certain bulk for their functions, do not decrease in the ratio of the size of the body, the upper surface of the cranium is raised by the hemispheres beneath into a smooth convexity.

The *Notornis* is a large modified form of the same natural family of the *Grallæ* as the *Porphyrio* and *Brachypteryx*, and from the form of its sternum it must have been, like the latter peculiar bird of New Zealand, deprived of the power of flight.

The fourth genus of bird indicated by portions of the skull in Mr. Walter Mantell's collection was referable to the family of Parrots (*Psittacidæ*), and amongst these to the genus *Nestor*. The bony portion of the upper beak—the only part of the skull preserved—by its deep, subcompressed, curved and pointed form, its seeming solidity, pierced by small subcircular nostrils close to its base, attested the family character; whilst the proportional length as compared with the depth, the narrow upper surface to where it suddenly expands above the nostrils to join the cranium, the absence of the notch on the under border, the very narrow elongated triangular palatal surface, with the median linear notch at its base,—all demonstrate that in this characteristic part of the skull the New Zealand bird represented by it most resembled the genus *Nestor*,—a singular nocturnal Parrot at present only known as a denizen of that island.

Thus then it appears that the indications of two genera, with several species of terrestrial birds of large or gigantic size, deduced in the Author's former Memoir (Part II.) from bones of the legs, are most fully and satisfactorily confirmed by the evidence of the subsequently received bones of the head and beak.

The form and structure of these characteristic parts in one of the genera (*Dinornis*) are so peculiar, that the author does not refer the genus to any known natural family of birds. Its location in the order *Struthionidæ* implies little more than an arrested development of wings, and an exaggerated development of legs, organized for progression on dry land.

As, however, there are strictly aquatic forms of birds deprived, by a low development and special modification of the wings, of the power of flight, so also there are, in other natural groups of birds, aberrant forms similarly debarred from the privilege and enjoyment of the characteristic kind and field of locomotion of their class. Apart from the true *Struthionidæ*, we have an instance of this in the *Brachypteryx* or modified Rail of New Zealand; the Dodo is a second instance, whether it be regarded as an aberrant Vulture or a modified Pigeon, according to the views entertained by Mr. Gould and supported, with new arguments, by Mr. Strickland, before the British Association at Oxford, and which will be fully elucidated in the forthcoming work on the extinct flightless birds of the Mauritius and neighbouring isles, which Mr. Strickland is about to publish in conjunction with Dr. Melville.

With regard to the natural group or family of birds to which the *Dinornis*, with its adze-like bill and crocodiloid cranium, may be referable, the author pointed out several marks of resemblance in the skeleton of the Bustard to the *Dinornis*, which are not presented by the skeletons of the true *Struthionidæ*. But he also dwelt upon the peculiar characters of the *Dinornis*, distinguishing it from the *Otidæ*, and indicating it to form a distinct family-type in the order of *Grallæ*.

With regard to the peculiar form of beak in *Dinornis*, reference was made to the deductions in the former memoirs, "from the unusual strength of the neck," that the *Dinornis* would be found to have a beak applicable "to a more laborious task than the mere plucking of seeds, fruits or herbage;" and that "the robust proportions of the cervical vertebræ, especially of their spinous processes, may have been the foundation of those forces by which the beak was associated with the feet in the labour of dislodging the farinaceous roots of the ferns that grow in characteristic abundance in New Zealand."

For this labour the beak of the *Dinornis*, formed after the model of the adze or pick-axe, seems peculiarly adapted, and the singular development in both breadth and depth of the occipital part of the cranium, with its strongly marked ridges, processes and muscular depressions, is precisely calculated for the adequate attachment of the muscular masses arising from the cervical vertebræ.

The second form of cranium and beak, referred to the genus *Palapteryx*, indicates that genus to be a member of the true *Struthionidæ*, and by its affinities to have been intermediate between *Dromaius* and *Apteryx*.

The *Notornis* is a struthious or brevipennate form of the *Rallidæ*, intermediate between *Porphyrio* and *Brachypteryx*. The remains of the beaks of the Psittaceous bird are not distinguishable generically from those of the genus *Nestor* of New Zealand.

Thus, observed Prof. Owen, "those concordances in the geographical distribution of existing and recently extinct forms of the warm-blooded vertebrate classes which are illustrated by the remains of Elephants, Rhinoceroses, Hippopotamuses, Hyænas, large Bovines and Cervines, in the pleistocene deposits of Asia and Europe,—by the absence of these and the presence of gigantic extinct Sloths, Armadillos and Anteaters, in the coeval deposits of South America, and of huge fossil Kangaroos, Wombats and Dasyures in the bone-caves and freshwater deposits of Australia,—have received new and striking elucidations from the repeated discovery, in the cavernous fissures, turbaries, and river-beds of New Zealand, of the remains of gigantic forms of birds allied to those small species, *Apteryx* and *Brachypteryx*, which constituted the highest representatives of the warm-blooded classes in the island, until the advent of Man led to the introduction of its present terrestrial mammals."

The author in conclusion repeated his acknowledgments to Dr. Mantell for the prompt accordance of the privilege of examining and describing these rare and interesting remains and expressed his high sense of the scientific value of the labours by which that eminent geologist's intelligent and enterprising son, Mr. Walter Mantell, had made so great an addition to the materials for developing the natural history of New Zealand.

The memoir was accompanied with numerous drawings of the specimens described, which will form plates 52—56 of the third volume of the 'Transactions.'

On the conclusion of Professor Owen's communication, Dr. Mantell expressed his opinion, that although the specimens formerly sent to this country were obtained from the beds of rivers and mountain-streams, and were regarded by the gentlemen who collected them as of very recent date, in reality they belonged to a period of as high antiquity, in relation to the surface-soil of New Zealand, as the diluvium containing bones of the Irish Elk, Mammoth, &c. to that of England. He observed that Mr. Colenso, Mr. Taylor, and Mr. Williams, who sent to England the bones figured and described by Professor Owen in the 'Zoological Transactions,' vol. iii., agree in this remarkable fact, that in some places, where the loamy marl in which their specimens were found was observed *in situ*, it was covered by several feet of strata of marine and freshwater sand, gravel and silt. The bones collected by Mr. Walter Mantell, among which were the crania and mandibles that formed the subject of Professor Owen's present communication, were all found imbedded in a loose pure sand, formed in a great measure of magnetic iron and minute crystals of augite and hornblende, the detritus of volcanic rocks. This sand has filled all the cavities and cancelli of the bones, but is not in any instance consolidated together: hence the bones are in the most beautiful state of preservation, and the most delicate processes entire. Dr. Mantell conceives that this bed of volcanic sand is a continuation of the deposit of sandy loam which occurs at the embouchures of the rivers along the west and east coasts of the North Island, in the localities that yielded the bones sent over by Mr. Williams and Mr. Taylor; and that in the higher regions of the same river-valleys, the detritus brought down by the mountain-streams from the volcanic chain whence they originate, is unmixed with the clay and silt of the lower alluvial tracts; for all the streams in these parts of the North Island rise from the lofty ridges of Mount Egmont and Tongariro. Dr. Mantell alluded to the fact, that along the sea-coasts and on the banks of the rivers Eritonga, Waibo, &c., there are horizontal terraces of boulders of trap-rocks fifty feet high; and that the small rocky islands of trachyte off the coast bear marks of wave-action to the height of 100 feet above the present sea-level. He mentioned other facts of a like nature in confirmation of his opinion, that since the Moas existed the surface of the country has been elevated many feet above the level of the sea, and that the present rivers and mountain-streams are flowing through channels cut into the ossiferous deposits; in like manner as the rivers of Auvergne flow through the newer tertiary marls and limestones containing bones of Mammalia, and those of England through the diluvial clay and loam in which are imbedded the remains of the large extinct Pachyderms, the Rhinoceros, Mammoth, &c. He deemed it probable that the last of the race of Moas were destroyed by the earliest inhabitants of New Zealand, as the Dodo was finally extirpated by the Dutch colonists of the Mauritius, and the Irish Elk by the early British or Celtic tribes; but he considered it evident that the bone-deposit was in the progress of accumulation ages ere man inhabited the country.

2. Drafts for a new arrangement of the Trochilidæ. By John Gould, F.R.S. L.S. Z.S. etc.

Genus Heliantheа.

Gen. char.—Rostrum longum, rectum vel sursum aliquantò tendens, cylindraceum. *Nares* basales, et plumis a rostri basi porrectis, obtectæ. *Alæ* mediocres, et validæ. *Cauda* mediocris, et occlusa, paululùm furcata. *Pedes* perparvi. *Tarsi* admodùm breves, et plumis induti. *Hallux* brevissimus.

Bill long, straight or inclining upwards, and cylindrical; nostrils basal and covered with the feathers advancing from the base of the bill; wings moderately long and powerful; tail of medium size and slightly forked when closed; feet very small; tarsi extremely short, and clothed with feathers; hind-toe the shortest.

Types, *Trochilus heliantea* and *Bonapartii*.

Remark.—Plumage of the males rich and beautiful in the extreme.

Hab. So far as is yet known, the Cordillerian Andes.

Helianthea Eos (n. sp.), Aves, t. i. *Hel.* mas, *summo capite nigro, apud frontem notâ metallicè aureo-viridi; collo anteriore et pectore splendidè aureo-viridibus; gutture centrali notam intensè cæruleam ferente.*

Male.—Crown of the head black, with a shining spot of metallic golden green on the forehead; fore-part of the neck and chest lustrous golden green, the golden green predominating on the lower part of the chest; on the centre of the throat a patch of rich deep blue; abdomen rich shining flame-colour; back, wing and upper tail-coverts bronzy orange; tail cinnamon-brown, the apical half of the two middle feathers and the tips of the remainder with a bronzy lustre; primaries chocolate-brown; secondaries reddish buff, forming a conspicuous mark on the wing.

Female.—Similar in colour, but much less resplendent, and entirely destitute of the spot of green on the forehead and the patch of blue on the throat.

Total length $5\frac{1}{4}$ inches; bill $1\frac{1}{2}$; wing $2\frac{3}{4}$; tail 2; tarsi $\frac{3}{16}$.

Hab. The highlands of New Grenada and Venezuela.

Remark.—Nearly allied to *H. Bonapartii.*

Genus Aglæactis.

Gen. char.—*Rostrum* sub-breve, paululùm apud basin depressum, rectum. *Nares* basales. *Alæ* elongatæ, validæ; remigibus primariis falciformibus hâc formâ præcipuè apud primam pennam notandâ. *Cauda* mediocris, et occlusa, paululùm furcata. *Pedes* validi et robusti. *Tarsi* in partem plumis induti. *Hallux* cum ungue, digito medio cum ungue longior.

Gen. char.—Bill rather short, a little depressed at the base and straight; nostrils basal; wings long and powerful; primaries, particularly the outer one, sickle-shaped; tail moderately large and slightly forked when closed; feet strong and powerful; tarsi partially clothed with feathers; hind-toe and nail longer than the middle toe and nail.

Types, *Trochilus cupripennis* and *T. Pamela.*

Aglæactis caumatonotus (n. sp.). *Ag. vertice et collo fuscis, loris, pectore, et partibus inferioribus cinnamomeis; gulâ fasciâ nigro-fuscâ trans-notatâ; lateribus nigro-fusco tinctis; plumarum penicillo elongato, et intensè fusco, sed ad apicem fulvo, apud pectus imum; alis æneo-olivaceis; caudâ cinnamomeâ, supernè æneo-olivaceâ; dorso caudæque tectricibus purpurascenti-liliaceis si plumæ contra lucem modo contrario in conspectu sint.*

Crown of the head brown; lores, chest and under-surface cinnamon-brown; throat crossed by a bar of blackish brown; flanks clouded with blackish brown; from the lower part of the chest springs a tuft of lengthened feathers, which are dark brown at the base and buff at the tip; wings bronzy olive; tail cinnamon-brown, except on the upper or exposed portion, which is rich bronzy olive;

back and upper tail-coverts shining purplish lilac, which colour is only seen when the feathers are looked at in the reverse direction.

Total length $4\frac{1}{2}$ inches; bill $\frac{7}{8}$; wing $3\frac{1}{4}$; tail $1\frac{3}{4}$; tarsi $\frac{3}{8}$.

Hab. Peru.

Remark.—Closely allied to *T. cupripennis*.

Genus Heliangelus.

Gen. char.—*Rostrum* rectum, æquè ac caput longum, cylindraceum, et ad basin aliquantò depressum. *Plumæ frontales* rostri basin non obtegentes. *Alæ* mediocriter validæ primariâ externâ falciformi. *Pedes* mediocriter validi, halluce digitum intermedium æquante. *Cauda* mediocris, subrotundata.

Gen. char.—Bill straight, about as long as the head, cylindrical, and slightly depressed at the base; feathers of the forehead not advancing upon the bill; wings somewhat powerful, outer primary sickle-shaped; feet moderately strong; hind-toe and nail the same length as the middle toe and nail; tail rather round in form and of medium size.

All the species of this genus are from the Andes, and distinguished by the extreme lustre of the throat, which in most of the species is bounded below by a gorget of white or buff.

Types, *Trochilus Clarisse*, *Spencei*, *amethysticollis*, and *strophianus*.

Heliangelus mavors (n. sp.), Aves, t. ii. *Hel*. mas, *fronte notam angustam intensè flammeam ferente, vertice corporeque superiore æneo-viridibus; gulâ intensè flammeâ, lunulâ latâ fulvâ, subtùs circumscriptâ, abdomine intensius fulvo, lateribus viridi lavatis; crisso griseo-fulvo; alis purpurascenti-fuscis; caudæ rectricibus intermediis duabus æneo-viridibus reliquis æneo-fuscis, externis duabus ad apicem obscurè albis; tarsis intensè fuscis; rostro nigro-fusco.*

Male.—Crown of the head and all the upper surface bronzy green, except the forehead, on which is a narrow mark of deep fiery red; throat deep fiery red, bounded below by a broad crescent-shaped mark of buff, which colour, but of a somewhat deeper tint, pervades the whole of the abdomen, except the flanks, which are washed with green; under tail-coverts greyish buff; wings purplish brown; two middle tail-feathers bronzy green, the remainder bronzy brown, the two outer ones on each side obscurely tipped with white; tarsi dark brown; bill blackish brown.

Total length $3\frac{7}{8}$ inches; bill $\frac{3}{4}$; wing $2\frac{1}{2}$; tail $1\frac{5}{8}$; tarsi $\frac{1}{4}$.

Hab. The Cordilleras of Venezuela and New Grenada.

Genus Thalurania.

Gen. char.—*Rostrum* capite longius, deorsùm curvatum, et paululùm apud basin depressum. *Alæ* breves, debiles. *Cauda* mediocris, furcata. *Tarsi* plumis induti, parvis, mollibus. *Hallux* cum ungue, digito intermedio cum ungue brevior.

Gen. char.—Bill longer than the head, curved downwards, and rather depressed at the base; wings short and feeble; tail moderately large and forked; tarsi clothed with feathers, small and delicate; hind-toe and nail shorter than the middle toe and nail.

Types, *Trochilus furcatus, nigro-fasciatus, Watertonii*, &c.

THALURANIA VIRIDIPECTUS (n. sp.). *Thal. corpore superiore æneo-viridi, hoc colore in viridissimum vergente apud uropygium; rectricibus caudæ crissoque necnon caudâ metallicè cæruleo-nigrescentibus; alis purpurascenti-nigris; gutture et pectore splendidè viridibus; abdomine fulgentè cæruleo; tarsis plumis albis indutis; rostro nigro.*

All the upper surface bronzy green, passing into bright grass-green on the lower part of the back; upper and under tail-coverts and tail steel bluish black; wings purplish black; throat and chest resplendent grass-green; abdomen bright blue; tarsi clothed with white feathers; bill black.

Total length $4\frac{1}{4}$ inches; bill 1; wing, $2\frac{1}{4}$; tail $1\frac{3}{4}$.

Hab. The Columbian Andes.

Remark.—Nearly allied to *Trochilus nigrofasciatus.*

CAMPYLOPTERUS OBSCURUS (n. sp.). *Camp. vertice, corpore superiore, rectricibusque caudæ quatuor intermediis viridibus; gulâ, partibusque inferioribus intensè griseis; lateribus crissoque viridi lavatis; rectricibus caudæ externis utrinque nigris, duabus externis ad apicem griseis.*

Crown of the head, all the upper surface and the four middle tail-feathers green; throat and under surface dark grey; flanks and under tail-coverts washed with green; the three lateral tail-feathers on each side black, the two outer ones tipped with grey.

Total length $5\frac{1}{4}$ inches; bill $1\frac{1}{8}$; wing 3; tail 2.

Hab. River Amazon.

Remark.—Nearly allied to, but quite distinct from, *Campylopterus latipennis.*

TROCHILUS (—— ?) CALIGATUS. *Troch. vertice, et corpore superiore viridibus, gulâ et corpore inferiore splendidè viridissimis; alis purpurascenti-nigris; caudæ tectricibus et caudâ nitidè metallico-cæruleis; crissi plumis eodem coloratis, albo fimbriatis; femoribus tarsisque plumis niveis indutis.*

Crown of the head and upper surface green; throat and all the under surface resplendent grass-green; wings purplish black; upper tail-coverts and tail bright steel-blue; under tail-coverts the same, fringed with white; thighs and tarsi clothed with snow-white feathers.

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

Hab. New Granada.

Remark.—Nearly allied to *Trochilus Saucerotii* and *T. erythronotus.*

Genus OXYPOGON.

Gen. char.—Rostrum capite brevius, debile et rectum. *Genæ* supra subtusque rostrum plumis elongatis ornatæ; illis suprà erectis, his subtùs pendentibus. *Alæ* paululò longæ. *Cauda* ampla et occlusa, furcata. *Pedes* ampli et validi. *Tarsi* nudi. *Hallux* cum ungue longior digito, cum ungue intermedio.

Gen. char.—Bill shorter than the head, feeble and straight; face both above and below the bill ornamented with lengthened plumes, the former erect, the latter pendent; wings rather long; tail large, and forked when closed; feet large and strong; tarsi bare of feathers; hind-toe and nail longer than the middle toe and nail.

Types, *Trochilus Guerinii* and *T. Lindenii.*

3. On Fastigiella, a new genus of Shells of the Lamarckian Family Canalifera. By Lovell Reeve, Esq.

The shell which I am about to describe, from the collection of Hugh Cuming, Esq., is of an entirely new form, differing generically as well as specifically from any of the class to which it belongs. It is of an elongated turreted growth, and may be said to partake in almost equal proportions of the characters of two genera somewhat removed from each other in the system, *Turritella* and *Cerithium.* As in *Turritella,* the shell is of a solid spirally-ribbed structure, without any indication of varices, a condition not to be found in *Cerithium*; whilst it possesses a character which excludes it from the family *Turbinacea,* in having a short umbilicated twisted canal, different from that of *Cerithium,* for the passage of an elevated fold of the mantle. At the base the shell is not much unlike some species of *Buccinum,* but it is remarkable for its elongated Turritella-like growth. It is, moreover, to all appearance the production of a carnivorous gasteropod, and more strictly referable to the Canaliferous tribe than the *Cerithia,* which, according to Deshayes, are vegetable-feeders, and partake in many instances of the freshwater habits of the *Melaniæ.*

Unfortunately Mr. Cuming is not in possession of any information respecting the shell, either as touching the animal or its place of habitation, and it only remains to add the following description, with the hope that the attention of conchologists will be directed to a form which appears new and of much interest.

Class GASTEROPODA.

Order PECTINIBRANCHIATA.

Family CANALIFERA.

Genus Fastigiella.

Testa elongato-turrita, basi contracta et umbilicata, aperturâ parvâ, canaliculatâ, canali brevissimo, subcontorto.

Fastigiella carinata. *Fast. testâ lanceolatâ, anfractibus rotundatis, carinis tribus, earum interstitiis nitidè excavatis, spiraliter cingulatis; extus intusque albâ.*

Hab. —— ? Long. $1\frac{3}{4}$ in.; lat. $\frac{5}{8}$ in.

On the characters of this species it may be remarked that there are ten forcibly developed keels to a whorl, all of which are concealed from the observer by the superposition of one whorl upon another excepting three, these being the most distant from each other.

BOTANICAL SOCIETY OF EDINBURGH.

May 11, 1848.—Rev. Dr. Fleming, President, in the Chair.

The following communications were read:—

1. "Remarks on Marine Vegetation in Estuaries," by the Rev. Dr. Fleming.

The author called attention to the condition of the roots of the Algæ, as organs of adhesion and not of nourishment, and, consequently, that when other circumstances are favourable, marine plants may be absent simply for want of a *soil*. He gave as instances, a bank on which *Ulva latissima* grew wherever there was a cockle, to which it adhered, in the absence of any other support. On another bank a single but remarkably large plant of *Fucus vesiculosus* was attached to a stranded root of a tree, no other point of support existing on the surrounding sandy moving surface. He next adverted to the disappearance in succession of the Algæ in passing from the sea through an estuary into a river, remarking that *Fucus serratus* and *F. vesiculosus* cease to grow before *F. canaliculatus*, while *F. vesiculosus* advances farthest into the brackish water, and may even be observed, in different states of development, in the grassy marshes covered only by the spring tides. He described the influence exerted by the brackish water in rendering the fronds of *Fucus nodosus* much narrower, diminishing the size and number of the bladders, and changing its colour into a paler hue. In the *Fucus vesiculosus*, the bladders by degrees disappear, and a cellular mass occurs along the middle; or the leaves become narrow and plain, and it assumes the appearance of *Fucus ceranoides*, while the colour passes into a dingy yellow.

Dr. Fleming concluded his remarks by recommending the careful study of all the changes which marine plants undergo when passing under the influence of fresh water, so as to determine the range of variation of particular species, and thereby assist the labours of the systematic botanist, and check the too frequently hasty discriminations of the palæontologist.

2. "Description of a new species of Fern from Tahiti," by Dr. Greville. This beautiful species, which has been named *Antrophyum Grevillii* (Balfour MSS.), was picked in the island of Tahiti by Dr. Sibbald in 1846. The full description will be published in these 'Annals'* and in the Society's Transactions.

3. "Supplement to the Synopsis of British Rubi, No. II.," by Chas. C. Babington, Esq. This paper will appear in these 'Annals'† and in the Society's Transactions.

4. "Notes of a Botanical Visit to Ben Wyvis, Ross-shire, in June 1847," by R. M. Stark, Esq.

After detailing the route from Aberdeen through Strathpeffer, the author mentioned a few of the plants met with on the mountain, which, from its great extent and situation, rendering it difficult of access, he considered would scarcely repay the trouble of the botanist. He found it destitute of the more interesting alpine plants, with the exception of *Arbutus alpina*, which covered the projecting

* See p. 10 of the present Number. † See p. 32 of the present Number.

rocks in considerable abundance. *Rubus Chamæmorus* was plentiful on the lower parts of the hill, while *Vaccinium Oxycoccus* occurred sparingly. Dr. Balfour corroborated Mr. Stark's account of the uninteresting character of Ben Wyvis as a botanical field.

Mr. Stark exhibited portions of the wood of *Tanghinia venenifera*, a poisonous tree, native of Madagascar; *Sterculia platanifolia*; *Bombax Ceiba*, the silk cotton-tree; and leaves of *Theophrasta Jussieui*. The specimens, which were of considerable dimensions, were grown in this country.

Specimens of fossil earth, containing Diatomaceæ, found in Aberdeenshire, were sent by Dr. Dickie, and exhibited under the microscope.

Mr. James M'Nab exhibited a flowering plant of *Meconopsis aculeata*, from the garden of the Caledonian Horticultural Society, seeds of which were received from the Himalaya mountains by the late Sheriff Speirs.

MISCELLANEOUS.

ORIGIN OF THE NAME VANESSA.

In reply to our correspondent who inquires respecting the origin of the name *Vanessa*, first given, we believe, by Fabricius to a species, and afterwards to one of those genera into which he divided the genus *Papilio* of Linnæus, we have no doubt he must have been indebted for it to Swift's well-known poem Cadenus and Vanessa, the former appellation being an anagram of Decanus, whilst by the latter the poet designated the victim of her unhappy attachment to him, Esther (or Hessy) Vanhomrigh.

In the great demand for new names which Fabricius had to assign to the novelties which he was occupied in describing, after having availed himself of classical mythology and poetry, and scripture history, we find evidence, in the names *Gonerilla*, *Cordelia*, and perhaps *Morna*, that he sometimes had recourse also to the names occurring in the literature of our own country, where he was long engaged in examining the Banksian and other cabinets.

M. Sodoffsky has sported a very superfluous critical conjecture (Bull. Soc. Impériale des Naturalistes de Moscou, 1837) that the name should be written *Phanessa*, as if it were derived from the Greek *Φάνης*. But it can never be supposed, that if such had been the intention of Fabricius, he would have written *Vanessa*.—R. T.

Lucernaria fascicularis, *Fleming*.

The Rev. Z. M. Hamilton, of Bressay, Zetland, has ascertained that this beautiful zoophyte feeds upon the young *Littorina littorea*. In a letter to Dr. Neill of the 3rd of March, he writes, "I discovered that it feeds on small wilks, which it, by means of its arms and feelers, puts into its stomach, so many even as four or five at a time, and when the meat is fully extracted the shells are rejected."

In a subsequent communication (20th of March) to Dr. Neill, Mr. Hamilton says,—" With regard to the food which this creature seems so much to enjoy, that there may be no mistake, I enclose the shell of a wilk (a small specimen of *Littorina littorea*) which I gave it two days ago, and which was today rejected in the empty state it now is.

"It is most interesting to watch the animal's movements; every day it appears in a different form, and developes new beauties. I almost think it is getting *tame,* for it does not now shrink from observation as it did at first, and readily clutches upon its food. When more than one wilk is given to it, it retains, by means of its feelers, those it cannot at once consume,—thus making them wait their turn, which comes so soon as the first taken are rejected. I once saw four or five wilks, of the size of the shell now sent, in its stomach at one time."—George Johnston.

On the Organization and Development of Linguatula (Pentastoma, Rudd.), *accompanied with the description of a new species from the Abdominal Cavity of the Mandrill.* By P. J. Van Beneden.

Among the intestinal worms, the order of the *Acanthotheci* is one of those which most requires further anatomical and physiological investigation*. I am happy to be able to fill up some of the principal gaps in their natural history.

I found in a Mandrill (*Cynocephalus Mormon*), in some cysts formed by the peritoneum, several *Linguatulæ* or *Pentastomæ,* very remarkable from their singular form. This is the first African animal in which *Linguatulæ* have been observed. The species is totally different from all hitherto known, and I have called it *Linguatula Diesingii,* in honour of the celebrated helminthologist of Vienna, M. Diesing.

This species has a white cylindrical annulated body, obtuse at both extremities and as broad in front as behind; there is considerable space between the rings, of which there are only twenty; they suddenly cease posteriorly. The mouth is rounded and situated on the same line as the four hooks; the body is fifteen millimetres in length and two millimetres in breadth.

I found several specimens of the *Linguatula proboscidea* in a Boa; they were fortunately alive, which enabled me to submit all their parts to a microscopic examination, and I have been enabled to decide the following points:—

1. These worms have the sexes separate, contrary to the opinion

* M. Valenciennes, in the beautiful report made to the French Academy of Sciences on M. Blanchard's Memoir on the Organization of Worms, stated,—"It should not be forgotten that the minute and delicate anatomy of these animals can be made only on perfectly fresh individuals. One of the most important genera to examine is *Linguatula.* I will just mention to the Academy, to show how much the meeting with certain intestinal worms is due to chance, that the only specimens of this very rare genus deposited in the rich collection of the Muséum d'Histoire Naturelle, were presented by M. Dumeril, who extracted them from a tumour of the nose of a dog more than thirty years ago; and that notwithstanding the most assiduous researches, no other specimens have again been met with in Paris."—*Comptes Rendus,* June 14, 1847.

of Professor Owen*: what may have led him into error is, that the female is provided with a double copulative sac which I found to be filled with spermatozoa. M. Valentin had previously detected this male product in the organ supposed by M. Diesing to be the gland which secretes the envelopes for the ova.

The male is provided with a double penis, which exceeds the body in length and corresponds to the long oviduct.

2. The *Pentastomæ* or *Linguatulæ* are not Entozoa, but belong to the division of articulated animals; they come nearest to the *Lerneæ*.

This opinion is based upon the following considerations:—

a. These animals on their extrication from the egg are provided with two pairs of articulated feet terminated by hooks.

b. The nervous system differs from that of the *Lerneæ* only in having the two chords which form the ganglionic chain separated throughout their length, whilst in the *Lerneæ* they are only separated for half their length.

c. In both cases the males are comparatively very small. The ovisacs in the females are equally bulky; but in the *Lerneæ*, which live in water, they project externally; whilst in the *Linguatulæ*, which always live in a different medium, they remain in the interior.

d. Besides the ring of nerves, the subœsophageal ganglion, and the chords which represent the ganglionic chain, the *Linguatulæ* are provided with different ganglions representing the great sympathic. I detected four perfectly distinct ganglions spread over the sides of the lower surface of the œsophagus in the new species from the Mandrill. In another species M. Blanchard detected these ganglions and stomato-gastric nerves; but he referred them to the system of the nerves of relation or those of animal life, judging, at least, from the name which he has assigned to them.

e. Another point, which however had not escaped the attention of naturalists, is, that the muscles exhibit in their primitive fibres the transverse lines which are not met with in the lower animals.—*Bullet. de l'Acad. Royale de Belgique.*

On certain Principles bearing upon the Natural Classification of Animals, and more particularly on the Methodical Distribution of the Mammifera. By M. Milne-Edwards.

Milne-Edwards, in this learned memoir, in which he gives in a connected form the views elsewhere presented by him in detached

* Professor Owen has rectified his original description, founded on the dissection of a single female specimen, in which the sacs appended to the oviduct were full of spermatozoa and supposed therefore to be the 'testes,' in his "Lectures on the Comparative Anatomy of the Invertebrate Animals," in which he describes the male *Linguatula* (p. 71), distinct from the female (p. 72), and after remarking that "most of the *Pentastomata* of Rudolphi appertain to the Cœlelminthic class," the Professor expressly states: "the *Acanthocephala* constitute a more limited, yet natural order; and the *Linguatulæ* (*Pentastomata* of Rudolphi) are the type of an analogous circumscribed group with a higher type of organization, which entitles them to rank in the class *Cœlelmintha*;" (Ib. p. 62.) one of the characters of the entozoa of this class being that they are of separate sexes.—Ed.

parts, proceeds on the general principle that the fundamental relations of animals are best exhibited in the metamorphoses of species, —understanding by the term metamorphosis, the series of changes undergone by all animals in the progress of their development from the earliest condition in the egg to the adult state; a greater or less part of which takes place in different animals within the egg state, and the rest after leaving it. In 1829, Milne-Edwards brought out these views, with special reference to the metamorphoses of crustacea; and further showed that crustacea have their closest resemblance to one another in their youngest age, and that the progress of development from the young up, tended to impress on the animal characters that were more and more special, and which removed them farther from the common type of the natural group to which they belonged. The same views, at the same period nearly, were independently presented by the celebrated Baer, and they have since been fully substantiated for the whole animal kingdom. Milne-Edwards observes:—

"Each animal experiences a variety of modifications, some of which appertain to the particular species, while others are equally presented by a number, more or less large, of different animals; and the latter have a wider and wider scope, as they correspond chronologically to a more and more early part of the series of genetic phænomena. Moreover it is easy to show that it is the general tendency in nature to produce a correspondence between these primordial resemblances of animals under development, and the different degrees of zoological affinity exhibited when the species have completed their development. The modifications which are manifested successively in the constitution of the young, or germ, as it enlarges, determine successively its existence as a member of a particular order, class, and family. I am far from believing in the identity of germs. But there is a resemblance, and this resemblance is close, as we approach the period of their origin. Hence it is that the embryogenic history of animals illustrates so fully and beautifully their natural relations."

In carrying out these principles it becomes evident that there is a natural system in animal nature, based upon a single grand principle; and further, that this system cannot be represented in a simple lineal series, but must be viewed as having its affiliations or lines of affinities, branching and reticulating in every direction and still subordinated to one plan. "There are a multitude of series which may be conceived of as branching from one another at different heights, or rather which are reunited at base, and separate and subdivide into secondary, ternary, quaternary groups, according as they diverge and take their distinctive characters more or less near the origin of their embryonic existence."

Milne-Edwards goes on to observe, that the successive changes in the organization of each animal constitute three distinct series: the *histogenic*, or the development of the tissues; the *organogenic*, or the production of the organs producing physiological phænomena; and the *zoogenic*, the modifications arising from the various combinations destined to make the being a zoological unity. These divisions are further subdivided as there are various *kinds* of tissues, organs, and specific characters; and different results arise from their unequal development. "Thus, two series of histogenic phænomena of the same kind, in two different animals, or two series of such phænomena of different kinds in the same animal, may offer at first a certain number of corresponding terms; but at a period more or less advanced, these terms will cease to be analogous, and in general the divergence will continue to increase as they approach the final result." In this manner, by an arrest of development of different tissues or organs, at different periods, one animal becomes widely different from another, and there will be an analogy between a finished tissue of what we designate an inferior grade, and one of the steps in the development of a superior. "By the applications of these principles, we explain the concordance between the permanent forms of certain animals, and the transitory state of the embryo in other species whose metamorphic career is longer continued." In a natural group, the species, with a short period of development, start upon the same route which those have followed that have left them on the road. The animals, therefore, whose embryogenic career is of different lengths, constitute a number of separate series, more or less closely related, according as their differences in zoogenic progress begin more early and are wider in character. The progress of metamorphosis produces generally a higher and higher grade. But there are instances of a degradation from the same source, as with the Lernæas, which, in a transitory state, have a rank corresponding with the Cyclops, though afterwards so inferior in character.

In view of these facts, we perceive the foundation of the homologies and analogies which have been observed between animals and groups of animals*. We comprehend how the secondary modifications running through one group are repeated in another series. A natural group, says Milne-Edwards, is a reunion of all the derivatives of the same type; a primary division includes all derived from the same *primary* type, or plan of development; and a secondary division, those from a *secondary* type. There are types of the first, second, third, fourth, &c., orders, and groups corresponding to each. Moreover each group may contain several natural series, parallel or otherwise, and more or less elevated in rank.

The importance of embryogeny as a means of distinctions is at once shown by the embryonary forms of animals of the four grand divisions of the animal kingdom, as long since laid down by Baer. In the ovum of the vertebrate animal, the first step is the formation of the medial depression which divides the central portion of the blastoderm into two symmetrical halves, and corresponds to the vertebral column and its adjuncts. There is nothing similar in the Invertebrata. Thus the very first point observed in the embryo of a vertebrate animal is that which is the dominant characteristic in this whole division. Other peculiarities are pointed out in the me-

* Milne-Edwards uses the term *direct affinity* for the immediate relations of species; *collateral affinity*, for the relations of parallel series.

moir for the Articulata, Mollusca and Radiata, which bear out the same principle.

Milne-Edwards presents reasons for separating the Batrachia from the Reptiles, as first proposed by Blainville, and thus makes five great divisions of the Vertebrata:—the Mammifera, Birds, Reptiles, Batrachia, and Fishes. The Reptiles are, from the first, aërial in their respiration, whilst the Batrachia, in their early state at least, have branchiæ like Fishes. He observes further, that the embryo of Fishes and Amphibia has no allantoid nor amnios, whilst in the true Reptiles, Birds, and Mammifera, these parts are always distinct. He hence divides the Vertebrata into the *Vertébrés Allantoidiens* and the *Vertébrés Anallantoidiens.*

The remainder of this memoir is occupied with remarks upon the Vertebrata with reference to their classification, which although of high importance, we have to pass by at this time, giving only in a tabular form the classification which he proposes.

A. VERTÉBRÉS ALLANTOIDIENS.

- I. Mammifères.
  - Monodelphiens ou Mammifères Placentaires.
    - Mammifères à placenta discoide.
      - Bimanes, Quadrumanes, Insectivores, Cheiroptères, Rongeurs.
    - Mammifères à placenta zonaire.
      - Carnivores, Amphibiens, Daman.
    - Mammifères à placenta diffus.
      - Pachydermes, Solipèdes, Ruminans, Siréniens, Cétacés, Edentés.
  - Didelphiens.
    - Marsupiaux.
      - Insectivores, Herbivores.
    - Monothrèmes.
- II. Oiseaux.
- III. Reptiles.
  - Sauriens.
  - Ophidiens.
  - Chéloniens.

B. VERTÉBRÉS ANALLANTOIDIENS.

- I. Batraciens.
  - Anoures, Urodèles, Cécilies, Perennibranches, Lepidosiren.
- II. Fishes.
  - Chondropterygiens, Poissons osseux, Cyclostomes, Amphioxus.

Notes on Diptera, Chalcidites, *and other Insects.* By Francis Walker, F.L.S.

I have been favoured by M. Kaltenbach of Aix-la-Chapelle with the loan of the following species, and with the notes of their œconomy. These notes belong to two subjects, which are—the relation of parasites to their prey, and the relation of herbivorous insects to vegetation. I may add, that not only the study of the latter insects, but also a knowledge of plants and of their dependence on soil and climate, is requisite as a preliminary to the examination of parasitic insects.

Detomyia Boleti, Kalt. Lives in *Boletus* (*Polyporus*) *igniarius*, the hard tinder boletus.

Mycetobia pallipes. Lives in the sap of *Ulmus campestris*, the common elm.

Ctenophora 2-maculata, Meig. Lives in the old wood of *Carpinus Betulus*, the hornbeam.

—— *nigricornis*, Meig. Lives in the old wood of *Quercus Robur*, the oak.

Lasioptera argyrosticta, Meig. Lives in the galls on the stem of *Rubus vulgaris*, the bramble. (*Eurytoma rufipes* has been reared from the galls of this plant, and is probably a parasite of *Lasioptera argyrosticta*.)

Cecidomyia Galeobdolontis, Kalt. Lives in the knobs by the roots of *Galeobdolon luteum*, yellow dead-nettle.

—— *Brassicæ*. Lives in *Brassica Rapa*, the turnip.

—— *Spartii*, Kalt. Lives in the knobs of the deformed flower of *Spartium*, the broom.

—— *Stachydis*, Kalt. Lives in the top leaves of *Stachys sylvatica*, the hedge-nettle.

—— *Spireæ*. Lives in the galls on the leaves of *Spiræa Ulmaria*, the meadow-sweet.

—— *Cardui*. Lives in the receptacle of *Carduus* and of *Cirsium*, the thistle.

—— *Hieracii*, Kalt. Lives in the receptacle of *Hieracium Pilosella*, the mouse-ear hawkweed.

—— *Nepetæ*, Kalt. Lives in the top leaves of *Nepeta Cataria*, cat-mint.

—— *Bryoniæ*, Kalt. Lives in the top leaves of *Bryonia*, bryony.

—— *Aceris*. Lives in the galls of *Acer pseudo-platanus*, the sycamore.

—— *Medicaginis*, Kalt. Lives in the knobs of the deformed flower of *Medicago falcata*, yellow medick.

—— *Polygoni*, Kalt. Lives in the leaves of *Polygonum amphibium*, spotted persicaria.

—— *Rumicis*, Kalt. Lives in *Rumex obtusifolius*, the broad-leaved dock.

—— *Veronicæ*, Meig. Lives in the leaves of *Veronica Chamædrys*, germander.

—— *Ptarmicæ*, Kalt. Lives in the flowers of *Achillea Ptarmica*, sneezewort.

—— *Urticæ*, Winnertz. Lives in the galls on the leaves of *Urtica dioica*, the nettle.

—— *Pini*, Ratzb. Lives on the leaves of *Pinus sylvestris*, Scotch pine.

—— *Poæ*, Kalt. Lives in the galls on the culms of *Poa nemoralis*, wood meadow-grass.

—— *Salicis*. Lives in the top leaves of the twigs of *Salix alba*, common white willow.

Simulia sericea, Meig. Lives in *Sparganium ramosum*, branched bur-reed.

Rhyphus fenestralis. Lives in *Racodium cellare*.

Xylophaga atra, Meig. Lives in the dry wood of *Carpinus Betulus*, the hornbeam.

Syrphus variabilis, Meig. Lives in the stems of *Carduus nutans*, musk thistle.

Anthomya platura, Meig. Lives in *Allium Porrum*, the leek.

—— *exilis*, Meig. Lives within *Rumex Acetosa*, the sorrel, and *Polygonum amphibium*, spotted persicaria.

Trypeta 8-punctata, Macq. Lives in the root of *Tragopogon*, goat's-beard.

—— *cognata*, Meig. Lives within *Tussilago Farfara*, colt's-foot.

—— *elongatula*, Loew. Lives in the receptacle of *Bidens cernua*, nodding bidens.

—— *flavicauda*, Meig. Lives in the receptacle of *Arctium*, burdock.

—— *marginata*, Fall. Lives in the receptacle of *Senecio vulgaris*, groundsel.

—— *pupillata*, Fall. Lives in the receptacle of *Hieracium sylvaticum*, wood hawkweed.

—— *colon*, Meig. Lives in the receptacle of *Centaurea scabiosa*, greater knapweed.

—— *cuspidata*, Meig. Lives in the receptacle of *Carduus nutans*, musk thistle.

—— *Zoë*, Weid. Lives within *Arctium*, the burdock.

—— *radiata*, Meig. Lives in the receptacle of *Senecio vulgaris*, groundsel.

—— *Heraclei*, Linn. Lives within *Heracleum Sphondylium*, cow parsnep.

—— *Arctii*, Meig. Lives in the receptacle of *Centaurea Jacea*, brown knapweed.

—— *arnicivora*, Loew. Lives in the receptacle of *Arnica montana*, mountain arnica.

—— *parietina*, Linn. Lives in the stems of *Artemisia vulgaris*, mugwort.

—— *producta*, Loew. Lives in the receptacle of *Apargia hispida*, rough apargia.

—— *vespertina*, Loew. Lives in the receptacle of *Hypochæris radicata*, long-rooted cat's-ear.

—— *Sonchi*, Meig. Lives in the receptacle of *Sonchus asper*, *S. arvensis*, corn sow-thistle, *Apargia autumnalis*, autumnal apargia.

—— *Leontodontis*, DeG. Lives in the receptacle of *Chrysanthemum leucanthemum*, ox-eye daisy, and in that of *Crepis biennis*, biennial crepis.

Drosophila Brassicæ, Kalt. Lives within the leaves of *Brassica Napus*, rape.

Phytomyza Arctii, Kalt. Lives in the leaves of *Arctium minus*, the small burdock.

—— *Senecionis*, Kalt. Lives in the leaves of *Senecio Jacobæa*, ragwort, and *S. vulgaris*, groundsel.

—— *Helosciadii*, Kalt. Lives in the leaves of *Helosciadium nodiflorum*, procumbent water-parsnep.

Phytomyza lateralis, Meig. Lives in the stem of *Verbena officinalis*, vervain.
—— *præcox*, Meig. Lives in the leaves of *Conyza*, fleabane.
—— *Ilicis*, Kalt. Lives in the leaves of *Ilex aquifolium*, holly.
—— *Euphrasiæ*, Kalt. Lives in the stem of *Euphrasia officinalis*, eyebright.
—— *Pisi*, Kalt. Lives in the leaves of *Pisum sativa*, pea.
—— *flavicornis*, Meig. Lives in the stem of *Urtica dioica*, nettle.
—— *Taraxaci*, Kalt. Lives subcutaneous in *Taraxacum officinale* (*Leontodon Taraxacum*), dandelion.
—— *Veronicæ*, Kalt. Lives subcutaneous in the sides of the leaves of *Veronica Chamædrys*, germander.
—— *Glechomæ*, Kalt. Lives subcutaneous in *Glechoma hederacea*, ground ivy.
—— *Linariæ*, Kalt. Lives subcutaneous in *Linaria vulgaris*, yellow toad-flax.
—— *Fediæ*, Kalt. Lives subcutaneous in *Fedia Clitoria*.
—— *Centaureæ*, Kalt. Lives subcutaneous in *Centaurea Jacea*, brown knapweed.
Agromyza Hieracii, Kalt. Lives subcutaneous in the leaves of *Hieracium sylvaticum*, wood hawkweed.
—— *Lamii*, Kalt. Lives in the leaves of *Lamium album*, white archangel.
—— *ænea*, Meig. Lives in the stem of *Angelica sylvestris*, wild angelica.
—— *nigripes*, Meig. Lives in the leaves of *Arundo Phragmitis*, reed.
—— *mobilis*, Meig. Lives in the leaves of *Urtica dioica*, nettle.
—— *Bellidis*, Kalt. Lives in the leaves of *Bellis perennis*, daisy.
—— *Xylostei*, Kalt. Lives in the leaves of *Lonicera Xylosteum*, fly honeysuckle.
—— *Trifolii*, Kalt. Lives in the leaves of *Trifolium pratense*, clover.
—— *Myosotidis*, Kalt. Lives in the leaves of *Myosotis intermedia*, scorpion-grass.
—— *Galeopsidis*, Kalt. Lives in the leaves of *Galeopsis Tetrahit*, hemp-nettle.
Eurytoma plumata. Destroys *Trypeta cuspidata*.
—— *curta*. Destroys a *Cynips* on oak-leaves.
—— *brevicollis*. Destroys an *Apion* on *Lotus corniculatus*, bird's-foot trefoil.
Decatoma variegata. Destroys *Cynips Centaureæ*.
Callimome nigricornis. Destroys *Neuroterus Reaumuri*, *Teras terminalis*, and *Cecidomyia Galeobdolontis*.
—— *leptocerus*. Destroys *Aulax caninæ* (Hartig), *Cynips Glechomæ*, and an insect in the spikes of *Festuca pinnata*, spiked fescue-grass.
—— *macropterus*. Destroys *Diastrophus Rubi*.
——, n. s.? Destroys *Trypeta cuspidata*.
—— *flavipes*. Destroys a *Cecidomyia* on the folded leaves of *Rosa canina*, dog-rose.
—— *auratus*. Destroys *Aphis Galii*.
—— *euchlorus*. Destroys a *Cynips* on oak-leaves.
—— *posticus*. Destroys *Cecidomyia Urticæ*. (Perhaps this *Callimome* is *Cynips Urticæ* Perris, Ann. Soc. Ent. ix.)

Callimome pallidicornis. Destroys *Cecidomyia Betulæ.*
Systasis encyrtoides. Destroys an *Apion* on *Spartium Scoparium,* broom.
Sphegigaster fronto. Destroys a subcutaneous insect in *Sinapis arvensis,* charlock.
Lamprotatus rufipes. Destroys *Phytomyza Glechomæ.*
Pteromalus elevatus. Destroys *Trypeta pugillata.*
—— *muscarum.* Destroys the grubs and flies in the stems of *Senecio vulgaris,* groundsel, and of *Lamium purpureum,* purple archangel.
—— *perpetuus.*, —— *viridulus.*, —— *tenuis.* Destroy an *Apion* in *Lotus corniculatus,* bird's-foot trefoil.
—— *Zipœtes.* Destroys a *Bruchus* in *Vicia sepium,* bush-vetch.
—— *Cosingas.* Destroys an *Apion* in *Lathyrus pratensis.*
—— *Nestocles.* Destroys a *Cynips* on oak-leaves.
—— *Ariomedes.* Destroys *Trypeta parietina.*
—— *Artemon.* Destroys *Cecidomyia Medicaginis.*
—— *Ceropasades.* Destroys *Trypeta pupillata* and *T. marginata.*
Encyrtus Thinæus. Destroys *Coccus Aceris* and *C. Cratægi.*
—— *sericeus.* Destroys *Coccus Ulmi.*
Myina (= *Aphilinus*) *Chaonia.* Destroys *Aphis Sedi.*
Entedon metallicus (= *E. Epigonus,* Walk.). Destroys *Cecidomyia Poæ,* Kalt.
—— *Prodice.* Destroys *Agromyza Lamii,* which is the cause of spots on the leaves of *Lamium album,* white archangel, and of *Ballota nigra,* black horehound.
—— *Acerbas.* Destroys a moth that folds the leaves of *Corylus Avellana,* the hazel.
—— *Amyrtæus.* Destroys *Agromyza Galeopsidis.*
Euderus Amphis. Destroys an insect in the spikes of *Festuca pinnata,* spiked fescue-grass.
Eulophus Eneugamus. Destroys an *Elachista* on *Ulmus campestris,* the elm, and one that causes spots on the leaves of *Carpinus Betulus,* the hornbeam.
—— *Laodochus.* Destroys a subcutaneous grub on *Scrophularia nodosa,* knotty-rooted figwort.
—— *Nycteus.* Destroys an *Elachista* on *Lonicera Periclymenum,* woodbine, and a moth that folds the leaves of *Corylus Avellana,* the hazel.
—— *Prothenor.* Destroys subcutaneous grubs in *Glechoma hederacea,* ground ivy, and in *Pteris aquilina,* the fern.
—— *Agraules.* Destroys a moth that folds the leaves of *Corylus Avellana,* the hazel.
—— *gallarum.* Destroys *Teras terminalis.*
Elachestus Artæus. Destroys *Phytomyza Veronicæ,* Kalt.
Diglyphus Isæa. Destroys *Trypeta pupillata, Phytomyza Bellidis,* Kalt., *Cecidomyia Rumicis,* Kalt., and a subcutaneous grub in *Medicago sativa,* lucern.
Tetrastichus Armæus. Destroys *Cecidomyia Spartii,* Kalt., and *C. Sambuci.* (It has been reared by Kollar, of Vienna, from the larva of his *Cecidomyia fusca.*)
—— *Rhosaces.* Destroys *Cassida equestris.*

Tetrastichus Anteius. Destroys a *Cecidomyia* in the flowers of *Carduus nutans,* musk thistle, and an *Apion* in *Vicia sepium,* bush vetch.

—— *Nerio.* Destroys an *Apion* in *Spartium Scoparium,* broom.

—— *Agathocles.* Destroys an *Apion* in *Trifolium pratense,* clover.

—— *Prosymna.* Destroys an *Apion* in the flowers of *Trifolium pratense* (clover), a subcutaneous larva in *Ranunculus repens,* creeping crowfoot, and another of the *Elachista* of *Lonicera Xylosteum,* fly honeysuckle.

—— *Lycidas.* Destroys a larva in the pollen of *Fraxinus,* the ash.

—— *Ligus.* Destroys *Phytomyza Taraxaci,* Kalt.

—— *Eudemus.* Destroys a *Cecidomyia* in the receptacle of *Achillæa Ptarmica,* sneezewort.

—— *Bunus.* Destroys *Cecidomyia Spirææ* that forms galls in *Spiræa Ulmaria,* the meadow-sweet.

—— *Chares.* Destroys *Cecidomyia Polygoni,* Kalt., that rolls up the leaves of *Polygonum amphibium,* spotted persicaria.

—— *Achæmenes.* Destroys *Cecidomyia Rumicis,* Kalt.

—— *Deipyrus.* Destroys *Cecidomyia Caricis.*

Platygaster Rhanis. Destroys *Cecidomyia Medicaginis,* Kalt.

—— *Sonchis.* Destroys *Cecidomyia Betulæ.*

—— *Orus.* Destroys *Lasioptera argyrosticta.*

On the Mode of Propagation of various Entozoa. By M. Emile Blanchard.

The author has investigated with great care the entozoa inhabiting the bodies of domestic animals, particularly the " Douve du Foie" (*Fasciola hepatica,* Linn.), which is found in the liver of cows and sheep, particularly in some parts of Germany. He has assured himself, by the examination of a large number of cattle, that these parasites do do not occur in the liver in any other than the adult condition, or at least very nearly full-grown. In the biliary ducts, on the other hand, the ova are to be found in great numbers, and in passing towards the inferior extremity of the intestinal tract these appear to undergo a process of incubation, being more advanced as they pass downwards. The intermediate stages between the ova and the adult animal are never to be found. It is, therefore, nearly certain that the ova pass out of the intestines with the excrements, and undergo development in some other situation, apart from the body of the infested animal; and that, after attaining nearly their full growth, they are received along with the food into the stomachs of other individuals, and thence pass again to the liver, where they propagate a new race.

M. Blanchard has also remarked, in regard to other entozoa, their occurrence only in the adult condition in the parts principally infested. This is the case with the *Amphistoma conicum,* which inhabits the first stomach of cows and oxen, with the *Brachylæmus variegatus,* which occurs in the lung of the *Rana esculenta,* and the *B. cylindraceus,* in that of the *Rana temporaria.* The *Tænia* and *Bothriocephalus* (tapeworms) of the human subject are, on the contrary, to be found in every stage of growth, a whole family sometimes occurring in the intestines of one individual.

The intermediate stages of growth of the above-mentioned entozoa are still unknown; but from the extreme variety of forms known to be assumed by some of the *Trematoda* at different stages of their development, it may be supposed, without much improbability, that we are already familiar with the younger conditions of some of them, and have recognized them as different species. M. Blanchard directs particular attention to the enormous numbers of the ova of these animals, as showing that a vast majority of them must be abortive, probably in consequence of not meeting with the proper conditions for their development.

The author has examined a very large number of fœtal animals, the adults of which are apt to be infested with the above parasites; but has never, in any instance, found a fœtus so infested. He directs attention to this fact as strongly indicating the necessity of the introduction of the ova from without, probably along with the alimentary matters.—*Comptes Rendus*, March 1848.

METEOROLOGICAL OBSERVATIONS FOR MAY 1848.

Chiswick.—May 1. Fine: cloudless, with very dry air. 2. Dry haze. 3, 4. Slight fog: fine: clear. 5—7. Very fine. 8. Excessively dry air. 9, 10. Very fine. 11—13. Hot and very dry. 14. Fine. 15. Slight haze: cloudy and fine. 16. Cloudless and very fine. 17. Very fine. 18. Fine: large white clouds: thunder and hail-shower in afternoon: clear at night. 19. Cloudy: slight showers. 20. Showery. 21. Fine: slight rain. 22. Very fine. 23. Cloudless. 24. Fine. 25. Clear: cloudy: clear. 26. Foggy: fine, with slight haze: clear. 27. Overcast. 28. Very fine: slight haze. 29. Very fine: hot and dry: partially overcast at night. 30, 31. Fine.

Mean temperature of the month	58°·12
Mean temperature of May 1847	56 ·83
Mean temperature of May for the last twenty years	55 ·91
Average amount of rain in May	1·84 inch.

Boston.—May 1—8. Fine. 9. Cloudy. 10. Fine. 11. Fine: two o'clock thermometer 78°. 12. Fine. 13. Cloudy. 14. Fine. 15. Cloudy. 16. Fine. 17. Fine: rain, thunder and lightning P.M. 18, 19. Fine. 20. Cloudy. 21. Fine. 22. Cloudy. 23—26. Fine. 27. Cloudy. 28, 29. Fine. 30. Cloudy. 31. Fine: rain P.M.

Applegarth Manse, Dumfries-shire.—May 1. Slight frost A.M.: fine. 2. Fine, but cloudy. 3. Very fine. 4. Beautiful day. 5. Beautiful day: getting cloudy. 6. Beautiful day. 7. Slight rain P.M. 8. Heavy rain early. 9, 10. Fine summer days. 11. Fine summer day: overcast. 12. Fine summer day: still fair. 13. Fine summer day: fine: clear. 14. Fine summer day: slight shower: thunder. 15. Cloudy: rain P.M. 16. Cloudy A.M.: clear P.M. 17. Clear and fine. 18. Cloudy: cleared. 19. Wet A.M., but fine. 20. Cloudy A.M.: fine P.M. 21. Dull and drizzling: cleared. 22, 23. Beautiful summer day. 24. Beautiful summer day: distant thunder: shower. 25. Beautiful day. 26. Clear A.M.: shower P.M. 27. Warm and fine. 28. Rain A.M.: showery all day. 29, 30. Fair and fine. 31. Heavy rain all day.

Mean temperature of the month	52°·9
Mean temperature of May 1847	51 ·1
Mean temperature of May for twenty-five years	51 ·09
Rain in May for twenty years	1·69 inch.

Sandwick Manse, Orkney.—May 1. Clear. 2. Fine. 3. Rain: fine. 4, 5. Fine. 6. Fine: cloudy. 7. Cloudy: showers. 8, 9. Clear. 10. Damp. 11. Fine: showers. 12. Bright: drizzle. 13. Drizzle: damp. 14. Clear: fine. 15. Cloudy: drizzle. 16. Rain: showers. 17. Clear: cloudy. 18. Fog: showers. 19. Clear: cloudy. 20. Drops: fine. 21. Clear: cloudy. 22. Cloudy. 23. Fog: damp. 24. Bright: damp. 25. Bright: cloudy. 26. Cloudy. 27. Bright: rain. 28. Bright: cloudy. 29. Clear: drops. 30. Cloudy: clear. 31. Rain.

Meteorological Observations made by Mr. Thompson *at the Garden of the Horticultural Society at* Chiswick, *near London; by* Mr. Veall, *at* Boston; *by the* Rev. W. Dunbar, *at Applegarth Manse,* Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse,* Orkney.

Days of Month. 1848. May.	Barometer. Chiswick. Max.	Barometer. Chiswick. Min.	Barometer. Boston. 8½ a.m.	Barometer. Dumfries-shire. 9 a.m.	Barometer. Dumfries-shire. 9 p.m.	Barometer. Orkney, Sandwick. 9¼ a.m.	Barometer. Orkney, Sandwick. 8¼ p.m.	Thermometer. Chiswick. Max.	Thermometer. Chiswick. Min.	Thermometer. Boston. 8½ a.m.	Thermometer. Dumfries-shire. Max.	Thermometer. Dumfries-shire. Min.	Thermometer. Orkney, Sandwick. 9¼ a.m.	Thermometer. Orkney, Sandwick. 8¼ p.m.	Wind. Chiswick. 1 p.m.	Wind. Boston.	Wind. Dumfries-shire.	Wind. Orkney, Sandwick.	Rain. Chiswick.	Rain. Boston.	Rain. Dumfries-shire.	Rain. Orkney, Sandwick.
1.	30·139	30·067	29·80	30·02	29·98	30·13	30·12	60	36	54	60	31½	49	42	e.	calm	s.–se.	ese.	......	......	......	·05
2.	30·077	30·066	29·70	30·00	29·94	30·04	29·98	64	31	56	54	35½	51	47	e.	se.	se.	sse.	......	......	......	......
● 3.	30·101	30·074	29·69	29·92	29·95	29·90	29·96	72	33	58	63	39	50	48½	e.	e.	se.–s.	ne.	......	......	......	·19
4.	30·165	30·133	29·70	30·03	0·05	30·03	30·18	72	38	64	68	37½	59	51	e.	s.	w.	calm	......	......	......	......
5.	30·166	30·159	29·75	30·06	30·00	30·06	30·11	74	36	62·5	69	40½	58	48	e.	calm	ssw.	calm	......	......	......	......
6.	30·089	30·022	29·65	30·02	29·95	30·04	29·87	78	38	64	62½	43	50	46½	sw.	s.	w.	se.	......	......	......	......
7.	30·045	29·993	29·55	29·85	29·80	29·61	29·65	78	37	64	54½	42	52	46	sw.	sw.	s.	sw.	......	......	......	......
8.	30·112	30·036	29·54	29·79	30·00	29·71	29·95	76	36	62	58½	47½	48½	46	w.	calm	w.	wsw.	......	......	0·30	·14
9.	30·222	30·153	29·71	30·11	30·08	30·12	30·07	78	38	56	65	36	49	47	e.	calm	s.	calm	......	......	......	......
☽ 10.	30·304	30·260	29·80	30·15	30·19	30·07	30·20	76	36	64	67	38½	51	48½	e.	calm	w.	wsw.	......	......	......	......
11.	30·320	30·278	29·80	30·18	30·10	30·00	29·91	84	40	68	70	39½	64	51	s.	calm	w.	sw.	......	......	......	·09
12.	30·240	30·170	29·67	30·04	30·07	29·94	30·05	80	41	64	65	50	50	48	ne.	sw.	sw-se.	w.	......	......	......	·05
13.	30·175	30·137	29·66	30·09	30·07	30·05	30·10	81	41	73·5	73½	43½	52½	47	e.	calm	sw.	wnw.	......	......	......	·06
14.	30·126	30·091	29·65	30·10	30·05	30·21	30·13	81	48	72	70	42½	49	45	e.	ne.	e.	ese.	......	......	......	......
15.	29·996	29·781	29·54	29·83	29·53	29·56	29·37	85	43	59	60	43	52	47	s.	calm	ssw.	w.	......	......	......	......
16.	29·653	29·482	29·17	29·33	29·33	29·16	29·31	82	47	67	62	50	50	48	sw.	sw.	s.	sw.	......	......	0·08	·23
17.	29·404	29·296	28·96	29·32	29·20	29·37	29·35	79	52	67	62	50	52	48	s.	sw.	s.	se.	......	......	......	·09
○ 18.	29·680	29·382	28·90	29·18	29·32	29·23	29·26	80	39	61	53	48	52	47	sw.	sw.	sw.	w.	......	·18	......	......
19.	29·706	29·702	29·28	29·93	29·51	29·55	29·66	65	44	60	58	42	53	50	s.	s.	se.	se.	·01	......	......	·14
20.	30·160	29·783	29·43	29·79	30·05	29·87	30·06	66	37	59	62	50	49	50	nw.	calm	nnw.	calm	·06	......	......	·02
21.	30·253	30·215	29·74	30·10	30·15	30·07	30·16	69	54	63	62	38	55	50	sw.	calm	sw.-s.	wnw.	·07	......	......	......
22.	30·283	30·242	29·77	30·25	30·28	30·28	30·28	73	48	62	68	46	52	52	nw.	nw.	s.	w.	......	......	......	......
23.	30·314	30·261	29·86	30·28	30·25	30·30	30·30	72	38	62	73	45½	57	52	ne.	ne.	ne.	w.	......	......	0·10	......
24.	30·287	30·256	29·80	30·25	30·25	30·25	30·29	76	41	64	73	57	57	51	ne.	e.	s–nw.	wnw.	......	......	......	......
☾ 25.	30·266	30·158	29·75	30·22	30·10	30·26	30·18	83	44	70	72	46	51½	50	ne.	calm	se.	s.	......	......	......	......
26.	30·106	30·031	29·59	30·05	30·00	30·14	30·12	83	51	66	72½	52	53	47	nw.	calm	sw.ne.	ese.	......	......	......	......
27.	30·130	30·101	29·65	30·01	29·99	30·09	29·99	67	34	69	70	53	54	50	e.	e.	ne.	w.	......	......	......	·19
28.	30·107	30·014	29·63	29·98	29·92	30·06	30·03	77	37	61	68½	51½	51½	49	e.	calm	nw.	calm	......	......	......	·18
29.	30·009	29·963	29·50	29·87	29·90	29·94	29·94	81	53	68	60	51	55	50½	sw.	se.	nw.	sse.	......	......	......	......
30.	30·117	30·056	29·60	29·98	30·00	30·03	30·03	72	39	57·5	63½	45	53	48½	nw.	n.	sw.	w.	·14	......	1·50	......
31.	30·049	29·823	29·53	29·70	29·54	29·60	29·42	69	41	63	54½	46	48½	50	sw.	wnw.	sw.	se.	......	......	......	·35
Mean.	30·123	30·006	29·59	29·949	29·911	29·924	29·936	75·25	41·00	63·2	64·3	44·5	52·53	48·43					0·28	0·18	1·98	1·78

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VIII.—*An Account of the Germination of* Isoëtes lacustris. By Karl Müller*.

[With two Plates.]

1. *Introduction.*

M. A. Raffenau Delile has already contributed an essay on this subject. He observed the germination of this very interesting genus in *Isoëtes setacea.* His observations were published in the 'Mémoires du Muséum d'Histoire Nat. de Paris,' tom. xiv. p. 100 *et seq.*, accompanied by two plates. However the whole of his investigations throw but little light upon the matter if we look especially—and with reason—for an account of the development of the embryo. M. Delile has given scarcely more than what may be observed with the naked eye in every germinating *Isoëtes*: the germ breaking through the ovule and developing independently.

It therefore was exceedingly agreeable to me, when my friend Dr. Karl Jessen of Kiel, through the kindness of Prof. Kunze of Leipsic, sent me for minute examination a quantity of *Isoëtes lacustris* with beautifully developed reproductive bodies. I was the more desirous of obtaining these from having recently studied the germination of the *Selaginellæ*, and had reason to expect that the two genera would exhibit as much agreement in this point as they do in their other allied conditions, depending on the structure of the two kinds of reproductive organs. How far this has turned out to be true will be seen in the course of these investigations. In any case it was of great scientific interest to make out the relation of two plants—as to the natural affinity of which opinion varies so much—in their earliest development, so

* Translated by Arthur Henfrey, F.L.S., from the Botanische Zeitung, April 14 and 21, 1848.

that some conclusion might be drawn as to the degree of their relationship.

The second reason which especially attracted me to the investigation of this subject was the peculiarity of the root-stock, first observed and described by H. v. Mohl, on which the youngest roots, contrary to the custom in all other vascular plants, develope out of the centre of the stem in a deep furrow, while the rootlets occurring on the outer periphery of the root-stock are the very oldest. It might be expected that the history of the development would give some information as to this circumstance; indeed it must be admitted that without a thorough knowledge of it, no safe opinion can be formed of the nature of the matter. Whether the following complete account of the development up to a tolerably perfect condition of the germ is sufficient for the above purpose, will subsequently be seen.

There was yet a third reason which rendered the whole investigation highly desirable to me; namely the wish to examine how the earliest formation of the embryo took place in an *asexual* plant, how it was brought about. It will be readily conceded here also, that this parallel is extremely well fitted to throw light upon the formation of the embryo in both classes of plants. Whether and how far the following history of development will allow of the parallel being perfectly drawn, will hereafter be evident in the course of the exposition. I think that at this moment we are in the utmost need of an investigation which shall show the—I might call it *uteral*—formation of the embryo in an asexual plant, where consequently there is no question about pollen-tubes. I think so the more that it will not be long before two parties stand opposed to each other, one ranged under the banner of Schleiden, the other of Amici. *Selaginella,* and still better *Isoëtes,* on account of the readier germination, perfectly admit of such an investigation, and the poor botanist who has looked around him so much for *analogies,* has really much reason to be earnestly thankful for the creation of the Lycopodiaceæ, for I know of no other family in which this again occurs.

These three reasons determined me to an investigation of a complete course of development of *Isoëtes lacustris*. I would willingly —as indeed I much wished—have given a further account of the whole course of development of this plant, but the air of the chamber affected all my hundreds of germinating plants, which I the more regret since my time is now too much taken up with other botanical matters to allow of my calculating on returning very soon to this subject. It was also part of my plan to add the earliest stages of the development of the *Selaginellæ*—which in my earlier researches I neglected, or rather did not discover. I lament that from the same causes I am unable to do so here, and therefore I beg the indulgent reader at least to follow with me the *germinating Isoëtes lacustris.*

2. *The Ovule.*

No explanation is necessary when I name the spore propagating the species an *ovule.* I have already used this expression in the same sense in my essay on the development of the Lycopodiaceæ*, for the germinating spore, and consequently also with Spring called the sporangium of *Selaginella* which incloses the spore of this kind, the *oophoridium.* The reasons why I then thought that I ought so to do were morphological and physiological, since the course of development of the oophoridium proved a distinct *axial* nature, and the plant, unlike the other vascular and cellular asexual vegetables, developed, not *extra* but *intra uterum.* This last reason is decidedly the more important here, and is fully applicable to *Isoëtes.* But whether the first ground is tenable in this genus may perhaps be doubted by many persons, who, with H. v. Mohl, would regard the germinating spore as a leaf-product. I regret especially in regard to this point that my history of the development does not extend up to this stage, for I do not for a moment doubt that the oophoridium of *Isoëtes* is equally an axial structure, and does not belong to the leaves as Mohl thinks. It is not of much importance that it is inclosed as in a sheath by the base of the leaf in *Isoëtes.* The leaves are so smooth all round that one may thence conclude that their bases are not applied to the formation of the oophoridia. The simpliest view of the matter is to assume that a mother-cell of the root-stock itself grows up into the excavated base of the leaf exactly as the mother-cell of the oophoridium does in *Selaginella*†. In bringing forward—and certainly with good reason—the condition of this latter plant as an analogical proof here, I think that I fully make good my view. It is evident then that the sporangia also of the spores which do not germinate are of an axial nature, as is the case in *Selaginella.* To complete the comparison between the ovule of the sexual plants and that of the Lycopodiaceæ, a third reason, an anatomical one, presents itself in *Isoëtes,* for the ovule of the *Isoëtes,* exactly like that of sexual plants, consists of three coats, to which may in a similar manner be applied the simple names *primine, secundine* and *nucleus,* without regarding the special anatomical distinctions.

1. The *Primine.*—This coat is not composed of cellular tissue.

* Ann. of Nat. Hist. Ser. 1. vol. xix.

† Ann. of Nat. Hist. Ser. 1. vol. xix. Pl. IV. fig. 7 *c* & fig. 9 *a*.

It is a dense envelope consisting of brown cellulose, which is covered on both surfaces, inside and out, with reticulated, ramifying ridges which give it the appearance of being composed of cellular tissue in which the cells only, but in their entire diameter, are homogeneously thickened (Pl. II. fig. 1). These ridges—by no means rare phænomena in the ovules of Lycopodiaceæ generally—have their analogues, like the whole primine, in the outer coat of the pollen-grains of many sexual plants. They usually project so much from the surface of the primine that they give the ovule a very wrinkled appearance. Indeed the conditions of their ramifications and elevations are so constant in the species of *Isoëtes*, that, recently, some new—and as Prof. Kunze thinks good—species have been discriminated by this character. On the surface of the primine here also, as in *Selaginella*, run the furrows of the tetrahedral union, appearing with more or less distinctness, in consequence of which the ovule itself exhibits a more or less perfect tetrahedral shape. At these furrows the primine subsequently splits in the germination (fig. 1).

2. The *Secundine.*—This has a wholly similar structure to the preceding, to the inner surface of which it is pretty firmly applied; but in germination it may very easily be isolated. Like the primine it is a thick brown coat produced by the deposition of cellulose, but it is quite homogeneous, and only exhibits here and there on the outer surface, impressions of those ridges which beset the primine. How these two membranes, each independently—as it appears—can be formed by the deposition of cellulose, will certainly remain a problem until the course of development of the oophoridia is known.

3. The *Nucleus.*—This forms a special, thick envelope, which is the more extraordinary that it is composed of a layer of broad, colourless, loosely united delicate cells, only here and there filled with uncoloured globules. When this layer of cells is examined on the outer surface, the form of the cells appears to be somewhat cubical with truncated angles (fig. 2). Almost all over the coat occur also other cells, essentially distinct from the delicate kind. These lie grouped round a centre. This consists of a very large cell which soon becomes divided into four by two septa crossing one another (figs. 2, 3). This large cell in many cases bears considerable resemblance to a stomate, but must not be imagined to be one. Yet it shares with many stomates the peculiarity, that it projects as a papilla from the surface. It is polyhedral, usually oval (fig. 3), but very often constricted in four places at the sides, so that the papillary projection appears to be composed of four spherical cells (fig. 2). All the walls of these large cells are excessively thickened on both sides, evidently by the deposition of cellulose. The thickening itself is emarginate on

both sides. Frequently also it passes over, the point running out, into the walls of the contiguous cells. All the cells of these remarkable groups are of a brown colour, which is deepest in the large cell, the colouring gradually fading outwards till it reaches the extremely delicate cellular tissue bounding the group; this tissue contrasting the more with the group that its walls are composed of much firmer and more distinctly defined membranes. Moreover the cells lying immediately round the large cell are distinguished by the irregularity of their form from those situated beyond them. Many such groups occur upon the coat of the nucleus. Frequently they are far apart, often near together, or again arranged in groups, so that we find no special regularity in the whole. But at one point the condition is more constant, for they especially occur upon that part of the surface of the coat where the primine and secundine subsequently open (fig. 1 *a*). At the point of the orifice usually appears one large cell (fig. 1 *a*) with its accessory cells, and it appears to me that it is exactly this place which subsequently gives way in the breaking through of the germ. It is conceivable that the coat is most brittle here, and therefore gives way so much the more readily when it is pushed up in a cone by the rising embryo. The presence of all these groups at the point of the ovule may be just as easily explained. I imagine that the thickening of this surface is merely to afford an additional defence to the contents of the nucleus and to the embryo against external, hurtful influences. For the bursting of the primine, which is always followed by that of the secundine, appears to depend upon various circumstances. Now if this dehiscence happened at an epoch when the contents of the nucleus had not yet attained to substantial independence sufficient to enable it to defend itself from the surrounding water, and the coat of the nucleus was yet so delicate that it would be powerless against the intrusion of any moisture, the conclusion is not very distant; certainly it would not be exactly beneficial to the contents of the nucleus. This seems to me to be the simplest, because the most natural explanation. The peculiar dehiscence of the primine and secundine also speak in favour of it. These two membranes only retract gradually during the process of germination, and remain attached to the nucleus until the embryo is very substantially developed, and all and every of the contents of the nucleus, which we shall presently become acquainted with, have disappeared. Where the root subsequently breaks through, those groups of cells do not make their appearance. By the time however that the breaking-through ensues, the young plant is already supplied with nutriment in a different way, as we shall discover in the course of this description; it is sufficiently independent to be able to defend itself against the water.

With regard to the coat of the nucleus, this appears to be called the spore-cell by some authors, for instance by Mettenius*. In the passage referred to, he describes the ovule of *Isoëtes lacustris* as follows:—"In *Isoëtes lacustris* the flattened surface of the large spore, which has the three ridges, is separated from the remainder of the periphery of the spore by an annular border, as has already been observed by Bischoff (Kryptog. Heft iii. p. 81), and the stratified composition of the outer coat, is still more evident than in *Lycopodium* (*Selaginella*). The spore-cell is immediately surrounded by a thin layer of membrane, then follows one tough and darker; both are of a granular structure; as the third and outermost layer succeeds one consisting of distinct pieces, readily separable, somewhat more transparent, and possessing papillose elevations on its surface." In numerous investigations I have found but the three coats which I have described above. The description of Mettenius is therefore obscure to me. Since he also describes three coats, I may guess that by the *spore-cell* he means my third coat, the nucleus. But then the characters do not agree, for my coat of the nucleus is not a cell, if by a cell is meant a simple vesicle not (disregarding the contents) again composed of a reticulated tissue. And yet the spore-cell of this observer must be my nucleus, since in this it is that the embryo finally makes its appearance, for he probably will not have meant the first cell of the embryo by this expression. Perhaps he has only examined dried ovules of *Isoëtes*, and the coat of the nucleus may have had a different shape in these. I have examined them only in the living condition, and in these the innermost coat was never a granulated simple cell.

In a note on the same page Mettenius reproaches me with having, in *Selaginella*, confounded the spore-cell with the innermost layer of the innermost coat of the spore, and at page 270 he says further, that he saw the spore in germination become gradually transformed into a sac composed of a single cell. From these words, my coat of the nucleus must be his spore-cell, and this becomes perfected into an independent sac (coat of the nucleus) only at a later stage, perhaps in germination. In *Selaginella*, I cannot now recollect, except in *Selaginella gracillima*, to have found such; in *Isoëtes lacustris* I have constantly met with it in the germinating spore. In any case it would be very interesting to have an accurate demonstration of the development of this cellular coat.

To avoid misconception, I observe, that by the *nucleus* I mean

* Linnæa, 1847, p. 269.

the third, innermost coat with all its contents, but that I distinguish the coat itself as the *coat of the nucleus*.

Regarding the contents, they are the same as those possessed by the ovules of *Selaginella*. They consist of a quantity of delicate, compact, transparent, at least colourless granules, which swim about in a fluid and give this a milky appearance. They are coloured brown by iodine, exactly as occurs in the *Selaginella*. Originally these cell-contents are but sparing in quantity; toward the beginning of the germination however they become so much increased that the whole of the cavity of the ovule is filled up (fig. 4).

3. *The Process of Germination.*

The part which the granular cell-contents play in the following process of formation of the embryo is of extraordinary importance, at the same time a very simple one. I showed formerly in my 'Essay on the Development of the Lycopodiaceæ*,' how this granular mass is constantly accompanied by a fluid which presents itself to the observer in the *form* of globules of oil. I pointed out moreover that these seeming globules of oil consist of a mucilaginous substance which furnishes the material for the subsequent formation of cells, and that these globules, coagulating in iodine and mineral acids, and above all being insoluble in æther, must not by any means be regarded as drops of oil, as has only too frequently happened; finally that they are the protoplasm of H. v. Mohl. All this holds good also of the contents of the ovule of *Isoëtes lacustris*. In the essay referred to I said further, that, mingled with this granular mass and the protoplasm, we always find some free cells which are coloured blue by iodine, which therefore are amylum-cells. All this is equally applicable to *Isoëtes*. But when I wrote that essay I was still ignorant of the connexion between the granular cell-contents, the amylum-cells and the protoplasm. This has only become clear to me, in the following manner, through the investigation of *Isoëtes*.

The granular matter is the element of the amylum-cell and the protoplasm. As I have mentioned above, every one of these granules is originally a perfectly compact globule. Such a globule, extremely small in its first stage, gradually increases in diameter, till, arrived at a certain limit, it presents a distinct cellular appearance. A cell of this kind then has the exact aspect of an amylum-cell, to which we readily see, beneath the microscope, that it very closely approaches in weight, since it always sinks to the bottom, and in texture, as it is lamellated, and looks almost as if perforated with a number of holes. In

* Ann. of Nat. Hist. Ser. 1. vol. xix.

fact, when it is acted on by iodine it also becomes coloured blue, and the result is that the said compact granule is transformed into an amylum-cell. This transition of the granule is actually very easy to trace when once we are aware of the connexion of the facts. All the intermediate stages between the original compact granule and the amylum-cell may readily be discriminated by the application of iodine. Moreover the granules become converted into starch at an extremely early epoch, before we can yet regard them as amylum-cells.

In my 'History of the Development of the Lycopodiaceæ' I mentioned a remarkable peculiarity of these amylum-cells, viz. that the blue colour produced by iodine very readily disappears again in certain amylum-cells, and that it may be restored just as readily by touching the cells, or often merely by rolling them backwards and forwards in the water; indeed, that one may often continue this alternation at one's pleasure for a long time. This peculiarity is equally characteristic of the amylum-cells of the ovule of *Isoëtes*. The phænomenon appears however only in the larger cells, such as may be recognised as amylum-cells even without the use of iodine. But neither here any more than in *Selaginella* have I succeeded in discovering the reason of this strange property.

With regard to the structure of the amylum-cell itself—this consists of more or less distinctly concentric layers deposited round a central nucleus which becomes coloured intensely blue by iodine (fig. 5). Several such dark groups often occur in one cell, the central nucleus being constantly present. In larger cells we may distinctly make out that these larger amylum-cells are distinct discoid bodies, convex on both faces (fig. 5 *a*). They frequently exhibit minute furrows, as is so often the case with starch-granules.

As soon as the granules are transformed into amylum they are in a condition to enter into new combinations with the elements of water. They swell up by the absorption of water, and then become decomposed into that fluid matter so often mentioned, which presents itself to the investigator in drops like oil. I have already stated in my 'History of the Development of *Chara**,' that I have directly observed this change, and I have there reported on it at length. As in that case, where the process may be traced more readily from the mere fact that the starch-cells are larger, they become softened in water, retaining their shape, until the whole of the contents comes into a fluid condition. Then they burst and the contents are scattered, always in the form of drops. I must therefore repeat here that the outermost layer of the

* Ann. of Nat. Hist. Ser. 1. vol. xvii. p. 258.

starch is always a denser membrane which may inclose the contents for a long time, and that therefore the process of solution proceeds from within outward. Exceedingly delicate granules are always found here, also, intermingled with the oil-like fluid (fig. 6). It is in like manner coloured brown by iodine.

In proportion as it was easy to observe this transformation of the starch-cells in the *Charæ,* since in them the whole contents of the nucleus consisted of starch, it was difficult to see the connexion between it and the primary granular mass of the ovule of the *Selaginellæ.* Therefore in the facts which I have published in my 'History of the Development of the Lycopodiaceæ' it must be equally understood, that the protoplasm is a product of the amylum-cells, and these latter of the granular mass.

By the time a considerable portion of the granular mass has become converted into protoplasm, the mass itself has so accumulated in the ovule that the latter is very much distended by it, and the mass has become so finely aggregated, that when isolated out of the ovule by careful preparation, it retains the shape of the ovule for some time as it lies in water beneath the microscope (fig. 4); and then *the first cell* is formed, in the interior of the mass, not very far from the apex of the ovule where it subsequently bursts, hanging immoveable but quite isolated in the mass. In order that it may constantly retain this position, it is extremely viscid and tenacious, so that it is usually uncommonly difficult to extract it in a perfect condition. It always presents an appearance as if it were fastened to the mass surrounding it by filaments.

It would be altogether useless to express any opinion as to the origin of this first cell. From my numerous investigations I do not believe in the possibility of discovering it in the first stage, simply for this reason: if it were before our eyes it could not be distinguished from the mucilaginous investing mass, since it must have the most deceptive resemblance to it. This reason therefore leads me to consider the discovery of the first perfect cell as a piece of good fortune, and this has only happened to me twice. Nevertheless this much is certain; the first cell is formed immediately out of the *protoplasm.* I beg my indulgent reader to form his own opinion as to the *mode* of origin of the cell as he may best conceive it.

4. *Formation of the Germ-plant up to the first rupture of the Ovule.*

When we have accomplished the always difficult operation of preparing the germ-cell free from its investing coats, we find it in the first instance perfectly round (fig. 7). I have neglected to measure it; but the relative size may readily be perceived from the figures by comparing the germ-cell, fig. 7 *a*, magnified fifty times with the ovule fig. 1, or fig. 14 also enlarged fifty diameters.

Under a power of 250 diameters it is distinctly seen that we have no longer to do with a simple cell, but with a mother-cell; in the fluid within it float some other cells in which the process of development has begun. Magnified 400 times the secondary (daughter)-cells are seen to consist of extremely delicate membranes, some of them also containing cytoblasts (Pl. II. fig. 7 *b*). The second germ-cell which I met with gives us some results with regard to the import of cytoblasts; the secondary cells are formed from them (fig. 8). Therefore in the first instance the mother-cell must contain merely a chaotic mass of cytoblastema, since fig. 8 speaks in favour of this, where most of the cell-contents consist of inorganized material for cells. Then free cytoblasts are produced out of this (fig. 8 *c*), and from these finally are developed the new cell-membrane, as is usual in the formation of the cell from cytoblasts, and the cytoblast remains lying on the wall (fig. 8 *d*).

When the whole of the cytoblastema of the mother-cell has been converted into secondary cells it forms a compact globular body (fig. 9 *a*), the cellular tissue of which is composed of many-sided cells compressed closely together, each containing its cytoblast (fig. 9 *b*). The mother-cell now acquires an oval shape. If acted on with iodine, it is rendered evident that the membrane of the mother-cell still incloses the whole tissue, for the latter contracts somewhat on account of the iodine, and the wall of the mother-cell thus becomes very distinctly visible as a colourless membrane enveloping the deep brown tissue (fig. 9 *c*). However, the presence of the mother-cell membrane is not a matter of long duration; apparently it lasts only up to this stage. Then it disappears, but whether by absorption or mechanical agency I have not observed. It may therefore be truly said that the germ is inclosed as in a sac by the mother-cell membrane up to a certain time. As it has often been asserted that this sac-like envelope of the original mother-membrane remains permanently inclosing the entire plant, I was unwilling to leave the above facts unmentioned, bearing as they do upon this opinion which has been so violently assailed by Schleiden.

Tracing the further course of the formation of the delicate germ, we next find the previously oval embryo extended more into a cylinder slightly curved on one side (fig. 10 *a*). Here, as in the immediately following stages, the cytoblast is still distinctly visible on the wall of every cell (fig. 10 *b*), till in the more independent germ it is gradually decomposed into chlorophylle.

The slight bend becomes continually more evident. A growth toward different sides visibly commences, showing itself in the altered form of the embryo; this is now elongated distinctly upward and downward (fig. 11). On the former prolongation nothing more is seen, except that the upper part of the embryo, *i. e.* that which subsequently breaks through the ovule, becomes attenuated. The alteration which occurs in the lower portion is more important. A growth toward two different sides manifests itself in very delicate outlines. On the one side (fig. 11 *a*) the embryo bulges out, on the other (*b*) it is attenuated, and the most external of the cells project spherically beyond the surface. Meanwhile a solitary cell in the concavity of the embryo has become so much enlarged that it protrudes like a globule beyond all the rest (fig. 11 *c*). *This is the first cell of the future so-called scale.* This exhibits over again all the phænomena presented by the mother-cell of the entire embryo. It contains like the latter an almost transparent, extremely fine granular cytoblastema, and is itself of an extraordinarily delicate structure. It is, moreover, situated in a *fold,* which is more clearly seen in the figures 12 and 13. *This fold is the future furrow or channel of the leaf.* When the observer succeeds in getting a view of this fold on the direct face, it is distinctly seen that the mother-cell of the scale stands upon another cell which serves for its foundation, and projects in like manner beyond the other cells forming the surface. I now leave the *cell of the scale,* that I may hereafter examine it more minutely in its relations as an independent organ,—the Scale.

While the *cell of the scale* up to the stage in fig. 13 has increased in size only and shown no apparent alteration in its interior, the double growth of the lower portion of the embryo has manifested itself in a more distinct manner; the projecting portion has become more evident, and the terminal cells forming spherical projections from the surface of the opposite side now have a horizontal direction.

This soon alters. The projecting portion which before only bellied out now becomes conical (fig. 12 *a*). Meanwhile it may be perceived that the lower surface of the embryo is becoming curved, at first slightly, afterwards in a very marked degree. Then that portion of the embryo on which the spherical, projecting cells occur turns upwards, out of its horizontal position and thus acquires one more vertical. By this means the spherical cells come to be placed on the upper surface (Pl. II. fig. 12 *d*). Here they come into immediate contact with the fold (fig. 13 *c*), the furrow of the future leaf, surround the *mother-cell of the scale* like a semicircular wall, *and form thus the foundation of the future leaf-sheath of the second leaf.*

This latter also has now commenced its course of development. It is the cell *c* in fig. 12, the cell *b* in fig. 13. It possesses the same characteristics, as mother-cell of the second leaf, as do the mother-cell of the whole embryo and that of the *scale*. It is a cell with extremely transparent contents and of most delicate consistence. The whole future germ-plant is now formed in the embryo.

1. *The first leaf* (fig. 12 *e*);
2. *The second leaf* (fig. 12 *f*);
3. *The scale of the first leaf* (fig. 12 *c*);
4. *The future root* (fig. 12 *b*);
5. *A reservoir, in which lies stored up the nutriment necessary to the embryo until it becomes capable of supporting itself independently* (fig. 12 *a*).

I will treat each of these organs separately in the following paragraphs, in order that I may be able to give a more summary account of them. It is very convenient also to break off here, since we have now arrived at the stage at which the embryo breaks through from the ovule. There are a few words to be added respecting this act.

The breaking through never happens all at once, but takes place gradually. First the *primine* bursts (fig. 14 *a*); this is soon followed by the opening of the *secundine* (fig. 14 *b*); the *coat of the nucleus* protrudes from these two as a conical process (fig. 14 *c*). The whole of the upper part of the ovule thus acquires a conical form.

The *primine* and *secundine* persist now in an unaltered condition, till at length, decaying, they fall away, bit by bit, from the coat of the nucleus, which itself in time meets with a similar fate. This now begins to expand considerably. This is caused solely by the expansion, not the multiplication, of its cells. The cellular tissue of the coat of the nucleus thus becomes quite loose in its texture. The papillary cells become less and less conspicuous; all the cells are transparent (fig. 15).

The result of this is, that as the light penetrates through the expanding coat of the nucleus we see the first leaf, the tissue of which has by this time become green, showing as a little green cone through the upper transparent part of the coat of the nucleus.

If the entire germ is now extracted from the ovule, it is found exactly of such size that it reaches from the very top of the ovule to the bottom (fig. 15 *b*). This seems indeed a necessary condition, since in order to break through the ovule some pressure must be exerted upon the coat of the nucleus. This pressure can only be effected by the continual growth of the germ in the longitudinal direction, thus becoming longer than the coat of the nucleus, stretching it and finally breaking through it (fig. 15 *a*). I have found this condition regularly in all the ovules I have examined. The various organs only sketched out in slight outlines in figs. 12 and 13, are much more distinctly seen in such a germ at this stage. We may here distinguish clearly two strongly marked divisions, viz. 1, *the germinal body*; 2, *the first leaf*.

I have already used the term germinal body (Keimkörper) for the part morphologically corresponding in the germinating *Selaginellæ*, for that, namely, out of which developes the terminal bud of the stem and the root, which phænomena I shall discuss in the following section, since the immediately succeeding stages of the embryo, while breaking through, do not essentially differ from this in form.

[To be continued.]

IX.—*Notice of a deposit of Fossil* Diatomaceæ *in Aberdeenshire.* By George Dickie, M.D., Lecturer on Botany, King's College, Aberdeen*.

It is unnecessary to insist here upon the very general occurrence of silex in fresh and salt water, or the means by which it is dissolved and retained in solution; the very general distribution of Diatomaceous plants is a sufficient proof, if any such need be brought forward. It may be, that by some process like that called electrotype, the organisms in question are enabled to perpetuate their own beautiful forms, the impressions being taken in the purest transparent silex. The rapidity with which they are multiplied will account for the large deposits of fossil earth found in different parts of the world, and the indestructible nature of the mineral which they have the power of depositing in or upon their tissue enables us to recognize them long subsequently to the time when their vitality ceased.

In the month of March last, two different substances were sent to me for examination; they were described as having been found under a bed of clay at Premnay in the interior of Aberdeenshire. One of them consisted of small solid fragments of a dull white, the other had the form of a fine powder of a pure white. On examination it was found that the former consisted of decomposed felspar forming a kind of porcelain earth, the other had no small resemblance to some fossil earths with whose physical characters I was not unacquainted; accordingly, on submitting it to examination under the microscope, I found it to be entirely composed

* Read before the Botanical Society of Edinburgh 8th June, 1848.

of *Diatomaceæ*. Being desirous of procuring additional information respecting the probable circumstances under which such a deposit might have taken place, I requested some particulars respecting it; my disappointment was considerable when informed that the decomposed felspar alone had been found under a bed of clay, but that the white powder was in reality the residue left after the use of peat as fuel, a quantity of which had been preserved, its peculiar appearance having attracted notice. The fact, however, is not less interesting when viewed in connection with a true fossil earth to be presently described, which was found by Mr. Murray, at Blackhouse near Peterhead, under a bed of peat, for specimens of which I am indebted to my friend Professor MacGillivray. The residue of the Premnay peat was found to consist of the following *Diatomaceæ* :—

Eunotieæ *.

Eunotia ocellata.
E. tetraodon.
E. turgida.
Himantidium Arcus.

Meridieæ.

Meridion circulare.

Fragilarieæ.

Fragilaria rhabdosoma.

Meloseireæ.

†Meloseira Italica.

Surirelleæ.

†Surirella bifrons.
Synedra Ulna.

Cymbelleæ.

Cymbella Ehrenbergii.
Cocconema lanceolatum.
Gomphonema lanceolatum?

Naviculeæ.

†Navicula acrosphæria.
N. binodis.
N. dicephala.
†N. major.
N. nodosa β. striata.
†N. viridis.
Stauroneis lanceolata.
S. linearis.
S. Microstauron.
†S. Phœnicenteron.

Tabellarieæ.

Tabellaria ventricosa.

Coscinodisceæ.

Coscinodiscus minor.

This last was detected by Mr. Thwaites, to whose assistance I am indebted in naming the species. Those marked † were in greatest quantity, and the *Meloseira Italica* was more abundant than the others; this species had not, so far as I am aware, been hitherto included in the list of British species, and I have found it in a living state very abundantly in several localities near Aberdeen; it generally occurs at the sources of cold springs.

The residue so rich in *Diatomaceæ*, remaining after burning peat from the Premnay bogs, renders it exceedingly probable that separate deposits of fossil *Diatomaceæ* may yet be detected there.

The specimen from Peterhead, in possession of Dr. MacGillivray, is a mass of small specific gravity having a laminated

* The names are adopted from Kützing's work on the *Diatomaceæ*.

structure with remains of vegetable fibre interspersed through it. It was found to contain nearly forty species of *Diatomaceæ*, viz.—

Eunotieæ.

Epithemia alpestris.
†E. gibba.
E. ocellata.
E. proboscidea.
E. turgida.
E. Zebra.
†Eunotia Monodon.
Himantidium Arcus.

Fragilarieæ.

Fragilaria rhabdosoma.

Meloseireæ.

Meloseira Italica.
M. subflexilis?

Surirelleæ.

Campylodiscus Clypeus.
Surirella elliptica.
S. Solea.
Synedra capitata.

Cocconeideæ.

Cocconeis Pediculus.

Cymbelleæ.

†Cymbella Ehrenbergii.
C. cuspidata.
†C. helvetica.
†C. maculata.
†Cocconema cymbiforme.
Gomphonema minutum.
G. pohliæforme.

Naviculeæ.

Navicula attenuata.
†N. binodis.
N. dicephala.
†N. inflata.
N. major.
†N. oblonga.
N. radiosa.
N. rhomboides.
N. viridis.
Stauroneis lanceolata.
Amphora ovalis.
A. elliptica.

Tabellarieæ.

Tabellaria fenestrata.

Those marked † were most abundant.

X.—*Descriptions of* Aphides. By Francis Walker, F.L.S.

[Continued from p. 48.]

Eighteenth Group.

This group may require subdivision, but it does not contain many species.

33. *Aphis Piceæ.*

Aphis Piceæ, Panz. Faun. Germ. 78. f. 22; Fabr. Rhyn. 302. 56; Zett. Faun. Lapp. i. 557. 1; Kalt. Mon. Pflan. i. 141. 111.
Lachnus grossus, Kalt. Ent. Zeitung, 1846, 175.

The viviparous winged female. This is black, smooth, and shining: the front of the head is slightly convex: there are two impressions on the crown: the feelers are red, filiform, and hardly half the length of the body; their tips are black; the fourth joint is rather more than one-third of the length of the third, which is crenulated beneath; the fifth joint is a little longer than the fourth; the sixth is not half the length of the fifth; the seventh is extremely short: the eyes are black and prominent: the mouth is black, and nearly as long as the body: the lobes of the chest are strongly marked: the nectaries hardly rise above the surface of the abdomen: the legs are black and not hairy; they are very long, especially the hind-legs; the thighs except their tips, the fore-shanks and the middle-shanks from the base to the middle, and the hind-shanks at the base, are red; the shanks are very slightly curved: the wings are very much longer than the body, and tinged with brown, but they are colourless towards the base; the wing-ribs and the wing-brands are black; the veins are paler; the base of the fore-border of the wing is convex; the brand is linear and very long, and occupies rather less than half the length of the wing; it terminates abruptly, forming nearly a right angle from whence springs the fourth vein which is long and straight; the third vein is obsolete near its source; it is forked before one-third and forked again after two-thirds of its length; the angles formed by these forks are very acute; the tip of the upper branch of the second fork is very near the tip of the fourth vein; the first and the second veins are almost straight; they are near each other at the base, but very far apart at the tips.

Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

This species feeds on *Abies Picea*, the silver fir, and on *A. excelsa*, the spruce fir; it occurs near London in the middle of June, and I have found it in abundance on the Alps of Switzerland.

34. *Aphis Pini*, Linn.

Aphis Pini, Linn. Syst. Nat. ii. 796. 21; Gmel. ed. Syst. Nat. i. 2207; Faun. Suec. 994; Fabr. Mant. Ins. ii. 317. 44; Sp. Ins. ii. 389. 39; Ent. Syst. iv. 219. 44; Syst. Rhyn. 300. 44; Rossi, Faun. Etrusc. 264. 1396.

A. nuda Pini, Deg. Ins. iii. 18. 1. t. 6. f. 1–14.

Lachnus Pini, Kalt. Mon. Pflan. i. 155. 8.

Pityaphis, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 482.

The viviparous wingless female. It is stout and active, and runs fast: the body is flat, subquadrate, hairy, smooth and shining, and thickly covered with very small black dots: the head is pale red: the chest is yellow: the abdomen is green: the front of the head is convex: the feelers are yellow, hairy, and less than half the length of the body; their tips are black; the fourth joint is more than half the length of the third; the fifth is longer than the fourth; the sixth is about half the length of the fifth; the seventh is extremely short: the eyes are black and prominent: the mouth is tawny, and reaches beyond the hind-hips; its tip is brown; the first joint is linear; the second, third and fourth joints are formed like a spindle which is shorter than the first joint: the nectaries are dull red, and like tubercles on the surface of the abdomen: the legs are tawny, hairy, long, and stout; the feet and the tips of the shanks are brown; the hips are large; the feet are rather long; the second joint and the shanks are slightly curved.

1st variety. The abdomen is yellow.

2nd variety. The abdomen is very pale buff, with three green stripes along its back.

3rd variety. The head and the fore-chest are red, and the rest of the body is white with two green stripes along the back: there is also a tawny space round the base of each nectary.

4th variety. The body is red, and mottled with white powder, and that chiefly on each side of the fore-part of the body which is pale red beneath.

5th variety. The disc of the abdomen is slightly metallic.

6th variety. The nectaries are black.

7th variety. The shanks are pale yellow towards the base; their tips and the feet are black.

8th variety. The legs are yellow; the feet, the tips of the thighs, the base and tips of the shanks, and the whole of the fore-shanks are black.

The viviparous winged female. While a pupa the body and the limbs are hairy: the body is bright red: the limbs are yellow; the tips of the feelers, the eyes, the tip of the mouth, the knees, the feet, and the tips of the shanks are black: the feelers are hardly half the length of the body. It acquires wings in the middle of June, and is then red: the disc of the chest is dark gray: the abdomen is yellow, elliptical, shining, broader than the chest, covered with little black dots, and having a whitish line bordered with darker colour along its back; it is paler beneath: the feelers are yellow, and hardly half the length of the body; their tips are brown: the mouth is yellow with a black tip: the nectaries are black, and each of them is surrounded by a red circle: the legs are yellow; the knees and the tips of the thighs are dull red; the feet and the tips of the shanks are black: the wings are colourless and longer than the body; the wing-ribs are yellow; the brands and the veins are dull red; the rib-veins begin to widen into the brands at about half the length of the wing; the brand is long and linear; the angle near its tip is less obtuse than that of *A. Abietis,* but more obtuse than that of *A. Piceæ*; the fourth vein is nearly straight; the third vein is obsolete near its source; it is forked before one-third and forked again after two-thirds of its length; the angles formed by these forks are very acute; the tip of the upper branch of the second fork is very near the tip of the fourth vein; the first and the second veins are almost straight; they are near each other at the base, but very far apart at the tips.

Length of the body 2 lines; of the wings 5 lines.

1st var. The back of the pupa is thickly covered with black dots: the head and the fore-chest are bright red; the rest of the chest is pale red: the abdomen is green, paler beneath.

2nd var. The body is brown and covered with white powder: the disc of the head and that of the chest are black: the feelers are as long as one-fifth of the body: the mouth is pale brown with a black tip: the legs are black; the base of the thighs is yellow; the shanks also are yellow near their base which is black: the wing-ribs and the veins are brown; the wing-brands are dark brown.

On *Pinus sylvestris,* the Scotch pine, during the greater part of the year.

35. *Aphis Pinicola.*

Lachnus Pinicola, Kalt. Mon. Pflan. i. 154. 7.

Aphis Piniphila, Ratz. Forst. Ins. iii. 219. 26. t. 11. f. 5.

The viviparous wingless female. The body is of a chocolate colour, with four rows of hoary spots; the underside is tawny and covered with a white bloom: the feelers are yellow with black tips, filiform, slender, slightly hairy, and less than half the length of the body; the fourth joint is much less than half the length of the third; the fifth is much longer than the fourth; the sixth is more than half the length of the fifth; the seventh is extremely short: the mouth is black, yellow at the base, and reaches far beyond the hind-hips; it increases slightly in breadth towards the tip: the eyes are black: the front is convex: the sides of the fore-chest are slightly notched: the nectaries are black, and hardly rise above the surface of the abdomen: the legs are yellow, long, slender, and slightly hairy; the shanks and the second joints of the feet are slightly curved; the hips, the thighs, the feet, and the shanks from the middle to the tips are black.

The viviparous winged female. This much resembles the wingless female, allowing for the usual difference between these two forms: the wings are colourless, and longer than the body; the brands and the veins are brown; the rib-vein widens into the brand, which is long and linear; the angle near its tip resembles that of *A. Piceæ,* and is much more obtuse than that of *A. Pini;* the fourth vein springs from this angle and is nearly straight; the third vein is obsolete near its source; it is forked before one-third and again after two-thirds of its length; the angles formed by these forks are very acute; the tip of the upper branch of the second fork is very near the tip of the fourth vein; the first and the second veins are almost straight; they are near each other at the base, but very far apart at the tips.

Length of the body $1\frac{1}{2}$–$1\frac{3}{4}$ line; of the wings $3\frac{1}{2}$–4 lines.

On *Pinus sylvestris,* the Scotch pine: very abundant in the autumn.

36. *Aphis Pineti.*

Aphis Pineti, Fabr. Ent. Syst. iv. 219. 45 ; Syst. Rhyn. 309. 45 ; Gmel. ed. Syst. Nat. i. 2207.

A. tomentosa Pini, Deg. Ins. iii. 26. 2. t. 6. f. 19. 25 ; Zett. Ins. Lapp. i. 558. 2.

Lachnus Pineti, Kalt. Mon. Pflan. i. 162. 12.

Pinetifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 482.

The viviparous wingless female. The body is oval, convex, dull green, shining, but thickly covered with white cottony matter ; the segments are of nearly equal size : the front is slightly convex, and beset with hairs : the mouth reaches the hind-hips ; its tip and the eyes are black : the feelers are filiform, slender, and less than half the length of the body ; their tips are black ; the fourth joint is more than half the length of the third ; the fifth is shorter than the fourth, and the sixth than the fifth ; the seventh is extremely short : the nectaries are like tubercles on the surface of the abdomen : the legs are stout, hairy, and pale green with a bluish tinge, and of moderate length ; the feet and the tips of the shanks are brown ; the shanks and the second joints of the feet are slightly curved.

1st variety. The body is dull red.

2nd variety. The body is dull reddish brown.

3rd variety. The body is dull dark red : the nectaries are black : the limbs are pale green.

The viviparous winged female. The body is grayish black : the limbs are black : the shanks are green with black tips : the wings are colourless, and very much longer than the body ; the wing-ribs and the wing-brands are dark brown ; the veins are paler ; the brand is long and linear ; the angle which it forms near its tip is less obtuse than that of *A. Pini* ; the fourth vein which springs from it is long and straight ; the third vein is obsolete near its source ; it is forked before one-third and forked again before two-thirds of its length ; the angles formed by these forks are very acute ; the tip of the upper branch of the second fork is very near the tip of the fourth vein ; the first and the second veins are almost straight ; they are near each other at the base, but very far apart at the tips.

Length of the body $1\frac{1}{4}$ line ; of the wings 3 lines.

1st variety. The body is black : the abdomen is dark green beneath : the feelers are green, brown at the base : the mouth is dark green : the legs are green : the wing-ribs are pale red.

The pupa has an elliptical dull brown body ; its rudimentary wings are black.

On *Pinus sylvestris,* the Scotch pine, in the autumn.

37. *Aphis Abietis*, n. s.

The viviparous wingless female. The body is oval, pale red and hairy: the feelers are pale brown, filiform, and nearly as long as one-fourth of the body; the fourth joint is less than half the length of the third; the fifth is much longer than the fourth; the sixth is as long as the fourth; the seventh is extremely short: the eyes are dark brown: the mouth is reddish brown, at least two-thirds of the length of the body, and reaches far beyond the hind-hips: the nectaries are dark, and like tubercles: the legs are dull reddish brown, hairy, and moderately long; the feet and the tips of the shanks are brown; the feet and the shanks are slightly curved, and the latter are very hairy.

The viviparous winged female. It resembles the preceding form in colour and shape, but the head and the disc of the chest are brown: the feelers are less than half the length of the body: the wings are colourless and moderately long; the veins and the brands are brown; the rib-vein begins to widen into the brand before half the length of the wing; the brand is long and narrow, and the angle which it forms at its tip is very obtuse; the first, the second and the fourth veins are nearly straight, and the two former are near each other at the base, but far apart at their tips; the third vein is indistinct and extremely slender, and obsolete at its source. While a pupa it is pale whitish red: the head is dark red: the limbs are very pale red: the feelers and the mouth have brown tips, and the former are hardly one-third of the length of the body: the eyes are black: the nectaries are dark red: the feet and the tips of the shanks are brown.

1st var. The body is tawny and covered with white powder: the disc of the head and that of the chest are dark brown: the limbs are tawny: the feelers are as long as one-third of the body: the eyes are black and prominent: the abdomen is paler beneath: the nectaries are brown: the feet and the tips of the shanks are brown: the wing-ribs, the brands and the veins are tawny.

The winged male. The body is dark brown: the feelers are brown, yellow at the base, and more than half the length of the body: the eyes are black: the mouth is yellow with a brown tip and nearly as long as the body: the legs are yellow and stout; the knees, the feet and the tips of the shanks are black: the wings are very much longer than the body.

Length of the body $1\frac{1}{2}$–2 lines; of the wings 2–$3\frac{1}{2}$ lines.

Found on *Abies excelsa*, the spruce fir, with the female in the summer and autumn.

38. *Aphis costata*, Zetterstedt.

Aphis costata, Zett. Faun. Lapp. i. 559. 3; Ins. Lapp. fasc. ii. 311. 4.

Lachnus fasciatus, Burm. Handb. der Ent. ii. 93. 4; Kalt. Mon. Pflan. i. 160. 9.

Cinara Symphiti, Curtis, Brit. Ent. 577.

Tæniolachnus, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 481.

The viviparous wingless female. The body is black, oval, hairy, velvet-like, and prettily mottled with white: the abdomen beneath is almost white: the feelers are filiform, black, hairy, pale yellow towards the base, and nearly half the length of the body; the fourth joint is much less than half the length of the third; the fifth is much longer than the fourth; the sixth is longer than the fifth; the seventh is extremely short: the front is convex: the mouth is black, yellow towards the base, and reaches beyond the hind-hips: the legs are black, stout, and hairy; the base of the thighs and the shanks except their tips are yellow; the shanks and the second joints of the feet are slightly curved. When young it is grayish black and linear: the mouth projects some way beyond the tip of the abdomen: the feelers and the legs are white; the knees, the feet, and the tips of the shanks and of the feelers are black.

1st var. The body is brown, shining, and mottled with gray and black down: the feelers are nearly white; their tips are brown: the nectaries are black: the legs are pale yellow; the feet, the tips of the thighs and of the shanks and the base also of the latter are black.

The viviparous winged female. It acquires wings in the beginning of June, and is then dark brown and covered with white powder: the feelers are tawny, and rather less than two-thirds of the length of the body; the tips of the joints are brown: the eyes are dark red and prominent: the mouth is tawny with a brown tip and reaches the hind-hips: the legs are tawny; the feet and the tips of the shanks are brown; the thighs also are adorned with brown spots and rings: the wings are colourless, clouded with brown, and longer than the body; the wing-ribs, the wing-brands and the veins are dark brown; the rib-vein begins to widen into the brand a little after half the length of the wing; the brand is rather long, and almost spindle-shaped; the angle near the tip of its hind-border is very obtuse, the part thence to the tip is slightly curved, and not near so long as that of *A. viminalis,* but much resembles the termination of the brand in *Aphis submacula*; the fourth vein is slightly curved and rather long; the third vein is obsolete near its source; it is forked before one-third and forked again after two-thirds of its length; the angles formed by these forks are very acute; the tip of the upper branch of the second fork is very near the tip of the fourth vein; the first and the second veins are almost straight; they are near each other at the base, but very far apart at the tips.

Length of the body $1\frac{1}{2}$–2 lines; of the wings $4\frac{3}{4}$ lines.

The oviparous wingless female. The body is bronze-colour with a yellowish border: the limbs are yellow: the feelers are about half the length of the body; the tips of the joints are black: the nectaries are also black: the knees are brown; the feet and the tips of the shanks are black. The end of October is its season for laying eggs; they are placed in a series along a leaf, and adhere together by their tips; their colour at first is yellow, and of a deeper tint at one end than at the other.

39. *Aphis Laricis*, n. s.

The viviparous wingless female. The body is oval, convex, hairy, velvet-like, very narrow towards the head, of a chocolate colour, and thickly covered with white spots of various sizes; the underside is of a rust-colour, and thickly covered with white powder: the feelers are yellow, slender, filiform, black towards the tips, and hardly more than one-third of the length of the body; the fourth joint is less than half the length of the third; the fifth is a little longer than the fourth; the sixth is about half the length of the fifth; the seventh is extremely short: the eyes are black and rather prominent: the mouth is black and reaches a little beyond the hind-hips; it is dirty white and half transparent towards the base: the nectaries are black: the front is convex: the sides of the fore-chest are slightly notched: the legs are yellow, long, stout, and hairy; the hips, the knees, the feet, the tips of the shanks, and the hind-thighs from the middle to the tips are black; the shanks and the second joints of the feet are slightly curved.

1st var. The body is broader and of a greenish brown colour: the head is reddish.

2nd var. The body is brown: the head is red: the tips only of the hind-thighs are black; the hind-shanks are black from their middle to their tips. When very young the body is pale brown, and the mouth projects beyond the abdomen like a tail.

3rd var. The body is brown, mottled with black and white.

The viviparous winged female. While a pupa it much resembles the wingless female in colour, being dark brown with a pale yellowish stripe along the middle of the abdomen; when the wings are unfolded it is dark brown, slightly powdered with white: the feelers are black, and rather less or rather more than half the length of the body; the base of the third joint is yellow; the fifth joint is as long as the fourth; the sixth is much more than half the length of the fifth: the mouth is yellow with a black tip: the base of the thighs, and the shanks except their tips are yellow; the shanks are especially hairy: the wings are colourless, and very much longer than the body; the wing-ribs are dull yellow; the wing-brands and the veins are brown; the rib-vein begins to widen into the brand at about half the length of the wing; the brand is rather long, the angle which it forms near its tip is very obtuse, and it thence slopes gradually away; the fourth vein is straight; the third vein is sometimes very indistinct or almost obsolete along its whole length; the second vein is slightly curved; the first is straight, and is near to the second at the base, but remote at the tip.

The oviparous wingless female. This appears towards the end of the autumn, and is larger than the viviparous female: the abdomen is at least thrice the breadth of the head or of the fore-chest: the body is light brown and has a very slight metallic tinge: the head and the fore-chest are somewhat darker than the rest of the body: there are three lines of black dots and two large transverse black velvet-like spots on each side of the abdomen: the feelers are yellow, black towards their tips, and less than one-third of the length of the body; the fifth joint is much longer than the fourth joint; the sixth is much less than half the length of the fifth: the mouth is black, dull yellow towards the base, and reaches the hind-hips, and is much less than half the length of the body: the legs are yellow; the thighs are darker towards their tips; the hips, the knees, and the tips of the shanks are black. The eggs as usual are large, and thickly enveloped in a glutinous matter; they are laid in November.

1st var. The body is dark brown: the tips of the joints of the feelers are black: the legs are darker and much longer than those of the viviparous female; the base only of the shanks is yellow.

Length of the body $1\frac{1}{2}$–3 lines; of the wings $2\frac{3}{4}$ lines.

40. *Aphis Juniperi*, Fabr.

Aphis Juniperi, Fabr. Ent. Syst. iv. 218. 40; Syst. Rhyn. 300. 40; Gmel. ed. Syst. Nat. i. 2205; Deg. Ins. iii. 56. 7. t. 4. f. 7–9; Schrank, Faun. Boie. ii. 1. 119.

Lachnus Juniperi, Kalt. Mon. Pflan. i. 153–6.

Juniperifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 481.

The viviparous wingless female. When young it is dull red, nearly linear, rather flat, and is covered with thick hairs: the head is broad: the eyes are dark brown: the limbs are dirty white: the feelers are hairy, slightly setaceous, shorter than the body; their tips are brown: the mouth has also a brown tip and is nearly as long as the body: the nectaries are hardly visible: the legs are hairy, long and stout. When full-grown it is pale red, oval, convex, plump, hairy, and thickly covered with white powder: the segments are all distinct, and of nearly equal length: there is a row of black velvet-like spots along each side of the back; they become fainter as they retreat from the head, and disappear before the middle of the body: the front is convex: the feelers are black, hairy, filiform, tawny at the base, and hardly more than one-fourth of the length of the body; the fourth joint is rather more than half the length of the third; the fifth is much longer than the fourth; the sixth is shorter than the fifth; the seventh is very short: the mouth is black, tawny at the base, and reaches nearly to the hind-hips: the front is convex: the nectaries are black, and rise very little above the surface of the abdomen: the legs are black, hairy, stout, and moderately long; the shanks and the second joints of the feet are very slightly curved.

1st var. When young it is dull green; the feelers are tawny with brown tips: when full-grown it is dark green with a brassy tinge.

2nd var. The body is of a pale flesh-red colour, thickly covered with white powder: the limbs are white, with the exception of the base of the feelers and of the thighs which are yellow.

The viviparous winged female. This form acquires wings soon after the middle of May: it is then black and hairy: the fore-border and the hind-border of the fore-chest and the abdomen are dull red: the feelers are dull brown, hairy, filiform, and less than half the length of the body: the mouth is pale red with a black tip, and reaches the hind-hips: the nectaries are black, and about one-twentieth of the length of the body; the base of each is encircled with a large black spot: the legs are black; the base of the thighs is dull yellow: the wings are colourless, and longer than the body; the wing-ribs are yellowish brown; the rib-veins and the brands are dark brown; the other veins are pale yellow; the rib-vein widens into the brand before half the length of the wing; the brand is long and linear, its tip is very obtuse, and the hind-border there forms almost a right angle; the fourth vein is long and straight; the third vein is very slender; it is forked a little before one-third and again before two-thirds of its length; the angles formed by these forks are very acute; the tip of the upper branch of the second fork is very near the tip of the fourth vein; the first and the second veins are almost straight; they are near each other at the base, but very far apart at the tips.

Length of the body $1\frac{1}{2}$ line; of the wings 4 lines.

41. *Aphis submacula,* n. s.

The viviparous winged female. The body and the limbs are black and hairy: the feelers are filiform, and rather more than half the length of the body; the fourth joint is much less than half the length of the third; the fifth is much longer than the fourth; the sixth is a little shorter than the fifth; the seventh is extremely short; the front is convex: the nectaries hardly rise above the surface of the abdomen : the legs are long and stout ; the base of the fore-thighs is brown ; the shanks and the first joints of the feelers are very slightly curved : the wings are brown, and of moderate size ; the rib-vein is black, and gradually widens into the brand which is long and nearly spindle-shaped, but rather broader at its tip than where it begins ; the hind-border near the tip is curved, and does not form an angle ; the branch-veins are tawny ; the fourth vein is curved and clouded at its base but afterwards straight ; the third is obsolete at its source, and forked just before one-third and again a little after two-thirds of its length ; the forks are more diverging from each other than in most species of this group ; the first and the second veins are nearly straight, and approach each other at their origin, but are far apart at their tips ; in each upper wing there is a large brown spot proceeding from the beginning of the brand into the disc of the wing, and ending at the first fork of the third vein.

Length of the body $1\frac{1}{2}$ line ; of the wings 4 lines.

Found in the Isle of Portland by Mr. Dale.

42. *Aphis saligna.*

Aphis saligna, Sulzer, Ins. t. 11. f. 6 ; Gmel. ed. Syst. Nat. i. 2209.

Aphis salicina ?, Zett. Ins. Lapp. i. 311. 6.

Aphis viminalis, Fonscol. Ann. Soc. Ent. Fr. x. 184. 27.

The viviparous wingless female. The body is large, oval, convex, and of a velvet-like bronze-brown colour : the head and the chest are shaded with black : the head is of moderate size : the abdomen above has two rows of black velvet-like spots on each side, and between them there are two rows of smaller black spots along the back ; these last rows are confluent on the segments towards the chest, and form a continuous transverse band : the body beneath is dull pale brown with a row of black dots on the sides of the abdominal segments : the feelers are black, filiform, hairy, yellow towards the base, and less than half the length of the body ; the fourth joint is much less than half the length of the third ; the fifth is a little longer than the fourth ; the sixth is a little shorter than the fifth ; the seventh is extremely short : the front is convex : the eyes are black and not prominent : the front is convex : the mouth is black, pale dull green towards the base, and it reaches the hind-hips : the nectaries are large, prominent, and velvet-black ; between them and a little in advance there is a large spot of the same size and colour : the legs are black, long, stout and hairy ; the thighs except the tips and the shanks towards the base are bright reddish yellow ; the shanks are straight ; the second joints of the feet are slightly curved. When very young it is linear, dull brown, and rather flat : the feelers are dull brown, yellowish white towards the base: the mouth is pale yellow with a black tip, and full as long as the body: the nectaries are black, the thighs, except the tips, and the shanks near the base, are pale yellow: sometimes the legs are yellow with the exception of the knees and of the feet.

The viviparous winged female. In colour it resembles the wingless insect, but the feelers are quite black: the wings are colourless and very long, their length much exceeding that of the body; the wing-ribs are dark red; the veins and the wing-brands are dark brown; the wing-vein begins to widen into the brand at about half the length of the wing; the brand is long and linear, the angle at its tip is very obtuse, and its termination is much more gradual than that of most other species of this group; the fourth vein is very slightly curved; the third vein is almost obsolete at its source, and is forked a little after one-third and again a little before two-thirds of its length, so that the two forks are near together; the first and the second veins are nearly straight, and, as is usual in this group, they are much nearer each other at the base than at the tips.

Length of the body $2\frac{1}{2}$–3 lines; of the wings 7 lines.

This species frequents willow-trees in the autumn. Mr. Wing observed it in great abundance on the shoots from the middle of September to the end of October in 1846; and he remarked that its honey-dew is very attractive to moths, among which *Nonagria crassicornis*, which very seldom touches sugar, was plentiful.

This fact has also been remarked in France, and is mentioned in the 'Annales de la Société Entomologique,' vol. vi.

43. *Aphis Roboris*, Linn.

Aphis Roboris, Linn. Syst. Nat. ii. 735. 22; Faun. Suec. 993; Fabr. Ent. Syst. iv. 218. 42; Syst. Rhyn. 300. 42; Schrank, Faun. Boic. ii. 1. 113. 1209; Gmel. ed. Syst. Nat. i. 2207; Fonscol. Ann. Soc. Ent. Fr. x. 183. 26.

Aphis longipes, Leon Dufour, Rech. sur les Hemipt., Mém. de l'Inst. iv. 243. t. 9. f. 116, 117.

Cinara Roboris, Curtis, Brit. Ent. xii. 576.

Lachnus Roboris, Kalt. Mon. Pflan. i. 148. 2.

Dryaphis, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 481.

The viviparous wingless female. This appears on the twigs and young branches of the oak in the beginning of July. When very young it is dull green or pale red, linear, narrow, and shining: the feelers are much less than half the length of the body; their tips are darker: the mouth is a little longer than the body; its tip and the eyes are black: the knees, the feet, and the tips of the shanks are also black. When half-grown the body is dark brown, flat, and rather narrow, and has a broad red band across it: the feelers are dull yellow, filiform, and about half the length of the body: the eyes are rather prominent: the mouth is pale yellow with a black tip and as long as the body: the legs are black; the thighs and the shanks are yellow towards the base. When full-grown it is oval, smooth, hairy, very glossy, and of a dark brown or metallic purple tint: the head is dark red, and has two impressions between the eyes: the feelers are black, hairy, yellow towards the base, and also at the base of each joint; the fourth joint is less than half the length of the third; the fifth is a little shorter than the fourth; the sixth is hardly half the length of the fifth; the seventh is extremely short: the front is convex: the sides of the fore-chest are slightly undulated: there is a rim round the under side of the abdomen: the mouth reaches the hind-hips: the nectaries are like tubercles, and hardly rise above the surface of the abdomen: the legs are long, slender, black, and hairy; the base of the thighs is yellow, and there is a broad yellow band around each shank; the pale colour as usual prevails most in the fore-legs and least in the hind-legs, which are very long, and their shanks are much curved.

The viviparous winged female. This differs as usual in structure from the wingless insect, but much resembles it in shape and colour: the fifth joint of the feelers is as long as the fourth: the wings are rather short and narrow, and of a dark brown colour with three colourless bands; the second band descends from the rib-vein to the hind-border of the wing; the third winds round the tip of the brand; the wing-rib is broad, and at half the length of the wing it dilates into a wide brand which is nearly linear, and is rounded away at the tip, not forming an angle; the fourth vein is rather long, and is much curved at its base which springs from the rib-vein just before the curve of the latter begins; it is clouded on each side of the base, and there divides the colourless band on the wing; the third vein is obsolete at its base; it is forked a little before one-third, and forked again a little before two-thirds of its length; the second vein is slightly curved; the first is undulated and strongly marked; these two veins are near each other where they leave the rib-vein, but far apart at their tips.

The oviparous wingless female. This is larger than the viviparous female, and the fifth joint of the feelers is longer than the fourth.

Length of the body 2–2½ lines; of the wings 5 lines.

This species is the prey of a parasitic Hymenopterous insect; it is most abundant in the autumn, and feeds then in large clusters on the shoots of the oak; it seems to prefer the branches that grow from the old stumps of that tree, and is attended by *Formica fuliginosa* and by *F. rufa*, especially by the latter species. The wings when just unfolded are of a milk-white colour, and rather opake: the young ones are sometimes near thirty in number, and like the mother Aphis are covered with a glutinous matter, which by the application of Canada balsam assumes a fine rich red hue: the insects infested by parasitic grubs do not so much abound with this coloured matter, but contain a white fluid, which also occurs, but in a smaller quantity, in those that are free from the internal devourers: these grubs are 1 line or more in length, white, slightly curved, and being inclosed in Canada balsam and thereby rendered transparent, they appear to be filled with the brown oak sap received through the medium of their prey.

44. *Aphis agilis.*

Lachnus agilis, Kalt. Mon. Pflan. i. 161. 11.

The viviparous wingless female. The body is spindle-shaped, grass-green, long and narrow, with three rows of black spots along the back: the front, the feelers, and the shanks are bristly: the front of the head is slightly notched: the feelers are filiform, pale green with brown tips, and much less than half the length of the body; the fourth joint is rather more than half the length of the third; the fifth is as long as the fourth; the sixth is very much shorter than the fifth; the seventh is extremely short, and almost obsolete: the eyes are dark brown: the mouth is pale green with a brown tip, and reaches to the hind-hips: the sides of the fore-chest are straight: the nectaries do not rise above the surface of the body: the legs are dull green, stout, long and bristly; the hind-legs are very much longer than the fore-legs; the knees and the feet are brown; the joints of the feet are unusually long, and the second joint is curved; the hind-shanks are very bristly. It runs very fast.

1st variety. The body linear.

2nd variety. The feelers only one-third of the length of the body.

3rd variety. The fore-part of the body is tinged with yellow, and there are four rows of black dots along the abdomen: the feelers are about half the length of the body.

The viviparous winged female. This insect acquires wings in the beginning of June: it is green, slightly covered with white powder, and in shape resembles the wingless female: the disc of the chest and that of the breast are pale reddish brown: the feelers are brown, pale yellow at the base, and a little more or less than half the length of the body: the eyes are dark brown: the mouth is pale yellow; its tip is brown: the legs are long and pale yellow; the knees, the feet, and the tips of the shanks are brown: the wings are transparent, narrow, and a little longer than the body; the wing-ribs are pale green; the wing-brands and the veins are pale brown; the rib-vein widens into the brand just after the middle of the fore-border of the wing; this brand is long and linear, thinned away at either end, terminating rather abruptly at the tip, and forming a very obtuse angle on the hind-border whence springs the fourth vein; the first and second branch-veins are indistinct and near together at the base, but widely apart at their tips; the latter is slightly waved; the third is obsolete till its fork which it sends forth at one-third of its length, and it has no second fork; the fourth vein is nearly straight.

Length of the body 1–1½ line; of the wings 3 lines.

1st var. The feelers are dull green; the tips of the joints are brown: the eyes are black: the mouth is pale green with a brown tip: the legs are pale green with dark brown tips: the wing-brands are pale green. While the pupa is young, its colour is yellowish green with a green abdomen; when it grows older it has four rows of black spots along the abdomen, and its rudimentary wings are pale yellow.

This species feeds on *Pinus sylvestris*, the Scotch pine, from the spring to the autumn.

The species of this group differ much from each other in shape, and as I have not yet noticed all the forms in which they appear, I shall probably mention them again in a future part of these descriptions. Some of the species are solitary, others herd together; *Aphis saligna, Pinicola, Laricis,* and *Roboris,* occur in thick clusters during the autumn, and the three last species are then attended by large swarms of *Scatopse picea,* among which *S. flavicollis* is sometimes found: these flies feed on the honey-dew, an appropriate occasion for their pairing which accordingly occurs at this time of the year.

[To be continued.]

XI.—*On the Insects of Jamaica.* By Philip Henry Gosse.

[Continued from vol. i. p. 352.]

106. *Clytus angulatus.* Taken at Savanna le mer, early in June.

107. *Eriphus terminalis.* Common on the Hampstead Road in June.

108. *Eriphus* (?) *humeralis.* Very numerous in the same locality and season as the preceding.

109. *Ptychodes trilineatus.* Some half-dozen specimens of this handsome beetle were procured on the Hampstead Road and in the Cotta Wood at Content during the last week in June.

110. *Tetraopes* (sp. nov.). Not uncommon on bushes beside the Hampstead Road in May and June.

111, 112. *Tetraopes.* Two other species.

113. *Odontata* (sp. near *bicolor*).

114. *Anoplitis sanguinicollis*? Two specimens taken on Bluefields Mountain in March. I met with it also near Alligator Pond in December.

115. *Imatidium* (sp. nov.). This little *Cassida,* exquisitely beautiful when alive, from the peculiar softness and richness of its purple hue, was rather numerous in the Cotta Wood, and the lower part of the Hampstead Road, near Content, in June. It occurred on the leaves of small trees, a little within the woods rather than at their edges, usually about eight or ten feet from the ground. I think we took one or two individuals also on Bluefields Mountain.

116. *Coptocycla guttata*?

117. *Coptocycla* (sp. near *gemmea*). Both of these small species were sufficiently common on the Hampstead Road and in the Cotta Wood in June. The brilliant iridescent hues that play over the glassy surfaces of these beetles during life vanish after death; but I have been told (though I have not been able to realize this by experiment) that these fleeting colours may be temporarily restored by plunging the dried specimens into hot water.

118. *Œdionychis æquinoctialis*? Taken at Bluefields about the end of December.

119. *Cerotoma* (sp. nov.).

120. *Galeruca Domingensis.* This little blue beetle occurred almost exclusively at the spot where the road called the Short Cut crosses the Paradise river, between Bluefields and Savanna le mar. Here however in March and April it was very numerous, hundreds thronging the air in flight a few yards above the earth, on the western bank, which is covered with a soft thymy herbage. The pretty little *Melitæa,* which Mr. Doubleday has named *M. Proclea,* was also very abundant in the same very limited spot at the same season.

121, 122. *Galeruca.* Two other species.

123. *Orchestris* (sp. nov.).

124. *Colaspis* (sp. near *viridipennis*). This pretty little beetle was very abundant upon the Hampstead Road in June. It principally occurred on the broad spinous leaves of a large herbaceous species of *Solanum,* common in spots which had been once reclaimed from the forest, but had been allowed to run to waste. Scores of these little green insects were seen on these plants, many of them *in copula.* When alarmed, they are apt to draw in their feet and drop to the ground.

125, 126. *Colaspis.* Two other species, both from the Hampstead Road.

127 to 137. *Cryptocephalus.* Ten species. All from the last-named locality.

138 to 140. *Coccinella.* Three species, all small; principally from Bluefields and the vicinity.

141. *Brachiacantha* (sp. nov.?).

142. *Exoplectra* (sp. nov.). Taken at Alligator Pond about the middle of December.

Passing by, at least for the present, the other Orders, I proceed to the Lepidoptera.

Lepidoptera.

1. *Papilio Marcellinus* (Doub.), *P. Protesilaus* (Drury). This butterfly occurred from the middle of April onward, through the summer. It was nowhere common, but Sabito Bottom was the chief locality where I observed it. Here we might sometimes see half-a-dozen in the course of a morning, unless the same individual would appear over again, flying rather low, with an irregular dancing motion, along the shrubs and small trees at the edges of woods. It is sufficiently rapid to be caught with difficulty, particularly when alarmed, and hence pursuit is rarely successful. I once caught a dragonfly (*Libellula*) with one of these butterflies in its mouth, which it had just captured; and both specimens are in my possession.

2. *Papilio Thersites.* This was always a rare insect. Now and then I caught a momentary glance of its broad yellow-disked wings, as it dashed along over the tops of the trees, particularly at Sabito; but I never captured it myself. In June several specimens were taken for me at Content. They flew high, about the summits of some trees by the road-side, in company with *P. Cresphontes,* so as to induce the suspicion in my friend that these were the sexes of one species.

3. *Papilio Cresphontes.* At all seasons this butterfly occurs in the lowlands, but sparingly. In the months of May and June it is somewhat less scarce than at other times. It is a lofty and a rapid flier, sailing along with little fanning motion of its wings, yet with much power and fleetness. It does not course along the edges of woods and road-sides, but now and then darts suddenly out of the forest or densely-wooded morass, and, appearing but a moment, dashes again among the trees, or soars away above their summits. In June, several at a time were frequently to be seen playing about the trees just above Content, often coming down to suck with quivering wings at the yellow blossoms of a patch

of *Cassia* that occupies a corner of the road. Here they were easily caught.

4. *Papilio Acamas.* On three occasions only did a specimen of this fine insect come into my hands, one of which was much weather-beaten; the others were in good condition. All were taken at Sabito. It flies high, alighting occasionally on projecting twigs, twenty or thirty feet above the ground.

5. *Papilio Pelaus.* This species is not uncommon, from April to September, and is widely spread, being found in most localities that I have examined, except the wooded summit of Bluefields Peak. Its ordinary flight is low, irregular, and not very rapid; it dances along from bush to bush, and from flower to flower, rifling them as it goes; but, if pursued, its power of wing is sufficient to carry it quickly out of reach. Yet, from its low haunt and its fondness for flowers, it is not a difficult butterfly to capture with the net. *Pelaus,* when sucking a flower, resting on a leaf, vibrates strongly its half-erected wings in a peculiar way, so as to be recognised almost as far as it can be seen.

6. *Papilio Polydamas.* Rather common at certain times and places. In May, on the road cut through the tall forest, between Shrewsbury and Content, I observed it somewhat numerous, flitting slowly over the low herbage, frequently alighting and allowing itself to be approached, so as even to be captured with the fingers. About the middle of June it was no less numerous at Belmont, manifesting the same predilection for the rank herbage of the road-sides. The species occurred not unfrequently also at Sabito, and along the road leading to Savanna le mer, and was confined to no particular season.

7. *Pieris Monuste.* Common in most situations, especially during the earlier months of the year.

8. *Pieris,* sp. nov. near *Josephina* (no. 114 of Doub. and Hewits. Diurn. Lep.). This rather large species was sufficiently common in the lowlands during the winter and spring. I met with it on the heavy sand of Alligator Pond in December, and afterwards somewhat numerously at Sabito and at the Hampstead Road.

9. *Pieris Margarita.* I did not meet with this till the latter part of March, when we obtained several specimens from Bluefields Mountain. It also occurred at Sabito and other lowland localities. Sabito in March and April, and the Hampstead Road in June are the great resorts of the *Pieridæ*: they commonly fly low, coursing along the bushes and herbage by the sides of roads, but frequently mount to the summits of the lower trees, and play around them, when in profuse blossom, frequently alighting in considerable numbers to suck. I have observed this habit much more on the mountains than in the lowlands.

10. *Callidryas Eubule.* Abundant at all times and in most situations, particularly in open pastures and ruinates.

11. *Callidryas Neleis.* This handsome species I did not meet with in 1845 till near the end of June, when it occurred on the Hampstead Road; a few specimens I took afterwards in the same locality, but it continued very scarce until the following April; about the middle of which month it suddenly became very abundant between Sabito Bottom and Cave, being for some weeks the most common species of butterfly to be seen. Its habits are much the same as those of the larger *Pieridæ* generally; flitting along the low bushes that fringe the road-sides with an unsteady but somewhat rapid flight, frequently alighting on flowers, and now and then retracing its course. In June it was similarly abundant on the Hampstead Road and around Content; and on my arrival at Kingston in July, on my way to England, this was found to be the most numerous species in that locality. It would be interesting to know if these alternations of abundance and scarcity are periodical.

12. *Gonepteryx Lyside.* Very rare: a single specimen or two occurred in December and January in the vicinity of Bluefields.

13. *Terias Elathea.*

14. *Terias Euterpe.*

15. *Terias Dina.*

16. *Terias Hyona.*

17. *Terias* (sp. nov.). These five species of *Terias* are common at most periods of the year: in spring they accompany the *Pierides* and *Callidryas Neleis* in their dancing flight along the road-side bushes; more particularly *Dina* and *Hyona.* I may remark of all these, as well as of the genera just named, that in a road they do not hover about or play backward and forward as some butterflies do, but pursue the course of the road, one way or the other, and that, notwithstanding the occasional interruptions of alighting, with pretty constant regularity, mostly keeping to that side of the road on which each may happen to be. I think I have remarked that most go the same way, though without any association. Occasionally one may be observed to return upon its course; but in such case it commonly pursues the new direction with the same regularity until out of sight.

But the more proper and peculiar resorts of the *Teriades* are large open plains, old pastures and guinea-grass pieces, especially the former two, which are generally overrun with herbaceous weeds, as the *Asclepiadeæ,* various species of *Cassia* and *Papilionaceæ.* The smaller kinds in particular are very abundant in such situations, as *Elathea* and *Euterpe,* and the delicate little white one with narrowly black-edged wings, which appears undescribed. Here they flit to and fro without any regularity, a few inches above the ground or herbage, alighting every instant.

The habit which the yellow *Pieridæ* have of resorting in numbers to the margin of water is common to the Jamaican species as well as their fellows in other parts of the world. During the rainy season, when the afternoon showers fill the hollows of the highways with broad but shallow pools, which the intense morning sun either wholly or in part dries up, one may see towards the middle of the day, each little patch of slushy mud surrounded by a yellow fringe, composed of a multitude, truly surprising, of these butterflies, large and small, chiefly *Callidryas* and *Terias,* which sit on the very edge of the water, side by side, their wings erect and closed, and their long suckers protruded and busily extracting the moisture. For the most part a considerable number on the wing are hovering about the spot, some alighting and some rising every moment. If compelled to take to flight, which they do very reluctantly, the multitude of yellow wings that in a moment throng the surrounding air is quite astonishing, and forms a very pleasing sight.

18. *Danais Berenice* var.? Very common in company with the *Teriades* just mentioned, over large open pastures, such as that of Robin's River in particular; where in the month of March great numbers may be seen either resting on the blossoms of the common Red-head (*Asclepias curassavica*) and other *Asclepiadeæ,* or heavily flying to and fro in pairs, united in sexual *copula.* It has not the lofty and powerful flight of *D. Archippus,* but hovers over the low pasture-herbage, with so little power of wing, that it is caught without the slightest trouble, and may be very readily taken with the fingers.

19. *Danais Cleothera.* This handsomely-marked species occurred at intervals throughout the year, but cannot be considered other than rare. It affects road-sides and openings in the woods rather than pastures, and mountain-sides of moderate elevation rather than the lowlands; in both of which particulars it differs from *D. Berenice.*

20. *Danais Archippus.* This I found still more rare than the preceding; a very few specimens only were seen by me, and those, though at widely separated intervals of time, only (if I remember rightly) in one locality; that part of the road to Savanna le mer which runs through Paradise morass, very near the dwelling-house of the estate. It flew low, about the logwood hedges; but there are no trees near, or it would probably have towered above them.

[To be continued.]

XII.—*On some new Fossil Fish of the Carboniferous Period.* By Frederick M'Coy, M.G.S. & N.H.S.D. &c.

[Continued from p. 10.]

Placoides.

(*Ichthyodorulites.*)

Homacanthus macrodus (M'Coy).

Sp. Char. Spine about 8 lines long and 2 lines wide at base, slightly arched and tapering to a point; section compressed, trigonal; anterior face formed by a narrow rounded keel, posterior concave face bounded on each side by a larger rounded ridge, between which and the anterior keel there is on each side a still smaller rounded longitudinal ridge, the two posterior ridges on each side dichotomise near their base; of the two intervening spaces the anterior is rather wider and the posterior rather narrower than the ridges which they separate, they are concave and very slightly striated longitudinally; posterior face with twelve or fourteen very large, compressed, falcate teeth, alternating in two rows, the alternating bases touching, keeled on their convex edge, their length nearly equalling the width of the side of the ray at their base.

The small size, few ridges and great posterior teeth easily distinguish this from other rays of the carboniferous period, while the two latter characters equally distinguish it from the *H. arcuatus* (Ag.) of the old red sandstone. This genus has not been noted before in the carboniferous series.

Rare in the carboniferous limestone of Armagh.

(*Col.* University of Cambridge.)

Homacanthus microdus (M'Coy).

Sp. Char. Spine about $1\frac{1}{4}$ inch long and 2 lines wide at base; very slightly arched, gradually tapering; section ovate; anterior face formed of a narrow rounded keel, each side with two slightly flattened nearly equal keels, the posterior one dichotomous at its base; they are their own width apart, the intervening spaces being flat and marked with about three longitudinal striæ; posterior face with two rows of numerous, conical hooked teeth, their length scarcely one-fifth the width of the ray at their base.

The more slender form, flattened ribs and interspaces, and numerous small conical teeth distinguish this from the last, with which alone it is likely to be confounded.

From the same locality and in the same collection as the last.

Ctenacanthus denticulatus (M'Coy).

Sp. Char. Spine nearly straight, slightly curved towards the apex; length of naked portion $5\frac{1}{2}$ inches, length of the rapidly tapering base 2 inches, width near base 9 lines; section truncato-elliptical, sides slightly convex, front narrow, rounded; posterior face wide, depressed, concave at both sides, with an obtuse ridge in the middle, the lateral angles closely set with a row of numerous small, conical, downward-curved teeth on each, their own length apart; longitudinal ridges rounded, less than their own diameter apart (about four in two lines in the middle of the ray), they are a little wider at base than towards the apex, increasing in number downwards by dichotomy; the sides of each ridge are denticulated with sharp, recurved teeth extending halfway across the intervening spaces, the denticle of one side connected with its fellow on the other by a slightly oblique fold across the ridge, each pair being separated from that above and below by about the thickness of the ridge; near the posterior margin on each side are four or five ridges much smaller than the rest, crossed by oblique blunt tubercles.

This species slightly resembles the *C. crenatus* (Ag.) in its ornament, but instead of the short, close notches in the sides of the ridges of that species, this is distinguished by the more distant, tooth-like denticulation and narrow transverse plicæ.

Not uncommon in the dark shale (of the age of the yellow sandstone) of Monaduff, Drumlish, in the N. of Ireland.

(*Col.* University of Cambridge and Mr. Griffith.)

Ctenacanthus distans (M'Coy).

Sp. Char. Spine compressed, gently arched, very long, slender, tapering at the rate of only 3 lines in 5 inches; posterior face with two rows of numerous small, short, conical compressed teeth, slightly bent downwards, rather more than the width of their base apart; sides flattened with about ten or twelve close flattened longitudinal ridges of irregular width, the broadest occasionally subdividing as they approach the base, all the ridges crenulated by small tubercles, about double the thickness of the ridge from each other; those on the anterior ridges are transverse and slightly oblique, while those nearer the concave margin are smaller, and assume the appearance of lengthened, nodular swellings, as in *Physonemus*.

This is a remarkably long and slender ray; one specimen in the University collection at Cambridge, of which a considerable portion of the apex must be lost, measures six inches in length and only six lines in width at the broadest part near the base, the broken distal extremity being three lines wide, which would probably indicate a further inch and half of length. The portion of the base inserted in the flesh is small and gradually tapering. I am not certain of the exact form of the section.

Not uncommon in the red limestone of Armagh.

(*Col.* University of Cambridge and Capt. Jones, &c.)

Gyracanthus obliquus (M'Coy).

Sp. Char. Dorsal ray nearly straight, about one foot long and one and a quarter inch wide at base; section heart-shaped, width two-thirds of the antero-posterior diameter; anterior face narrow, rounded; posterior face broad, concave, having near the apex a row of small hooked teeth on each side; sides slightly convex, marked with numerous very oblique crenulated ridges or rows of tubercles, which meet the anterior face at an angle of about 35° (those of opposite sides meeting at an angle of 70°); the ridges become gradually more oblique, smooth, and entire near the apex, they are about half a line in width, and slightly more than their own diameter apart. The line of separation between the ridged external surface and the finely striated part which enters the flesh is very oblique and with a slight sigmoidal curve.

This large ray is most allied to the *G. tuberculatus* (Ag.), from which it is distinguished by the much greater obliquity of the sculptured ridges, and the more compressed form of the section; the *G. Alnvicensis* (Ag.) has ridges nearly as oblique as the present species, but they are smooth and entire instead of being strongly crenato-tuberculate.

Very common in the dark shale (at the base of the carboniferous system), supposed to be of the age of the yellow sandstone, in the valley of the Moyola, at Moyheeland, Draperstown, in the N. of Ireland.

(*Col.* Cambridge University and Mr. Griffith at Dublin.)

Physonemus arcuatus (M'Coy).

Sp. Char. Ray wide, much curved; longitudinal rounded ridges very numerous, about fifteen in the space of half an inch, less than their own diameter apart, dilated into rounded, smooth, bubble-like tubercles, which are nearly twice their diameter apart; the narrow sulci between the ridges have two or three obscure longitudinal striæ.

Distinguished from the *Physonemus subteres* (Ag.) by its much greater size, more numerous ridges and wide arcuate form.

Very rare: from the carboniferous limestone of Armagh.

(*Col.* Cambridge University.)

Asteroptychius semiornatus (M'Coy).

Sp. Char. Ray slightly arched, about 3 lines wide, and tapering at the rate of about 1 line in 1 inch; section much compressed, the sides being flattened, and the thickness about one-third the width; about eight narrow, longitudinal smooth ridges on each side, separated by flat spaces nearly twice the width of the ridges; all the spaces are marked with two or three obsolete longitudinal striæ, but only the anterior one on each side contains a row of irregularly placed tubercles.

This is more compressed and arched than the *A. ornatus* (Ag.), and differs besides in having but one row of tubercles on each side, while that species has a row in nearly every space.

Not uncommon in the Armagh limestone.

(*Col.* Cambridge University, &c.)

Erismacanthus (M'Coy), n. g.

(Etym. *ἔρεισμα, a prop or stay,* and *ἄκανθα, a spine.*)

Gen. Char. Spine of three divaricating portions,—1st, a large, compressed, finely striated base which entered the flesh; 2nd, a short, strongly compressed, rapidly tapering spine curved directly backwards, the sides marked with strong, smooth, longitudinal ridges, and having two rows of short downward-curved teeth on the posterior concave margin; 3rd, a peculiar prop-like portion extending directly forwards nearly at right angles with the base, gently arched downwards, compressed at the basal half, depressed at the distal half, closely covered with blunt, smooth, oval tubercles, and with some large, irregular spines on the under side; the portion of the base above the flesh and from which those two portions branch, is irregularly tuberculated.

The long anterior prop or stay-like branch renders this ichthyodorulite so unlike any described form, that I should have hesitated to describe it, but for the number of examples which I have recently examined. Something slightly analogous I observe in the articulation of the spines of the recent fish allied to *Synodontus,* in which a shorter but similarly curved and directed prop-like process may be observed, but which is concealed beneath the soft parts and not external as in the fossil. I know but one species of the genus, which I have great pleasure in dedicating to Capt. Jones, R.N., M.P. &c., who is in possession of more extensive and exact knowledge of the fossil fishes of the mountain limestone than I believe any other observer. It is to his acumen in recognising the true characters of the species, zeal in collecting, and liberality with which both his cabinet and information are made available to those studying the subject, that we are mainly indebted for the extended lists which have been published of the Ichthyolites of this formation.

Erismacanthus Jonesii (M'Coy).

Sp. Char. Posterior spine little more than twice as long as wide slightly curved, compressed, sides flattened, with about eight or nine longitudinal ridges, which are smooth and less than their own diameter apart; the intervening spaces finely striated longitudinally; posterior concave face with two regular, close rows of small pointed teeth directed very obliquely downwards; the surface towards the base is marked with small, scattered, oval, smooth tubercles; anterior branch three times as long, and about the same size at its origin as the posterior spine; the part of the spine from which those two portions take their common origin is equal to the width of their united bases, and covered with scattered round tubercles; the height of the anterior branch is double its width at the basal half, but it becomes depressed, so that its width is double the height in the section of the distal half; it is covered above and on the sides with close quincuncially arranged, smooth, oval tubercles; the compressed, finely striated base which enters the flesh seems abruptly truncated below. Length of posterior spine 1 inch, width at base 6 lines; length of anterior process (imperfect at extremity) 2 inches 9 lines, depth at base 4 lines, at tip 1 line; width at base 2 lines, at tip 3 lines; length of the common base $1\frac{1}{2}$ inch, width 9 lines.

Not very uncommon in the carboniferous limestone of Armagh. (*Col.* University of Cambridge and Capt. Jones.)

Cosmacanthus carbonarius (M'Coy).

Sp. Char. Spine nearly straight, semicylindrical; section semilunate; sides and anterior face broadly rounded in one continuous curve; posterior sulcus very wide, rounded; about eight longitudinal rows of small oval tubercles on each side, the tubercles nearly touching in each row, and the rows less than their diameter apart; no posterior teeth, the posterior sulcus being bounded by the last lateral row of tubercles on each side. A fragment 1 inch 8 lines long and $2\frac{1}{2}$ lines wide at the narrow end, increases at the rate of nearly 2 lines in an inch.

This differs from the Devonian *C. Malcolmsoni* (Ag.) in its greater size and much more numerous rows of tubercles. Two imperfect specimens from the limestone of Armagh are in the collection of Capt. Jones at Dublin.

Platycanthus (M'Coy), n. g.

Gen. Char. Ray triangular, very wide, the length of the base nearly equalling the height of the spine, arched backwards, much compressed; sides flat; anterior face flat, the thickest part of the ray; surface pustulated; two rows of sharp conical teeth on the posterior face.

In their great compression and pustulated surface the rays of this genus resemble the Oracanths, but they differ from them by their small size, arched form, and distinct posterior rows of teeth, which latter character also distinguishes them from the Byssacanths of the old red sandstone, as well as the absence of ridges on the surface. I only know the genus in the mountain limestone.

Platycanthus isosceles (M'Coy).

Sp. Char. Length of the base and height of the spine each about 1 inch; anterior face 1 line wide in the middle and slightly convex; surface covered with numerous smooth, oval or rounded tubercles subquincuncially arranged, largest towards the anterior face, about twice their diameter apart; intervening surface marked with minute, longitudinal rough sulci; posterior teeth conical, smooth at the apex, longitudinally plicated at the base.

Rare in the carboniferous limestone of Armagh.
(*Col.* Capt. Jones, R.N., M.P.)

Nemacanthus priscus (M'Coy).

Sp. Char. Ray much elongated, slightly arched, compressed towards the anterior face, which forms a prominent rounded ridge or keel; sides with numerous unequal, irregularly placed, oval, blunt tubercles, between which the surface is marked with longitudinal rows of minute impressed puncta, and a few irregular impressed flexuous striæ; base attenuated and finely striated.

This spine agrees with the Triassic Nemacanths in having the sides flattened and inclined towards the anterior face, on which is a central rounded ridge or keel. The only specimen I have seen is imperfect, measuring $3\frac{1}{2}$ inches in length; the broken distal extremity is 4 lines in antero-posterior diameter and 2 lines wide.

From the red limestone of Armagh.
(*Col.* of Capt. Jones.)

Dipriacanthus (M'Coy), n. g.

(Etym. *δὶς*, *bis*, *πρίων*, *serra*, and *ἄκανθα*, *aculeus*.)

Gen. Char. Spine small, arched, tapering, much compressed, minutely and irregularly tuberculated; two rows of small conical teeth on the posterior margin, and two rows of larger adpressed teeth on the anterior face directed upwards.

The spines for which I propose this name are easily recognised by their small size, curved form, and having the anterior, as well as the posterior, margin armed with rows of teeth. These characters, while they separate them widely from the other fossil spines, strongly recall to our mind the *Pimelodes* and *Synodonts* of the Nile; in fact the *Synodontus serratus* described by Rüppell* is a perfect prototype, in its spinous defences, of our *Dipriacanthus falcatus,* except that both the anterior and posterior rows of teeth are single on the recent spines. In their compressed section and irregularly tuberculated surface the Dipriacanths resemble the Oracanths, but are distinguished by their arched figure and rows of teeth.

Dipriacanthus falcatus (M'Coy).

Sp. Char. Spine slender, gradually tapering, much hooked, compressed, sides convex; section oval, long diameter twice the length of the short diameter; surface with very minute irregular, longitudinal striæ, and few distant, irregularly scattered, small tubercles; teeth of the posterior margin short, conical, at right angles to the spine; teeth of the anterior margin slender, pointed, adpressed close to the spines with their points upwards. Length of specimen imperfect, at base 1 inch 2 lines, greatest width 2 lines.

The specimen described is from the carboniferous limestone of Armagh.

(*Col.* Capt. Jones, R.N.)

Dipriacanthus Stokesii (M'Coy).

Sp. Char. Slightly arched, much compressed, sides flat, anterior and posterior margins narrow, obtusely rounded; section oblong, the long diameter being from four to five times longer than the short; teeth of the posterior margin slender, conical, projecting at right angles to the spine; teeth of the anterior margin large, thick, smooth, the upper sharp edge widest, closely adpressed to the surface; surface closely covered with small, irregular, smooth granules, which under a strong lens are found to be radiatingly striated at their base, and with the intervening narrow spaces very minutely granulated.

When highly magnified the granulation of this spine resembles on a small scale the star-like style of ornament of the bony plates

* Beschreibung und Abbildung mehrere neuer Fische, im Nil entdeckt, Frankfort a. M. 1829, pl. 2. fig. 1.

of *Asterolepis* (Eich.). The base is imperfect but apparently dilated in a remarkable degree, and in its present state the lower portion seems bent at a considerable angle from the curve of the rest of the spine.

Collected from the carboniferous limestone of Armagh by the Rev. W. Stokes of Caius College, Cambridge, and by him presented to the University collection. I have associated his name with this interesting form as a slight memorial of the zeal with which he has collected those remains, and the liberality with which he has made them available for public instruction.

Leptacanthus junceus (M'Coy).

Sp. Char. Nearly straight, about $1\frac{1}{2}$ line wide; section semielliptical; sides nearly convex, meeting in front to form a sharp anterior edge, and converging behind to a narrow posterior sulcus, bordered on each side by a row of strong, conical, downward-curved teeth, little longer than wide, and about the width of their base apart; each side with about seven longitudinal, narrow, equal, thread-like ridges, twice their diameter apart, and having between each pair two or three obsolete longitudinal striæ.

Rare in the black beds at the the top of the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

(Cestraciontes—*Teeth.*)

Psammodus canaliculatus (M'Coy).

Sp. Char. Tooth oblong, generally about twice as long as wide, the two long sides straight and parallel, one of the short sides or ends very convex, the other equally concave (for articulation); the crown of the tooth concave along the middle, the two long margins being prominent and rounded; there is generally a considerable hump-like elevation near the convex end; surface roughly wrinkled transversely, the ends generally more or less rudely plicated longitudinally.

This remarkable tooth is much allied to the *P. rugosus* (Ag.), but is strongly distinguished by its ends being formed for articulation, one convex and the other concave, instead of being straight as in that species; also by the strong longitudinal plication of the surface near the ends, and the peculiar, curved, swelling near the convex extremity. When the ends are wanting it is distinguished by its mesial concavity (the other being convex), and by the minute rugæ of the surface running across instead of in the direction of the length. When much worn the surface becomes polished and porous as in the *P. porosus* (Ag.), and as we constantly see on the prominent parts of the *P. rugosus* (Ag.). Length generally about 2 inches.

Rare in the Armagh limestone.

(*Col.* of the University of Cambridge and of Capt. Jones, M.P.)

Helodus appendiculatus (M'Coy).

Sp. Char. Transversely trigonal, compressed, width of the base rather more than twice the greatest height of the tooth; crown divided into an obtusely trigonal, straight, central compressed cone, and one very small, accessory similarly-shaped one on each side, sharply defined by a distinct notch; surface smooth, highly polished, porous at the apex and posterior side of the edge of the principal cone; edge of the enamel-like surface at the base obtuse, forming a slightly arched line, concavity downwards: bony root large, simple, coarsely fibrous.

Three teeth *in situ*, one behind the other, present the following characters:—the anterior tooth is the smallest, most compressed, and perfectly erect; principal cone sharp, but its height scarcely exceeding one-third of its width; secondary cone on each side very small, not as deeply separated from the middle as in the others; entire surface highly polished with the exception of the apex, which is slightly punctured. The second tooth is the longest and thickest, slightly inclined backwards; height of the principal cone about half its width; apex obtuse, small accessory cone on each side, pointed and defined by a deep notch from the central one; anterior side flattened, smooth, polished; posterior side tumid, coarsely punctured, the punctures extending over the apex. Third tooth entirely procumbent, the apex of the cone being marginal and in contact with the long, coarsely fibrous, osseous base, which latter is truncate below, is as wide as the tooth, and equals the principal cone in length: the proportions of this tooth are nearly those of the middle one, but having no posterior side; anterior side smooth and polished, apex punctured.

Rare: from the carboniferous limestone of Armagh.

(*Col.* Capt. Jones, R.N.)

Helodus rudis (M'Coy).

Sp. Char. Irregularly oblong, subquadrate; sides steep, irregularly nodulose or undulato-plicate; crown irregularly gibbous, the highest point a little nearer one end than the other; surface polished, coarsely punctured. Length 7 lines, width $4\frac{1}{2}$ lines, height $2\frac{1}{2}$ lines.

The curiously irregular lump-like figure and quadrate base of this species distinguish it easily from its congeners; the steep, striated margin is also peculiar. The puncturing of the surface rather coarser than that of the *H. turgidus* (Ag.). I have seen several specimens from the Armagh limestone.

(*Col.* Cambridge University.)

Chomatodus obliquus (M'Coy).

Sp. Char. Obliquely rhomboidal, transversely elongate; apex marginal, obtusely pointed; middle of the tooth obliquely tumid or convex; attenuated sides flattened or slightly concave; ends obtusely pointed or rounded; surface highly polished and perfectly smooth except at the apex, which is coarsely punctured; basal margin surrounded by a broad imbricating fold of ganoine*, increasing to three or four on the ends of some of the teeth.

This species differs from the *C. cinctus* (Ag.) in its obliquely rhomboidal flattened form and marginal apex, as well as having but one fold of ganoine at the middle of the basal margin. In some examples the ends are equal and the width three times the length, in others the ends are unequal, and the length two-thirds of the width, but in all the apex is marginal and the general form obliquely rhomboidal, the basal margin having a downward curve nearly opposite the apical projection of the anterior margin, and between the two extends the oblique mesial convexity. Length averaging 4 lines.

Rare, in the carboniferous limestone of Armagh.

(*Col.* Cambridge University and Capt. Jones, R.N. &c.)

Chomatodus denticulatus (M'Coy).

Sp. Char. Transversely oval, base about three times wider than long; middle elevated into a compressed, obtusely pointed cone, about equal in height to the short diameter (length) of base, from which a sharp, much compressed mesial ridge extends on each side to either end, its cutting edge being broken into numerous obtuse, compressed denticles decreasing in size towards the ends; the notches which separate the little cones on the edge give rise to obtuse sulci, defining them a short way down the sides; surface smooth; base surrounded with three

* I provisionally use this term (from γάνος, *splendour*) to designate that peculiar, dense, modification of *dentine* which forms the highly polished surface of most fish-teeth, and which is not unfrequently confounded with the true enamel of the teeth of the higher animals; the latter is however secreted by a distinct organ quite external to and independent of the dentine, while the false enamel which I propose to call *ganoine* is merely produced by the calcigerous tubes of the dentine becoming suddenly straighter, closer and more numerous as they approach the surface.

or four imbricating folds of ganoine, irregularly jagged at their edges.

This species is rather smaller, more elevated and more compressed than the *C. cinctus* (Ag.), from which it is further distinguished by the number of minor cones set on the mesial ridge.

Rare, in the red carboniferous limestone of Armagh.

(*Col.* University of Cambridge.)

Petalodus rhombus (M'Coy).

Sp. Char. Crown sharp, compressed; *anterior face* rather more than *three times wider than high, regularly rhombic,* the upper and lower margins almost symmetrical, the lateral portions of each being nearly straight or slightly concave, and meeting in the middle at an obtuse angle; the angles of the upper and lower margins nearly equal, that of the basal margin pointing down, of the cutting edge up; the cutting edge is obscurely undulato-dentate by short obsolete vertical furrows, and minutely crenulato-striated; the lower margin is prominent and surrounded by five or six small imbrications of pseudo-enamel or ganoine, those descend lower (as usual) on the posterior face, where also the mesial angulation is less; surface smooth with a few fine irregular longitudinal striæ; root moderately large. Height of the middle of the crown 6 lines, width about 1 inch 9 lines, depth of root about 7 lines.

This can only be confounded with the *P. acuminatus* (Ag.), from which it is fully distinguished by the great proportional width of the crown and the rhomboidal form of the anterior face produced by the similar shape of the superior and basal margins; the latter being deeply angulated in the middle, resembling the cutting margin reversed in the present species, while the middle half is very obtusely rounded in the former, and then abruptly curved upwards and again downwards further towards the ends; in that species also the cutting edge, although slightly waving, is destitute of the broad longitudinal plicæ of the present form.

Rare, in the carboniferous limestone of Derbyshire.

(*Col.* Cambridge University.)

Polyrhizodus (M'Coy), n. g.

Gen. Char. Tooth thick, crown but slightly elevated, forming a transversely oval crushing surface, narrowing towards the extremities; anterior and posterior ridges separating the crown from the root, obtuse, without imbricating folds, the posterior ridge much lower than the anterior; root very large, deeply divided into several distinct, root-like lobes or fangs.

This is perhaps the most remarkable genus of ichthyolites yet made known, as it presents the only instance in the entire class of a fish-tooth divided into several distinct fangs—the imperfectly double, divaricating, base of certain sharks' teeth, or the prolonged external plicæ of certain sauroids (*Holoptychius, Rhizodus*, &c.) not deserving to be viewed in the light of really divided or fanged roots as in the mammals and the present genus of fish. The group is most allied to *Petalodus* (Owen), with which Agassiz seems to have unaccountably confounded one of the species; but instead of the thin, scale-like or petal-like character of the *Petalodi*, with their highly elevated, compressed, sharp-edged crown, we have here a tooth of remarkably thick and clumsy form, with the crown but little raised and all the parts obtuse; the crown in *Petalodus* is covered with a thick coat of smooth, highly polished enamel-like substance or ganoine, and separated on each side from the root by several imbricating folds, while the crown in the present genus is nearly as dull as the root, and in one species coarsely punctured as in *Psammodus*, and the characteristic basal imbrications are replaced by a simple, obtuse ridge; finally, in *Petalodus*, the root forms a large, simple, compressed truncated base, while in *Polyrhizodus* it is divided into from five to eight fangs.

Polyrhizodus magnus (M'Coy).

Syn. *Petalodus radicans* (Ag. MSS. name in collections).

Sp. Char. Tooth from one-half to two inches wide and about one inch in depth; crown from three to four lines wide, nearly flat, inclined at an angle of about 70° from the slightly raised posterior edge, smooth, or with minute branching striæ on the upper edge; anterior and upper margins nearly parallel for the middle half of the width, while they rapidly converge in the two outer fourths, so that the extremities are narrowed to a point at each end and considerably bent downwards; root very thick and deeply divided into six or eight long, ovate fang-like lobes, roughened by the passage of the nutrient vessels; inferior, posterior ridge is (like the anterior margin of the crown) simply rounded, without imbricating folds, and about one-third more than the width of the crown below the cutting edge.

This fine species is not uncommon in the limestone of Armagh. (*Col.* University of Cambridge, Capt. Jones, Mr. Griffith, &c.)

Polyrhizodus pusillus (M'Coy).

Sp. Char. Crown compressed, raised into a rounded obtuse lobe less than half the width of the base in height; base of the crown forming a very prominent obtusely rounded ridge; root divided into about ten small rounded fangs; surface of the crown coarsely punctured, a few of the punctures near the apex longitudinally confluent so as to give it a slightly pectinated appearance; width of crown $2\frac{1}{2}$ lines.

Easily distinguished by its small size, coarsely punctured surface and the raised lobe of the margin of the crown.

Rare, in the limestone of Armagh, from whence there is one example in the University collection at Cambridge, and another in that of Capt. Jones.

Glossodus (M'Coy), n. g.

Gen. Char. Tooth tongue-shaped, oblong, quadrangular, much higher than wide; crown elevated, slightly recurved, narrowing from the base to a small, subtruncate apex; surface porous, puncta generally seeming confluent towards the apex; punctured surface terminating below in a notch, or arched line, the convexity upwards; root long, as wide as the crown, coarsely fibrous.

The *Glossodi* are distinguished from the *Helodi*, with which alone they have any affinity, by the quadrangular form of the horizontal section of the tooth, the sides being flattened as well as the anterior and posterior faces; also by the great height of the crown in proportion to its width. The long root-like base of the tooth, which resembles that of some *Petalodi* (e. g. *P. psittacinus*, Ag. MSS.), rather than that of *Helodus* in form, is of an open lacunose structure, being permeated by very large flexuous medullary canals producing irregular openings on the surface. The ridge separating the punctured surface from the base forms a sinus directed upwards, which is the reverse of what we find in *Petalodus*, approaching the ordinary sharks, and also conforming to what we see in *Helodus* and *Strophodus* when the separating line in those genera is not straight. As in *Petalodus*, the basal margin of the surface is much nearer the apex on the convex anterior side than on the concave posterior or internal face, the latter being generally about twice the length of the former. The characters above given as distinguishing those teeth from the *Helodi* also separate them from the genuine *Petalodi* of Owen, as also the want of the imbricating folds at the base.

Glossodus lingua-bovis (M'Coy).

Sp. Char. Height of the crown exceeding the width of the base, which is three times the width of the truncated apex; greatest antero-posterior diameter half the width of the base; surface dull, covered with coarse, wide, occasionally confluent puncta, the interstices crossed by minute, flexuous, oblique striæ.

This curious tooth resembles a neat's tongue in miniature;

the oblique striation crossing the ordinary punctuation of Psammodontoid teeth is a character I have not seen in any other tooth. Height of crown 6 lines, width of base 5 lines, depth of root 4 lines.

From the carboniferous limestone of Armagh.

(*Col.* Capt. Jones, R.N.)

Glossodus marginatus (M'Coy).

Sp. Char. Crown about one-third higher than wide, having a slight antero-posterior sigmoïdal curve; thickness, from before backwards, little more than one-fourth of the width; lateral margins subparallel, prominent on the posterior face, which is gently concave in the middle; apex narrowed, rounded, curved backwards; surface glossy, finely punctured, marked towards the tip with minute anastomosing longitudinal wrinkles; a few obtuse plicæ. Length of crown 5 lines, width 3 lines.

Easily distinguished from the *G. marginatus* by its more finely punctured, glossy surface, rounded tip and prominent lateral margins.

One of the rarest fossils of the carboniferous limestone of Armagh.

(*Col.* University of Cambridge; I think I have seen another in that of Capt. Jones at Dublin.)

Climaxodus (M'Coy), n. g.

(Etym. *κλίμαξ, a flight of steps,* and *ὀδοὺς, a tooth.*)

Gen. Char. Tooth longer than wide, gradually narrowing towards the front with nearly straight sides; anterior part of the crown crossed by broad, imbricating, transverse ridges at right angles to its length; surface minutely punctured.

The above generic name has reference to the remarkable step-like character of the ridges which cross the anterior part of the tooth at regular intervals. The broad posterior part of the tooth is without ridges and resembles a *Psammodus*. In the fact of being as it were small, ridged *Psammodi*, those teeth are allied to the genus *Pœcilodus*, but all the true *Pœcilodi* are inequilateral, mussel-shaped teeth, consequently placed in pairs in the mouth, and have the ridges oblique; the *Climaxodi*, on the contrary, are equilateral, and were therefore most probably mesial in position, and the ridging is transverse. I am aware of one species in the Armagh limestone and the following. I think it possible that the so-called *Pœcilodus parallelus* (Ag.) may ultimately be referred to this genus, as it differs from the true *Pœcilodi* in some at least of the above characters.

Climaxodus imbricatus (M'Coy).

The only specimen I have access to at present of this species is imperfect at each end, being 7 lines long, $5\frac{1}{2}$ lines wide at the broad end, and 3 lines wide at the narrow anterior end; the anterior portion of the crown is crossed by 7 transverse imbricating ridges in a space of 4 lines, the posterior ones are three-fourths of a line apart, and have a double curvature arising from a small backward wave in the middle, the anterior ones are closer and pass with a slight forward curve across the tooth; all the imbrications have a backward curve at their extremities, giving them the appearance of lapping round the crown, and all have their free edges directed backwards, so as to resemble a row of *Petalodi* or other shark's teeth soldered together in the position they usually occupy, one behind the other; the posterior half is without ridges, the whole crown is slightly convex at the sides and concave in the middle; the surface is dull and seen by the lens to be finely punctured.

Rare, in the dark impure limestone overlying the main carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Pœcilodus aliformis (M'Coy).

Sp. Char. Wing-shaped or contorto-subtrigonal, narrow before, broad and subtruncate behind; inner, straight margin thin, higher in the middle than at each end, the surface seeming concave from thence to the external oblique margin, which is abruptly deflected, much thickened, rounded, strongly arched downwards at each end, with a slight sigmoidal curve; this ridge is crossed by seven or eight large, obtusely rounded wrinkles, which become obsolete as they approach the thin inner margin; surface finely granuloso-punctate under the lens.

This species most resembles some of the wing-shaped forms of the *P. sublævis* (Ag.), but the whole tooth is more strongly contorted sigmoïdally; the external oblique margin is more thickened, ridge-like and deflected, and above all the great size of the transverse waves or wrinkles easily distinguishes it. The length of a perfect specimen is 1 inch 3 lines, width of the broad posterior end 9 lines, depth of the middle of the external margin 4 lines, width of the transverse wrinkles rather more than $1\frac{1}{2}$ line.

Rare, from the black upper limestone of Derbyshire.

(*Col.* University of Cambridge.)

Pœcilodus foveolatus (M'Coy).

Sp. Char. Longitudinally clavate, depressed, nearly three times longer than wide; anterior end narrow subtruncate; surface obliquely crossed by nine or ten thick, flat, imbricating ridges, varying from one line to half a line wide; they run nearly straight, but each has got an abrupt angular bend about the middle, which makes the posterior half of each edge seem about half a line further out than the anterior half; each imbrication has one, or rarely two rows of large equidistant puncta or small pits.

This differs from the *P. Jonesii* (Ag.) in its very narrow elongate form, more numerous flat imbricating ridges, the row of notch-like curves one in the edge of each, and the regular rows of great puncta. The specimen described is imperfect, but seems to have been about $1\frac{1}{4}$ inch long and 4 lines wide.

From the upper black beds of limestone in Derbyshire.

(*Col.* University of Cambridge.)

Chirodus (M'Coy), n. g.

(Etym. *χεὶρ, manus,* and *ὀδοὺς, dens.*)

Gen. Char. General form of *Ceratodus,* that is more or less fan-shaped, thick, flattened, with the anterior broad margin deeply divided into lobes; but the inner, nearly straight margin has a small, recurved, thumb-like lobe projecting nearly at right angles from the middle of its length (preventing the mesial junction of the tritors of each side of the jaw); the inner marginal lobe is the longest; surface minutely punctured.

The only specimen which has occurred to me of this genus presents only two lobes in the anterior margin, but as the outer edge is imperfect there *may* have been another lobe, but I think not more. I should have referred the tooth to the Permian genus *Ceratodus,* but that the inner margin (which in *Ceratodus* is straight to fit the similar edge of the tooth on the other side of the jaw) has got a small lobe projecting horizontally inwards from its middle, which would prevent such a union; or if it be viewed as possibly the outer margin, we would have the equally singular characters not only of so great a disparity in size between two adjacent lobes, but the principal marginal lobes would *increase* in size from within outwards, which would be contrary to all analogy. Hence, independent of the geological importance of not extending unnecessarily the vertical range of a genus, we find it zoologically impossible to group together teeth so differently constructed that they could not be similarly arranged in the mouth. I have named the genus from the general resemblance to a hand, or still more to the foot of a *Chirotherium* in miniature.

Chirodus pes-ranæ (M'Coy).

Sp. Char. Length 8 lines, narrow; anterior lobes narrow, prominent, rounded, arched, separated by deep concave furrows; the inner lobe about a line longer than the next outer one; at the base of the former, or about half the length of the whole tooth, there projects horizontally inwards from the inner margin a short, wide, slightly recurved, flattened lobe, about 1 line long; posterior part of the tooth flattened; surface finely punctured under the lens.

This little species is something the size and shape of the foot of our common frog, whence the specific name.

Rare, in the black shaly beds of the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Orodus porosus (M'Coy).

Sp. Char. Subcylindrical, transverse diameter (or length of base) six or seven times greater than the antero-posterior; anterior and posterior margins nearly parallel, the middle being scarcely wider than the ends, which are obtusely subtruncate; sides slightly tumid, converging to a narrow mesial ridge; one small obtuse mesial cone not exceeding the short diameter of the base in height, and forming an obtuse ridge to the base on each; on each side there are four or five smaller tubercles, the smallest towards the ends, only those nearest the centre send one or two small ridges down the anterior side, while the posterior is more regularly ridged; basal margin tuberculato-plicate; surface coarsely punctured, except on the prominent worn points which are smooth; transverse diameter usually about 9 lines, short diameter $1\frac{1}{2}$ line.

In one example there are three nearly equal and similar teeth close behind each other; the mesial ridge is a little nearer the posterior than the anterior margin, and most so in the most anterior teeth.

From the carboniferous limestone of Armagh.

(*Col.* Capt. Jones, R.N., M.P.)

Orodus compressus (M'Coy).

Sp. Char. Much compressed, crown elevated into a thin edge of equal height throughout, surmounted by a fine ridge and festooned by four or five sharp points on each side; the centre has a larger point, producing a globular swelling in the middle of each of the flattened sides, over which it sends a small flexuous ridge giving out short branches on each side, while the lateral points only send short simple ridges not half-way down the sides; ends abruptly truncated; base surrounded by a sharply defined thickened border; surface smooth, highly polished; root nearly as deep as the crown is high, truncate below and at the ends; height of crown 1 line, width of base $3\frac{1}{2}$ lines.

This *Orodus* is extremely like a *Ctenoptychius* in general aspect, from the thin, compressed, rectilinear, nearly square form of crown and root, the prominent, defined ridge at the base of the former and its pectinated upper edge; this edge however instead of being sharp is surmounted by a little ridge, from which the small lateral ridges are given off as above-mentioned—characters which do not exist in *Ctenoptychius*.

Rare: from the same locality and in the same collection as the last.

Petrodus (M'Coy), n. g.

Gen. Char. Teeth conical, supported on a nearly circular osseous base, concave beneath; crown with a dense compact surface, height not exceeding the width, deeply furrowed with rough radiating ridges. *Microscopic structure*: vertical and horizontal sections nearly similar, showing the centre to be composed of exceedingly coarse irregular medullary fissures, irregularly branching and anastomosing as they approach the periphery, and sending out at right angles minute, flexuous, calcigerous tubes into the large, irregular clear interspace; the enamel-like surface forms a wide, dark-coloured band of fine, straight, parallel calcigerous tubes at the circumference of the magnified section.

The above generic name brings to mind not only the peculiarly rugged *crag-like* aspect of those teeth, but also their relation to the genera *Orodus* and *Acrodus* (Ag.), from both of which they are distinguished by a simply conic form, the base being nearly circular and not greatly lengthened in one direction as in those genera, as well as the dense stony character of the surface and great depth, coarseness and star-like disposition of the superficial vertical ridges. The base is slightly hollowed in the middle below, of a coarsely osseous texture, penetrated with numerous small vascular canals. It is interesting to observe that of all the fossil teeth yet made known, the microscopic structure of the *Petrodi* approaches nearest to the internal characters of the recent *Cestracion*.

Petrodus patelliformis (M'Coy).

Sp. Char. Conical, height one-half to two-thirds the width of the base, which is round or rarely subtrigonal; apex rudely pointed, becoming flat by wear; sides radiatingly ridged with about thirteen or fourteen very strong, single or dichotomous ridges, the sides of which are usually cut by numerous deep oblique sulci; the ridges are highest at the base, where they terminate abruptly; osseous base a little wider than the crown. Diameter of base 3 to 4 lines.

This tooth presents considerable variation in the proportion of height to width of the base, and also in the number and relative thickness and complexity of the ridges; there is no variety however sufficiently striking to require particular notice or occasion any difficulty in the identification of the species.

It seems abundant in some parts of the Derbyshire limestone.

(*Col.* Cambridge University.)

Hybodontes.

Cladodus lævis (M'Coy).

Sp. Char. Principal cone very thick, slightly oblique, its height equal to half the width of the root; secondary cones two on each side, very strong, the outer largest and divaricating, nearly half the length of the principal cone; all the cones obtusely rounded at the summit, very slightly tapering, and the height of each slightly exceeding the width of its own base; base of the crown and osseous root concave; surface of all the cones smooth, highly polished. Width of crown 9 lines, height of principal cone from the basal margin 5 lines.

This closely resembles the *C. marginatus* (Ag.) in size and form, but the cones taper less and the species is fully distinguished by its smooth surface, destitute of the coarse longitudinal plaits or striæ of that or the allied species.

Carboniferous limestone of Armagh.

(*Col.* University of Cambridge.)

XIII.—Dr. Mantell *on* Mr. Smith's "*Observations*" *in Annals of Nat. Hist. for July* 1848.

To the Editors of the Annals of Natural History.

Gentlemen,

As I have neither leisure nor inclination to engage in controversy, I shall offer but one remark on the observations of Mr. Toulmin Smith.

In the last Number of the 'Annals' (p. 49) Mr. Smith has quoted certain passages from my 'Wonders of Geology' (6th edit. p. 638), which he is pleased to declare are at variance with opinions expressed in my former communication to you: I must therefore again intrude on your indulgence, and request the insertion of the entire paragraphs referred to:—

"A very elegant and interesting family of zoophytes described by me in an early memoir (published in the 'Linnæan Transactions,' vol. xi.), and subsequently named *Ventriculites*, occurs in the Sussex and Wiltshire chalk, in such numbers, and under such dissimilar forms as to require a passing notice in this place; especially as the subject has recently been investigated by a gentleman of distinguished ability*. *After mature reflection and the re-examination of such specimens as are within my reach, I see no reason whatever to alter a single word in the following description taken from my late work (the* Medals of Creation, p. 274) *on Fossil Remains.*"

Then follows the description given in my former communication in the 'Annals of Natural History' for June, p. 435.

"*I cannot admit the correctness of Mr. Toulmin Smith's interpretation of the appearances described in the text*; of the accuracy of his beautiful microscopic examination of the intimate tissue of these zoophytes I have no doubt; and will only remark, that the octahedral form, represented as that assumed by the inosculating fibres of the membrane of the Ventriculidæ, is a very extraordinary anomaly in animal structures."

From the passages printed in italics, and which are omitted in Mr. Smith's quotations, your readers may now judge whether there is any discrepancy between the statement in the 'Wonders of Geology,' and that in my remarks published in the 'Annals of Nat. Hist.' p. 435.

In common fairness, not only the truth, but the *whole* truth should have been given by Mr. Smith, when accusing an author of injustice and inconsistency.

With the assurance that I shall not trespass again on your pages with any remarks on this subject,

I am, Gentlemen, your very obedient servant,

GIDEON ALGERNON MANTELL.

19 Chester Square, Pimlico, July 10, 1848.

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* On the *Ventriculidæ* of the Chalk, by J. Toulmin Smith, Esq., Annals of Nat. Hist. No. 131.

BIBLIOGRAPHICAL NOTICES.

The British Desmidieæ. By John Ralfs, M.R.C.S. Pp. xxii. & 226. Tab. 35. 8vo. Reeve, Benham and Reeve, 1848.

The foundation of this admirable work was laid in a series of papers read before the Botanical Society of Edinburgh and published from time to time in this Journal. The figures and a great portion of the descriptive matter were most unfairly appropriated by the author of a treatise on the 'British Freshwater Algæ,' who seemed to think that as he was engaged on the subject, no one else had a right to interfere with it, and that every one in possession of information, the fruit of his own industry and observation, was obliged to forego the publication of such materials in a separate form and at once give up the possession of it to him. The matter was treated by us at the time with far more lenity than it deserved, and the almost universal sense of the propriety of our criticism has fully justified the approbation with which those most competent to judge of the subject received our comments. We should indeed have grieved had the treatment which he met with discouraged Mr. Ralfs in his well-directed labour and prevented his undertaking the task which he has now brought, after almost infinite pains, and we fear with little remuneration, to such a brilliant consummation.

No country has contributed more perhaps to the knowledge of Algæ than our own. Commencing with the magnificent works of Turner and of Dillwyn, we have by the labours of Borrer, Hooker, Griffiths and other excellent observers recorded in English Botany, and in more recent times of Greville, Harvey, Berkeley, Hassall, Ralfs and Thwaites, a succession of observations illustrating in turn every group of this great and important natural order. Even before the improvement of our microscopes, which has thrown so much light on every branch of natural history, there were keen observers amongst us who anticipated some of the most curious modern discoveries. Captain Carmichael for instance at Appin, at a distance from all sources of information, without a single neighbour sympathizing in his pursuits, and with a microscope of very imperfect construction, ascertained the real structure of the fructification of Fuci as appears from the manuscript now before the writer of these remarks; but unfortunately the publication of this and others of his discoveries was prevented by the derangement to which the book trade was subject a year or two before his death, which took place in 1827.

During the early part of this period indeed it was principally facts and forms which were recorded, affording a storehouse for others out of which to generalize, and most unhappily for the progress of Algology those who used them did so either in ignorance or neglect of each other's labours. Thus the elder Agardh's system, which was for a long time implicitly received, was formed without due reference to the numerous treatises of the French algologists. In later times indeed Greville acquired very correct general views of the affinities of Algæ, and defined many new genera, which have been for the most part adopted; and had he carried on his botanical pursuits to a still more recent period, when the improvement of the microscope would have corrected many points in regard of minute structure which were scarcely before within the grasp of the observer, there can be no doubt that he would have ranked as one of the first algologists of the day. He commenced too a series of correct illustrations of *Diatomaceæ*, but his observations in this direction, though the most valuable which had then appeared, seem to have been checked by growing notions of the animal nature of the lower Algæ. The neighbouring group of *Desmidieæ*, though containing some of the most curious and beautiful forms in nature, had all along, with very few exceptions, been unaccountably passed by without examination. Turpin's and Meyen's observations were neglected or disbelieved, while Kützing's, Meneghini's, and above all Brébisson's treatises seem to have been almost unknown. The memoirs of the two former indeed were accessible enough, but the credit attached in this country to Ehrenberg's notions as to the animal nature of these bodies seems very much to have turned aside the attention of botanists from them, while they were not adopted by the zoologists, but were left to be admired and then laid aside by the mere microscopist.

Such very nearly was the state of the subject when the *Diatomaceæ* and *Desmidieæ* were taken up by Mr. Ralfs, who was perhaps the first botanist in England who fully felt the necessity, not merely of ascertaining the general appearance of the threads or frustules as seen immediately under the microscope, but of understanding the form of their sections with a view to the complete development of their structure. This, with the older microscopes, was almost impossible, as the utmost clearness and definition of outline is necessary for this point, and even with all modern helps and appliances the necessary manipulation is difficult enough. Mr. Ralfs however was no less gifted with tact than perseverance, and thus some of the most anomalous appearances were resolved into very simple phænomena. In the course of his observations he found daily more and more reason to believe in the vegetable nature, more especially of the *Desmidieæ*, a belief as regards the latter amounting at last to perfect conviction from the discovery, peculiarly his own, except as regarded the long anomalous *Closteria*, of a mode of propagation, extending through the whole group, by means of the conjugation of distinct individuals after the manner of the *Conjugatæ*. Mr. Thwaites, whose interesting discoveries have already been recorded in our Journal, has now extended this to *Diatomaceæ*, so that, together with the Corallines, there is at the present period no doubt, except as regards one or two *Hæmatococci*, of the vegetable nature of the whole order of Algæ.

But not only has this discovery thrown light upon the real affinities of these productions, but as regards generic and specific distinctions it is of no less importance, for strongly as the mode of conjugation resembles that of *Zygnema* and its allies, the mode of propagation and indeed the actual physical value of the bodies is not the same. In *Conjugatæ* the spores germinate, and by the development of the first shoots produce a new individual, but in the *Desmidieæ* (at least as indicated by *Closterium**) and *Diatomaceæ*, the reproductive bodies, which in the former case often assume forms altogether at variance with those of the perfect plant, and in both are generally of a very different size, appear rather to be contracted fronds which, without any actual germination, by the mere production of articulations produce new individuals. And hence in specific discrimination it is absolutely necessary to know the whole of the phases through which a species passes, exhibiting great varieties of size and form, before it is possible to determine what are specific characters and what are not; and thus many a puzzling appearance, which was before quite inexplicable, becomes clear and instructive.

Mr. Ralfs however holds, and we believe rightly, that the mode of production of the cells in some other tribes of Algæ ultimately follows the same type.

"In the *Desmidieæ,*" he says, "the multiplication of cells by repeated transverse division is full of interest, both on account of the remarkable manner in which it takes place, and because it unfolds, as I believe, the nature of the process in other families, and furnishes a valuable addition to our knowledge of their structure and physiology.

"The compressed and deeply constricted cells of *Euastrum* offer most favourable opportunities for ascertaining the manner of the division; for although the frond is really a single cell, yet this cell in all its stages appears like two, the segments being always distinct, even from the commencement. As the connecting portion is so small, and necessarily produces the new segments, which cannot arise from a broader base than its opening, these are at first very minute, though they rapidly increase in size. The segments are separated by the elongation of the connecting tube, which is converted into two roundish hyaline lobules. These lobules increase in size, acquire colour, and gradually put on the appearance of the old portions. Of course, as they increase the original segments are pushed farther asunder, and at length are disconnected, each taking with it a new segment to supply the place of that from which it has separated.

"It is curious to trace the progressive development of the new portions. At first they are devoid of colour, and have much the appearance of condensed gelatine, but as they increase in size the internal fluid acquires a green tint, which is at first very faint, but soon becomes darker; at length it assumes a granular state. At the same time the new segments increase in size and obtain their normal figure; the covering in some species shows the presence of puncta or granules; and lastly, in *Xanthidium* and *Staurastrum* the spines

* See Morren's memoir in the 5th volume of the Second Series of 'Annales des Sciences Naturelles.' A second mode of propagation appears to be indicated by Mr. Ralfs at tab. 27. In other *Desmidieæ* the development of the spores has we believe not been yet ascertained, but from analogy we believe that it will prove similar to that of *Diatomaceæ*.

and processes make their appearance, beginning as mere tubercles, and then lengthening until they attain their perfect form and size; but complete separation frequently occurs before the whole process is completed. This singular process is repeated again and again, so that the older segments are united successively, as it were, with many generations. In *Sphærozosma* the same changes take place, and are just as evident, but the cells continue linked together, and a filament is formed, which elongates more and more rapidly as the joints increase in number. This continued multiplication by division has its limits; the segments gradually enlarge whilst they divide, and at length the plant ceases to grow; the division of the cells is no longer repeated; the internal matter changes its appearance, increases in density, and contains starch-granules which soon become numerous; the reproductive granules are perfected, and the individual perishes. In a filament the two oldest segments are found at its opposite extremities; for so long as the joints divide they are necessarily separated further and further from each other. Whilst this process is in progress the filament in *Sphærozosma* consists of segments of all sizes; but after it has reached maturity there is little inequality between them, except in some of the last-formed segments, which are permanently smaller. The case is the same with those genera in which the separation of the cells is complete. I admit that the division of the cells just described apparently differs greatly from that in other simple Algæ; but I believe that the process in all is essentially the same, and that whatever differences exist are modifications necessarily resulting from the different forms of the cells. In the examples already given the cell itself consists of two distinct portions, having a constriction between them; hence each of the new-formed portions is similarly distinct from the older one which forms it and to which it is united.

"In order fully to elucidate the subject, cells may be distributed into three principal kinds, distinguished by their form:

"1st. Bipartite cells, already described, and more or less constricted at the middle;

"2nd. Cells globose or rounded at the ends, or having the extremities attenuated;

"3rd. Cylindrical cells.

"Bipartite cells belong only to the *Desmidieæ*; cells globose or roundish at the ends are seen in the *Nostocs* and *Palmelleæ*; attenuated cells in the *Desmidieæ*; and cylindrical ones in the *Conjugatæ*, *Tiresias*, &c.

"It is obvious that the new portions must arise from the whole of the junction margin of the original valves; consequently when the junction occupies only a part of the breadth the new portion will be narrower than the old; but when the junction of the valves is as broad as the cell, the new portion will from the beginning be of the same breadth. From this important fact, we may explain the different sorts of division. Since in the two latter kinds of cell the valves are united by their entire breadth, the new portions cannot be distinguished by their size, we must therefore have recourse to other aids to enable us to trace the changes and satisfy ourselves of their real identity with that already described; and I hope to be able to show that this identity does exist.

"In *Nostoc* and *Anabaina* the cells are globular, and as there is no constriction we might remain ignorant of the real method of division; but, guided by the analogical process in the *Desmidieæ*, I hope to make it sufficiently plain. The hemispheres are thrust apart by the new formation; but now it is the outer rounded margin that we look to for an explanation. If a globe be cut into two equal portions, each will represent half a circle. By comparison with the neighbouring cells, we find that these two half circles remain unaltered, and are merely separated from each other, for if again brought together they would reconstitute the former globe. The new formations however separate them further and further, until the intervening space equals that occupied by the original globe, and then we find two globes exactly like the primary one, the internal half of each being the newly-formed one. During this time the inner portions, as they extend, develope more and more of the circle, until each becomes, as I have stated, a perfect hemisphere. The whole process cannot, of course, be seen in the same cell; but in a dividing filament some joints may be observed in one stage and some in another, which renders the evidence complete.

"When the cell is oblong, or only rounded at the extremities, the process, though similar, is less evident: the cell at first seems merely to elongate until it obtains nearly twice its original length, when the division commences and the rounding of the new ends becomes apparent. The tapering cell presents but little difference, for the separation takes place before its extremities are fully developed. Sometimes these cells separate obliquely, as in *Spirotænia* and *Scenedesmus*.

"I ought to state however that the opinions advocated above do not agree with those of M. De Brébisson, who has attained so high a reputation for his intimate acquaintance with the freshwater Algæ, and to whose kindness I have been so often indebted during the progress of the present work. He considers that there is an essential distinction in the mode of division between the *Desmidieæ* and *Nostochineæ* (including in the latter the *Palmelleæ*), and that from it indeed differential characters are obtained by which we can distinguish these nearly-allied groups. He observes of *Hormospora mutabilis*, Bréb.*, 'Ils sont le plus souvent géminés, se multipliant par une division spontanée (déduplication) transversale, comme cela arrive dans quelques autres Pleurococcoidées. Une division analogue a lieu dans les Desmidiées, auxquelles on serait d'abord tenté de rapporter les Hormospora; mais les demi-corpuscules (hémisomates) des Desmidiées développent à leur point de séparation une nouvelle portion semblable à la première, tandis que, dans l'accroissement des Nostocinées, les corpuscules sont divisés en deux par un étranglement transversal, sans qu'il s'ensuive une reproduction sur

* Annales des Sciences Naturelles, Jan. 1844.

chacun des points de rupture. Il y a dans ce cas, comme je l'ai dit ailleurs, *déduplication simple*. Dans les Desmidiées, il y a *déduplication* et *réduplication*.'

"It is with unfeigned diffidence that I venture to dissent from the opinion of one possessing so profound a knowledge of these tribes, and I do so only from conviction, the result of close and repeated investigations.

"I have stated my belief that the same changes occur in both the *Desmidieæ* and the *Nostochineæ*. A cell in *Micrasterias* has two hemispheres, just as a joint in *Anabaina* has; in both these separate, and in both each hemisphere becomes again a perfect sphere; and if in *Micrasterias* the two hemispheres were united by their whole bases, there would not remain even an apparent difference between them.

"The form of the cylindrical cells no longer helps us in tracing the method of division. In *Penium* as in the *Conjugatæ*, they seem merely to elongate and then divide. As I formerly suggested, in a paper read before the Botanical Society of Edinburgh, I consider it extremely probable that in all the simple Algæ the cell or joint consists of two valves, and that additions occur at their junction, the original parts remaining unaffected: but this it may never be possible to demonstrate satisfactorily, unless a species of Conferva with a coloured integument should be detected, or some means can be devised for permanently colouring the filaments without impairing their growth. Then indeed the question might be determined; at present I can merely show the probability that the cell in cylindrical species of *Desmidieæ* agrees with the joint in a *Zygnema* or *Tyndaridea*; since whenever the covering is colourless and free from markings not the slightest difference can be perceived. This is the case in a few species of *Penium*; and hence *Penium Brebissonii* is by some authors placed in the *Palmelleæ*. In *Penium margaritaceum* and *Penium Cylindrus* the integument is coloured, and we are enabled, by means of the paler appearance of the newly-formed portions, to satisfy ourselves that in these also each half of the original cell is acquiring during the division a new partner. In *Didymoprium* the same fact is rendered apparent, because the suture passes between minute teeth; these teeth recede from each other, and the new teeth which appear between them show the place where the separation of the joint has occurred."

To these interesting observations it may be added that the order of development in *Diatomaceæ*, where the frustules adhere long enough together to show their progress, is precisely the same. In *Isthmia*, for instance, if the several segments of the thread be indicated by symbols expressing the order of their development, the same symbols would equally express the same phænomena in a thread of *Sphærozosma*.

Many other matters of interest are discussed in the Introduction, such as the claims of these bodies to be ranked amongst vegetables, the nature of the active molecules at the apex of the frustules of *Closterium*, the swarming of the articulations of *Scenedesmus*, the mode of preserving specimens for microscopical observation which has been so extensively and successfully carried out by Mr. Thwaites, &c., for information on which we must refer our readers to the work itself. The long extract we have given will sufficiently show the style and powers of reasoning of our author. The introduction was unfortunately written and printed before the descriptive-matter, which precluded the possibility of putting the last finishing touch, on the completion of the work, which is often of such immense value in giving the proper effect to the whole. It is impossible to read it without feeling this, especially as the brilliant discoveries of Mr. Thwaites on the conjugation of *Diatomaceæ* were made before the publication of the volume, and which would have given Mr. Ralfs new ground for thought and comparison, discoveries now extended to the spores of *Palmellæ*.

Of the general execution of the work we cannot speak too highly: the descriptions are accurate and copious, the species well-defined, the synonyms carefully scrutinized, every available source of information ransacked, and the figures, for which it is principally indebted to Mr. Jenner, beautiful and accurate. The whole tone of the book too is exactly that manly tone at once of modest candour and of self-respect, which shows the faithful and conscientious observer confident in his own carefulness and measure of ability, but aware of the liability to error which is inseparable from man's nature.

It is a book not merely for the algologist but for the physiologist, and in the spores of these curious productions the geologist will recognise the bodies which are so prevalent in flints. Fossil fronds of *Desmidieæ* have been found by Professor Bailey, who detected various species of *Closterium* and *Euastrum* in calcareous marls collected in New Hampshire and New York by Professors Hubbard and Hall, and also in marl at Scotch Town, New York, by Mr. Connors. Professor Bailey informed Mr. Ralfs that the specimens from the last-named station were taken from below the bones of *Mastodon giganteus*. As sporangia of the *Desmidieæ* and other membranous bodies in a fossil state have lately been detected by Mr. Deane and Dr. G. Mantell in the gray chalk of Folkestone, it is probable that a careful search in that neighbourhood would also bring to light the fossil fronds of *Desmidieæ*.

We are not aware that any *Desmidieæ* have yet been found in amber. A list of *Diatomaceæ* contained in that curious substance was lately given in our Journal. These were communicated to Ehrenberg by Dr. Thomas of Berlin, and specimens containing the same species have been entrusted by Dr. Thomas to the writer of these remarks; but in a very extensive list of specimens prepared by Dr. Thomas now in our hands, it does not appear that any *Desmidieæ* have yet been detected, nor is there any indication of the kind in the work of Dr. Berendt.

It remains only that we recommend most cordially the work of Mr. Ralfs to the attention of our readers, assuring them that they will not be disappointed in it; and to express our hope that it will shortly be followed by a similar volume on the *Diatomaceæ*.

Journals of Travels in Assam, Burma, Bootan, Affganistan, and the neighbouring countries. By the late WILLIAM GRIFFITH, F.L.S., &c. &c. Arranged by J. MACCLELLAND, F.L.S. Calcutta, 1847.

Notulæ ad Plantas Asiaticas. Part I. *Development of Organs in Phanerogamous Plants.* By the same.

Icones Plantarum Asiaticarum. Part I. By the same.

These valuable works are a portion of the "Posthumous Papers bequeathed to the Honourable the East India Company, and printed by order of the Government of Bengal," of the late lamented W. Griffith. The Company has, with its accustomed liberality, printed them, and is now presenting copies of them to those persons and Societies to whom they may be useful. It does not appear that any copies are offered for sale.

The work at the head of our list is an octavo volume of above 500 pages, full of remarks upon the little-known districts which he traversed and peculiarly rich in botanical information. It is also illustrated by some capital sketches of scenery. The other two books constitute the descriptive text, and illustrative plates of what may be considered as one work. The quarto plates are sixty-two in number, and are quite filled with magnified and elaborate dissections in illustration, chiefly of the development of the parts of the flower, in numerous genera and species. It is unnecessary to remark upon the value of these plates and their descriptions. Those who are acquainted with Mr. Griffith's papers contained in the late volumes of the 'Linnæan Transactions,'—and what botanist is not?—will know what to expect and will not be disappointed.

We presume from the Travels ending with the "end of vol. I." and the other books being each denominated Part I., that it is the intention of the Honourable Company to publish further portions of the papers in its possession. We trust that it will prove so; for the remarks of such an observer as the present author ought not to be lost.

The Marine Botanist: an Introduction to the study of Algology, containing Descriptions of the commonest British Sea-Weeds, with Figures of the most remarkable Species. By ISABELLA GIFFORD. London: Darton and Co.

A nice little book upon the British Sea-weeds, which our subscribers may safely recommend to such of their friends as purpose visiting the coast.

The work is professedly only a preparation for more perfect systematic books, the object of this being to give descriptions of our commonest marine Algæ in as simple words as possible, and the authoress has shown as much judgement in the important matter of terminology as in the general arrangement of the matter. An absolute avoidance of scientific terms must lead to obscurity in the present state of knowledge, and the only way to simplify the technical terms is to make them more scientifically definite. Those who object to the "hard words," as they are called, in works on Natural

History, should recollect that the only road to literature lies through the dictionary, and that their objection is the same as that of the child who dislikes the task of "meaning spelling."

Very little trouble will be required to master the few terms in the Glossary of the present little book, where they are clearly explained. The work is very neatly got up, and is well adapted to attract new votaries to the study of our marine flora; for although it does not convey much information beyond the names, these are precisely what all beginners are most interested in, and of course the name of an object must necessarily be known in order to the communication of observation of structure or habit.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

March 21, 1848.—E. Forster, Esq., V.P., in the Chair.

Read a Memoir "On the Australian species of the Coleopterous genus *Bolboceras*, Kirby." By J. O. Westwood, Esq., F.L.S. &c.

In this paper, which contains the characters and descriptions of five new species of *Bolboceras* from Australia, Mr. Westwood passes in review the various writers on the subject, and enters into some critical detail on the characters which they have assigned to the genus. The following are the characters of the new species proposed:—

1. B. (Elephastomus) Kirbii; castaneo-fulvus, capitis cornu antico porrecto brevi truncato plano subtùs in spinam bifidam haud producto, vertice carinâ brevi transversâ, prothoracis lateribus valdè punctatis utrinque fossulatis; disco posticè canali abbreviato longitudinali instructo.—Long. corp. lin. 9.

B. (Elephastomus) Kirbii, *Hope MSS.*

Hab. in Terrâ Van Diemen. In Mus. Hope.

This appears to be the insect given by Mr. MacLeay as the female of *Elephastomus proboscideus*. It is however a male, and is given by Dr. Klug as a variety of the male of that species. The insect above described appears sufficiently distinct as a species from the former.

2. B. Reichii; castaneus nitidus, capite cornu valdè elongato erecto, prothorace anticè valdè deflexo et subconcavo cornubus duobus crassis longitudine capitis porrectis lateralibus armato: singulo versus basin dente obtuso erecto instructo; prothoracis lateribus rudè punctatis spatioque triangulari impresso et punctato ante scutellum; margine postico parùm elevato, elytris striis gracillimis punctatis, tibiis anticis extùs 5-dentatis. ♂.—Long. corp. lin. 11; lat. prothoracis lin. 7.

Hab. Port Essington. In Muss. Hope et Reich.

♂ *Bolboceras Reichii*, Guérin, Voyage de la Favorite, et Iconogr. du Règne An. Ins. p. 84.

Bolboceras Kirbii ♂, Hope in Proc. of Ent. Soc., Nov. 1841, p. 43.

♀ *Bolboceras Kirbii*, Bainbridge in Trans. Ent. Soc.

Differt capite minori, vertice in tuberculum conicum apice bifidum elevato, clypeo et vertice carinâ tenui angulatâ separatis, pronoto anticè spatio subhexagono plano polito, in puncta duo profunda anticè lateraliter desinente; disco pone medium valdè punctato, versus marginem posticum elevato lævi, spatio ovali mediano punctato et impresso relicto.—Long. corp. lin. 11.

Hab. ad Melville Island. Mus. Hope (etiam in Mus. Gory, nunc Hope, cum nomine *B. Reichii* inscripto).

Obs. The name given to the male of this species is here retained in preference to that of the female, in accordance with the usual custom in such cases.

3. B. Taurus; castaneus nitidus, capitis vertice utrinque laminis duabus auriculatis erectis instructo cornubusque duobus elongatis curvatis nigris ante oculos armato, pronoto in medio versus marginem anticum parùm reflexo seu tuberculis duobus transversis subelevatis instructo; lateribus punctatis.—Long. corp. lin. 8.

Hab. ad Swan River. In Mus. Hope (olim Gory, sub nomine manuscripto suprà indicato; etiam in Mus. Saunders).

4. B. Capreolus; castaneus nitidus, capite posticè nigricante; vertice cornu lato furcato 6-dentato erecto armato, pronoto anticè retuso glabro, dorso carinâ transversâ pone medium instructo, mandibulis magnis extùs denticulatis. ♂.—Long. corp. lin. 9.

Hab. in Novâ Hollandiâ, Swan River. In Mus. Hope (olim Mus. Gory, cum nomine suprà inscripto designatum).

5. B. Bainbridgii; piceus, capitis clypeo anticè tridentato, dente intermedio minori; vertice inermi, pronoto anticè valdè declivi dente erecto versus marginem anticum; parte declivi suprà carinâ curvatâ marginatâ.—Long. corp. lin. 7.

Hab. in Novâ Hollandiâ, Swan River. In Mus. D. Hope.

Of these species, as well as of *B.* (*Elephastomus*) *Australasiæ*, Kirby, *B. serricollis*, Bainbridge, *B. hastifer*, Bainb., *B.* 3-*tuberculatus*, Bainb., *B.* 7-*tuberculatus*, Bainb., *B. coronatus*, Klug, *B. quadricornis*, Klug, *B. neglectus*, Hope, *B. rotundatus*, Hope, and *B. rubescens*, Hope, Mr. Westwood adds figures, either of the whole insect or of the more distinctive parts. He also figures and describes a new subgenus with the following characters:—

Subgenus Stenaspidius.

Corpus magìs elongatum quam in *Bolboceratis veris*; scutello elongato (nec triangulari); elytris striis 5 tantùm inter humeros et suturam; mesosterno porrecto. Differt etiam colore antennarum.

Bolboceras (Stenaspidius) nigricornis; ovalis niger nitidus sparsim punctatus, capite tuberculo conico inter oculos, pronoto canali punctato medio aliisque duobus abbreviatis pone oculos, elytris striato-punctatis.—Long. corp. lin. $3\frac{1}{2}$.

Hab. in Novâ Hollandiâ. In Mus. D. Hope (olim Gory, cum nomine suprà indicato inscripto).

April 4.—E. Forster, Esq., V.P., in the Chair.

Read some "Notes on the Vegetation of Scinde," extracted from a Letter addressed by John Ellerton Stocks, Esq., M.D., to J. F. Royle, Esq., M.D., F.R.S., F.L.S. &c., dated Bombay, November 25, 1847.

The extracts consisted, first, of a sketch of the physical geography, soil and climate of the neighbourhood of Kurrachee, of the road from Kurrachee to Hydrabad, and of that between Hydrabad and Roree; secondly, of lists of the more remarkable plants arranged according to the stations in which they were found; thirdly, of comparative estimates of the prevalent proportions of the principal Natural Orders as compared with the Flora of India generally; fourthly, of lists of the characteristic plants of Scinde, and of those which predominate in the number of individuals to such an extent as to give a peculiar character to the face of the country; and lastly, of an indication of those species by which the Flora of Scinde is connected severally with those of Cabool, of Arabia, of Egypt, and of the Punjaub and Delhi.

In a postscript to his letter, which was accompanied by a packet of specimens, Dr. Stocks refers to Captain Vicary's paper on the Plants of Scinde, in the Journal of the Asiatic Society of Calcutta for November 1847*, which he had received subsequently to writing the letter, and to his own remarks printed by Sir William J. Hooker, from a letter addressed to him in the Supplement to the Botanical Magazine for September. He desires that Captain Vicary's published names of various species may be substituted for his own MS. names; and remarks that Captain Vicary's *Ægialitis* is a true *Statice*; his *Breweria evolvuloides* is *Seddera latifolia*, Hochst. and Steud.; his *Calligonum polygonoides* is certainly a new genus, for which Dr. Stocks had in his MSS. proposed the name of *Gibsonia*; his *Morisonia Asiatica* is *M. Lawiana*, Stocks, in Calcutta Journal, 1846; his *Zygophyllum obtusum* is *Z. simplex*, L.; his *Corchorus depressus* is *C. humilis*, Munro; his frutescent *Crambe* is a species of *Didesmus*, *D. panduriformis*, Stocks; and his *Cadaba Indica* is a fine *Capparis*, probably new, and found also in Arabia. Dr. Stocks proposes the name of *Vicarya* for a new genus of *Malvaceæ* which he purposes describing, along with *Gibsonia* and *Sericostoma*, a new genus of *Boragineæ*, in the next number of the Bombay Asiatic Journal.

April 18.—T. Horsfield, M.D., V.P., in the Chair.

Read a continuation of Mr. Newport's Third Memoir "On the Anatomy and Development of *Meloë*."

The author remarked that every normal change in structure depends on definite laws, and that when the proper operation of these is impeded, or when change is effected by violence, the function of structure is impaired.

After mentioning that Malpighi, in his anatomy of the Silk-worm, glanced at, and Dr. Willis, in this country, at the end of the seventeenth century, more particularly announced, the view that changes in structure in all animals are regulated by those general principles which have since been so admirably worked out by Geoffroy Saint-Hilaire, Mr. Newport stated that his object in the present memoir is to further exemplify these principles in the Anatomy of *Melöe*, and

* Reprinted in this Journal for June, 1848.

to endeavour to apply them to the explanation of function as dependent on structure.

Although the object of variations in structure cannot always be at once traced in the details, it is invariably evident in the general design of parts, and it is found to be so likewise in their peculiarities in proportion as we become more fully acquainted with the habits of animals, as is shown in the details of structure in the young *Melöe* and *Stylops* at particular periods of their growth. Changes in the structure of parts during growth in the young animal were shown to commence in the cells of the tegument, and that it is by means of these that the form of the body is gradually altered. These changes are not to be confounded with other *secondary* ones which give form to the adult animal, and which we are familiar with as the *metamorphoses*.

The dermal appendages, spines, hairs and scales, were shown to be similar in their mode of origin in the tegument to the appendages of segments, and their growth and removal to be regulated by the same principles. Mr. Newport showed that the appendages originate by an extension outwards of the whole of the layers of a portion of tegument, whilst spines, hairs and scales originate in the nuclei of cells of separate layers. He stated also that he had detected these modes of origin in the embryo before it leaves the ovum, and combated the view of M. Lavalle that spines are originally an extension outwards of the whole of the dermal tissue, as they are often found to be in *Crustacea* at advanced periods of growth, showing that they only become so in them, and in the larvæ of other *Articulata*, during their growth and enlargement, by involving contiguous portions of the tissue. These views were illustrated by examination of the tegument of *Melöe*, and by reference to the changes in the tegument of *Lepidoptera* at the period of transformation.

The author then passed to a consideration of the *secondary* causes of development—the *metamorphoses*—and pointed out, from an examination of the cast skin of the larva of *Melöe*, which always remains attached to the body of the inactive full-grown larva in its cell, what are its previous habits and form, drawing attention to the fact, that the cast skin of an insect, when relaxed and unfolded, enables the anatomist of the *Invertebrata* to indicate the form and general habits of a species as precisely as the fossil bone enables the comparative anatomist of the *Vertebrata* to indicate those of the inhabitant of a former world.

The changes which *Melöe* undergoes were then described; and the mode of formation of the head in the *Articulata* explained as composed of a definite number of originally distinct segments. Mr. Newport referred to his former discovery of these segments in the embryo of *Geophilus*, and stated, in answer to the recent denial of some parts of his views by Professor Erichson, regarding the organs of manducation in *Myriapoda*, that he has satisfied himself of their correctness, having not only confirmed them in that class, but also in the embryos of other *Articulata*. These views he then applied to illustrate the anatomy of the head and organs of manducation in *Melöe*, showing the mode in which the changes in the structure of the mandibles are effected, and pointing out corresponding changes in the function of the parts; noticing also that change in structure during the growth of an animal usually precedes change in the function of an organ,—a circumstance which leads to the inference that function is closely dependent on special structure.

The secondary changes during the development of *Articulata*, the *metamorphoses*, are effected, not by the tegument itself, but by the agency of structures connected with the tegument—the muscles. The author stated that we are entirely ignorant of the secret cause which first excites the muscles, at a definite period of growth, into action in effecting these changes; but suggested that it is in the expansive and contractile forms of growth in the tissues themselves. All that is known with certainty is, that it is through the direct agency of the muscles that the form of body of the insect is rapidly altered at the period of the metamorphoses, and that the operation of these is accelerated or retarded by physical influences. The mode in which the muscles operate in effecting the changes was then pointed out, and the altered proportions of different parts of the body after the change was shown to depend on the greater or less extent to which the contraction of the muscles of different segments is carried.

The result of these altered proportions in the tegument of an insect that is changing to the form of pupa or nymph, as in *Melöe*, is a rapid re-induction of the forces of growth in the appendages, the future wings and legs, which become greatly elongated, at and immediately after the change, These alterations of form are accompanied as a last result by changes in the intimate structure of the tegument, a consolidation of a large portion of it, and the formation of the dermo-skeleton of the imago.

May 2.—The Lord Bishop of Norwich, President, in the Chair.

Read a memoir "On the Anatomy and affinities of *Pteronarcys regalis*, Newm." By George Newport, Esq., F.R.S., F.L.S. &c. &c.

Mr. Newport commenced by stating that the existence of a winged insect with branchial organs for respiration is so anomalous a condition of life, that himself as well as others at first regarded the specimen he had obtained rather as an accidental instance of incomplete development than a normal condition. He found however, on comparing his specimen, preserved in spirit, with other dried specimens in the cabinets of the British Museum, that this was not the case, as evidences of branchiæ are to be found in the whole of the dried specimens of the genus in that collection.

Having waited some years since obtaining this specimen, in hopes of receiving others for the purpose of dissection, the author has now made a careful examination of the insect. He described the forms of branchiæ in different genera of *Neuroptera*, and pointed out that the peculiarity of *Pteronarcys* consists in its possessing in its winged state, both branchiæ for aquatic respiration and spiracles for the direct respiration of air.

He then described the branchiæ, their connexion with the respiratory organs, and the mode in which the blood circulates through them, as he has seen in a neighbouring family, *Sialis*, and reviewed what is yet known of the habits of the insect in connexion with these remarkable structures.

The author regards *Pteronarcys*, from the circumstance of its possessing in its winged state the means of both aquatic and aërial respiration, as an *Insect Proteus*, the representative of the *Proteus* of *Vertebrata*, both in structure and habits.

The anatomy of some parts of the dermo-skeleton, of the spiracles, and of the distribution of its internal respiratory organs, as compared with that of neighbouring genera, is then described, as well as of the digestive organs, and nervous and reproductive system. These are minutely examined and the structures delineated on an accompanying plate.

BOTANICAL SOCIETY OF EDINBURGH.

June 8, 1848.—The Rev. Dr. Fleming, President, in the Chair.

The following communications were read:—

1. "Notice of Fossil *Diatomaceæ* found in Aberdeenshire," by G. Dickie, M.D. (See p. 93 of the present Number.)

2. "On Microscopic Bodies existing on the Epidermal Surface of the Lilac," by Mr. W. M. Dobie.

These bodies were described as being of a circular or elliptical form, composed of a congeries of cells, and quite distinct from the stomata. They were represented as about one-thousandth part of an inch in diameter, and as containing occasionally granular matter in their interior. In most cases they were found to be elevated above the surface of the epidermis, but occasionally a depression or pit seemed formed to receive them. By moistening the leaf and scraping it with the edge of a knife they were in some instances detached with a funnel-like prolongation on their lower side. The author noticed the action of various reagents upon them, such as iodine, acetic, nitric, and sulphuric acid, and concluded by expressing his opinion that they were of a glandular nature. The paper was illustrated by drawings.

3. "Abstract of Documents by M. Ch. des Moulins, relative to the preservation of the Germinating Powers of Seeds," by Chas. C. Babington, Esq. In this paper several well-authenticated instances are detailed, in which seeds found in tumuli in France, where they must have lain for centuries, had germinated on exposure to the air. Among the species obtained from these seeds, *Heliotropium europæum*, *Medicago lupulina* and *Mercurialis annua*, were most abundant.

Specimens of Tea prepared by Mr. Thomas M'Nab, from plants growing in the Edinburgh Botanic Garden, were exhibited.

Mr. Evans exhibited growing plants of *Paris quadrifolia* and *Ophioglossum vulgatum* recently found in Arniston Woods by Mr. Veitch, gardener at Arniston.

Professor Balfour read a letter from Dr. Dickie of Aberdeen, stating that the species of *Sagina* found on the sea-coast of Aberdeen is the *S. maritima* of Don, not of Smith, and the *S. stricta* of Fries.

MISCELLANEOUS.

Apera interrupta, *Beauv.*

I have the pleasure of announcing the addition of this grass to the list of British natives. A few specimens of it were gathered on June 9, 1848, near Thetford by the Rev. W. W. Newbould, but not having then the means of determining their name, they were laid aside and did not undergo examination until recently. Early in July 1848 Mr. Newbould brought them to me as probable specimens of *Apera interrupta*, and I had the satisfaction of confirming his determination of the name. On July 4, 1848, we went together to Thetford and found the plant in small quantity on walls in the town (the Norfolk side), but in the utmost profusion in the neighbouring sandy district of Suffolk. The greatest quantity was seen between what, on the Ordnance Map, is marked as the 77th mile-stone (it is different on the stone itself) near Elvedon, and the words "Redneck Heath." A drawing of it has been made, which will be published in an early number of the 'Supplement to English Botany.'—C. C. B.

Orobanche Picridis, *F. W. Schultz.*

This is another of Mr. Newbould's discoveries. It grows parasitically upon *Picris hieracioides* on the waste part of a field near Comberton in Cambridgeshire. The general appearance distinguishes the living plant from its allies, and as its technical characters will be found in almost any good continental flora, it is undesirable to occupy space with them here. The plant was in perfection on July 15, 1848, when Mr. Newbould conducted me to the spot where it grows, and although we examined carefully, we could not trace its attachment to any plants except the *Picris*; neither is it stated to prey upon any other plants on the continent. A drawing of this also is prepared for 'Eng. Bot. Supplement.'—C. C. B.

Fossils of the Exploring Expedition under the command of Charles Wilkes, U.S.N.: *a Fossil Fish from Australia, and a Belemnite from Tierra del Fuego*; *described by* James D. Dana, Geol. of the Exped.

Urosthenes (nov. gen.).—Allied to *Palæoniscus*.—Body elongated, prolonged into upper lobe of tail nearly to apex. Anal fin triangular, attached to the body as far as the base of the caudal. Dorsal fin directly over the anterior part of caudal. Ventral fin distant from the anal. Rays of the fins very fine and numerous; articulations oblong, the surface of each excavate.

Urosthenes australis.—Body narrow oblong. Scales smooth and without markings, subquadrate, over the posterior part of the body transverse. Caudal fin slightly furcate. Anal fin larger than dorsal; two to four free spines or accessory rays just in advance of each of the fins; articulations of rays oblong rectangular, those of dorsal fin, near its base and outer margin, three or four times as long as broad, and surface fluted-excavated.—From the B coal-pit, Newcastle, on the Hunter, where it was obtained by Mr. James Steel, the superintendent of the works, by whom the specimen was kindly submitted to the writer for description. The specimen is in the museum of the Newcastle Mechanics' Institute. The anterior part, to beyond the pectoral fins, is wanting. Length of part preserved 12 inches; width $2\frac{3}{4}$ inches; near base of caudal fin 1 inch.

Helicerus (nov. gen.).—Allied to Belemnites. Calcareous ossicle thick, subcylindrical, containing internally a slender tubular cavity, (a continuation probably of an alveolus above,) which terminates in a small fusiform chamber helicoidly divided. This chamber has the shape of two cones put base to base; the tube leading to it appears to have contained a rolled membrane to correspond with the turns of the spiral dissepiment in the fusiform chamber.

Helicerus fuegiensis.—Ossicle cylindrical, half an inch in diameter; diameter of tube within nearly one-sixth that of the fossil, and that of the chamber more than half the same. Texture of the ossicle radiating fibrous, like ordinary Belemnites. Found by the writer in a slate rock on the shores of Nassau Bay, near Cape Horn.—*Silliman's Journal for May* 1848.

Notes on some Australian Fossils. By J. D. Dana.

In the valuable article by F. M'Coy on the fossils of Australia (Ann. Nat. Hist. vol. xx. p. 145), which was published some months after the writer's article on this subject, but before that article had reached Mr. M'Coy, there are some species redescribed. We observe that

Cardinia ? exilis, M'Coy, is *Cardinia recta*, D.

Pleurotomaria Morrisiana, M'Coy, is *Pleurotomaria trifilata*, D.

Pachydomus ovalis and *P. pusillus*, M'Coy, are species of *Astartila*, D., a genus nearer *Astarte* than *Pachydomus*.

Pachydomus sacculus, M'Coy, is a *Eurydesma*; *E. cordata ?* of Morris. (See Strzelecki's N. S. Wales, pl. 12. fig. 1.)

The genus *Notomya*, M'Coy, corresponds to *Pyramus*, D., and from the examination of our species, we cannot believe that they are related to the *Myidæ*.

The genus *Mæonia* of the author, (changed from *Myonia*,) along with *Pyramus*, and probably *Cleobis*, make a natural group among the *Astartidæ*, having the smaller anterior muscular impression facing in the same plane with the larger anterior, and thus differing strikingly from *Astarte*, *Pachydomus*, *Astartila*, *Cardinia*. Moreover the larger anterior is prolonged upward, and is pointed, towards the smaller anterior muscular impression. *Mæonia* has a second small anterior muscular impression, situated high up on the beak: if this is not sufficient for a generic distinction, all the species may be thrown together in the genus *Mæonia*, as the gradations are such that it is difficult to draw lines of distinction. The *Pachydomus gigas* of M'Coy falls into the same group, being between *Cleobis* and *Mæonia* as these genera were before laid down. The group *Cleobis*, if sustained, would include species not having the sides at all excavate; but this hardly seems to be a generic character among these species. The *Pachydomus globosus* of Morris and M'Coy appears to be a different species from the *P. globosus* of Sowerby, whose figure in 'Mitchell's Australia' (pl. 1. p. 14. vol. i.) represents a species with very *thick* valves, and from Harper's Hill, instead of Illawarra. Morris's species is believed to be *Cleobis grandis* of the writer.

The species referred in a former article to *Modiolopsis* (Hall) appear to have two muscular impressions, and for the most part more properly belong with the *Cypricardiæ*.—*Silliman's Journal for May* 1848.

A new Organ of Sound in Lepidoptera. By S. S. Haldeman.

The *Lithosia miniata*, Kirby (Fauna Bor.-Am. p. 305), or an allied species, produces an audible stridulation by vibrating the pleura beneath the wings, this part being marked in recent specimens by parallel lines, apparently indicating the position of the muscles. It is possible that the European *Acherontia atropos* may produce its peculiar sound in a similar manner.—*Silliman's Journal for May* 1848.

METEOROLOGICAL OBSERVATIONS FOR JUNE 1848.

Chiswick.—June 1. Cloudy and fine: rain. 2. Showery. 3. Showery: fine: clear. 4. Heavy showers: fine. 5. Fine. 6. Uniform haze: fine: clear. 7. Very fine. 8. Cloudy. 9. Very fine: rain. 10. Constant heavy rain. 11. Overcast: cloudy. 12. Cloudy: rain. 13. Heavy showers. 14—16. Very fine. 17. Cloudy and fine. 18. Densely overcast: rain at night. 19, 20. Overcast. 21. Cloudy and fine. 22. Very fine. 23. Hazy: rain. 24. Rain: fine: slight rain. 25. Overcast. 26. Fine. 27. Cloudy. 28, 29. Fine. 30. Rain.

Mean temperature of the month	59°·58
Mean temperature of June 1847	58 ·46
Mean temperature of June for the last twenty years	60 ·81
Average amount of rain in June	1·88 inch.

Boston.—June 1. Fine: rain P.M. 2. Cloudy. 3. Cloudy: rain P.M. 4. Fine: rain P.M. 5. Cloudy. 6. Fine. 7, 8. Fine: rain P.M. 9. Cloudy: rain P.M. 10. Fine: rain P.M. 11. Cloudy: rain early A.M. 12. Cloudy: rain A.M. and P.M. 13. Rain: rain A.M. 14, 15. Fine. 16. Cloudy: rain A.M. and P.M. 17. Rain: rain A.M. 18. Cloudy: rain A.M. and P.M. 19—21. Cloudy. 22. Fine. 23. Cloudy: rain P.M. 24. Cloudy: rain A.M. and P.M. 25. Cloudy. 26. Fine. 27. Cloudy: rain early A.M. 28. Cloudy: rain A.M. 29. Rain: rain A.M. 30. Fine: rain P.M.—This has been the wettest June for nine years, and May the driest for nineteen years.

Applegarth Manse, Dumfries-shire.—June 1. Showery all day: A.M. clear. 2. Showery all day: thunder. 3. Fine A.M.: rain: thunder. 4. Showery: hail. 5. Fair, but cloudy. 6. Slight showers. 7. Showers: thunder: hail. 8. Showers: thunder. 9. Fine: some drops of rain. 10. Fair and fine. 11. Fine: warm: showers. 12. Rain all day. 13. Showery nearly all day. 14. Showers early: cleared: fine. 15. Fiery wind: fair. 16. Heavy showers P.M. 17. Fine: one slight shower. 18—20. Very fine summer days. 21. Warm: thunder: showers. 22. Fair: wind violent. 23. Slight shower P.M. 24. Fair and pleasant. 25. Fine A.M.: rain P.M. 26—30. Constant showers.

Mean temperature of the month	55°·7
Mean temperature of June 1847	55 ·2
Mean temperature of June for the last twenty-five years .	56 ·1
Average amount of rain in June for twenty years	3·16 inches.

Sandwick Manse, Orkney.—June 1. Showers: fine. 2. Cloudy. 3. Cloudy: rain. 4. Cloudy. 5. Rain: cloudy. 6. Bright: showers. 7. Clear: showers. 8. Clear: cloudy. 9—11. Clear. 12. Clear: cloudy. 13. Drops: rain. 14. Damp: rain. 15. Rain: drops. 16, 17. Fine. 18. Cloudy. 19, 20. Bright: cloudy. 21—25. Cloudy. 26. Bright: cloudy. 27. Rain: damp. 28. Rain. 29. Cloudy. 30. Bright: drops.

Meteorological Observations made by Mr. Thompson *at the Garden of the Horticultural Society at* Chiswick, *near London; by* Mr. Veall, *at* Boston; *by the* Rev. W. Dunbar, *at Applegarth Manse,* Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse,* Orkney.

Days of Month.	Barometer.							Thermometer.								Wind.				Rain.			
	Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.			Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.
1848. June.	Max.	Min.		9 a.m.	9 p.m.	9¼ a.m.	8½ p.m.	Max.	Min.		Max.	Min.	9¼ a.m.	8½ p.m.								
● 1.	29·854	29·656	29·33	29·58	29·34	29·46	29·42	60	49	55·5	52½	44	50	48½	w.	w.	sw.	calm	·08	·20	......	·10
2.	29·417	29·309	28·98	29·19	29·18	29·36	29·38	66	40	59·5	53½	46½	53	50	sw.	s.	sw.	ene.	·07	·15	......	......
3.	29·354	29·270	28·84	29·16	29·20	29·45	29·52	65	40	58	59	38	53½	50½	s.	s.	ne.	ene.	·03	·05	......	·14
4.	29·658	29·465	29·03	29·29	29·40	29·55	29·58	68	47	62	59	44½	51½	50½	sw.	s.	ne.	ne.	·07	·02	......	·11
5.	29·768	29·697	29·21	29·44	29·50	29·55	29·57	70	40	60	57½	46½	49	48½	sw.	w.	se-sw.	w.	......	......	......	·12
6.	29·869	29·787	29·30	29·56	29·56	29·53	29·44	73	46	62	57	43½	54	50	sw.	s.	sw.	s.	......	......	......	......
7.	29·861	29·788	29·35	29·50	29·54	29·46	29·49	73	47	63	58	48	54½	50	sw.	w.	sw.	s.	......	......	......	·11
☽ 8.	29·804	29·766	29·30	29·54	29·55	29·50	29·53	65	43	62	59	41½	55	50	sw.	w.	s-sse.	ssw.	·01	·10	1·40	......
9.	29·821	29·623	29·32	29·53	29·52	29·54	29·60	67	53	61	54	45½	56	49½	sw.	sw.	s.	wsw.	·27	·08	......	......
10.	29·627	29·576	29·14	29·42	29·52	29·57	29·65	63	53	61	61½	46	50	49	sw.	w.	s.	w.	·95	·43	......	......
11.	29·811	29·730	29·26	29·60	29·69	29·76	29·84	71	50	60	62½	44½	53	50	sw.	n.	sw.	e.	......	·06	......	......
12.	29·784	29·515	29·35	29·69	29·61	29·78	29·85	65	55	65	65½	40½	58	52	e.	w.	se.	e.	·78	......	......	·16
13.	29·919	29·499	29·03	29·30	29·27	29·75	29·49	65	42	60	57	49	51	48½	se.	sse.	se.–s.	ne.	·12	·52	......	·02
14.	29·974	29·934	29·48	29·55	29·69	29·42	29·69	73	50	60	59	46½	52	51	s.	se.	sw.	s.	......	·13	......	1·23
15.	29·833	29·770	29·45	29·78	29·83	29·95	30·02	80	56	68·5	68½	51	54	55	e.	se.	se.	se.	......	......	......	·24
○ 16.	29·822	29·748	29·36	29·84	29·83	30·05	30·06	82	54	63	70	49½	62	57	s.	e.	ese.	sse.	·09	·38	1·95	......
17.	29·800	29·754	29·35	29·80	29·75	30·06	30·01	72	54	64	65	55	60	56	sw.	ene.	ese.	e.	......	·40	......	......
18.	29·992	29·865	29·32	29·78	29·95	30·02	30·12	68	52	64	66	51½	59	52	sw.	w.	ese.	calm	·07	·04	......	......
19.	30·142	30·062	29·60	30·05	30·10	30·16	30·18	65	51	56·5	72	49	54	53	ne.	n.	sw-se.	w.	......	·17	......	......
20.	30·130	30·075	29·70	30·09	30·00	30·16	30·01	66	47	57	73	53	58	51½	ne.	......	ne.	w.	......	......	......	......
21.	30·065	30·063	29·60	29·99	29·99	30·10	30·09	77	52	61	73½	54	55	54	ne.	n.	se.	calm	......	......	......	......
22.	30·019	29·866	29·54	29·97	29·87	30·05	30·07	81	55	73	72½	55	54	51	e.	e.	se.	e.	......	......	......	......
23.	29·830	29·591	29·40	29·82	29·64	30·05	29·95	75	55	63	65	56	51½	51	e.	e.	e.	e.	·44	......	0·25	·05
☾ 24.	29·633	29·560	29·11	29·51	29·48	29·83	29·81	69	52	65	62	51½	54	50½	sw.	s.	ne.	ne.	·04	·69	......	......
25.	29·897	29·631	29·17	29·65	29·80	29·85	29·93	65	52	65	64½	49	50½	47½	sw.	wsw.	ne.	n.	·04	·09	......	......
26.	30·016	30·011	29·55	29·89	29·84	29·98	29·84	73	54	63	68½	45	54	48	sw.	n.	e—s.	ese.	·01	......	......	......
27.	29·923	29·776	29·40	29·60	29·43	29·54	29·38	70	57	62·5	60½	53½	54½	54	sw.	w.	s.	w.	·02	·64	......	·06
28.	29·859	29·807	29·25	29·48	29·56	29·35	29·44	69	50	65·5	61	52½	54½	52	sw.	w.	w.	w.	·02	......	......	·26
29.	29·758	29·619	29·10	29·42	29·47	29·52	29·59	71	48	57	63	52	54½	51	sw.	w.	w.	ne.	·01	·07	......	·07
● 30.	29·645	29·538	29·11	29·37	29·41	29·58	29·64	67	37	62	57½	50½	52	46	sw.	calm	ene.	n.	·08	......	2·50	......
Mean.	29·829	29·711	29·30	29·613	29·616	29·731	29·739	69·80	49·36	61·9	62·5	48·4	54·06	50·91					3·20	4·22	6·10	2·67

THE ANNALS

AND

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[SECOND SERIES.]

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XIV.—*Some Account of a diœcious Rotifer allied to the genus* Notommata *of Ehrenberg.* By Thomas Brightwell, F.L.S.

[With a Plate.]

Notwithstanding the laborious researches of Ehrenberg and other eminent zoologists among the microscopic animals, much obscurity still rests on their precise characters, and their mode of increase and propagation.

The Rotatoria of Ehrenberg (Systolides of Dujardin) are characterized as androgynous, combining the male and female parts in the same individual; but the facts we have to adduce go to show that, at least, one of the more highly organized species is diœcious; and that it is propagated by a union between the sexes, analogous to that of animals placed in a much higher class.

It appears that M. Doyère has discovered male organs and spermatozoa in the Tardigrades, a family few in species, but composed of two or three distinct genera. They are incorporated by Dujardin among the Systolides, and form, according to this author, a passage from the Systolides to the Helminthides on the one hand, and the Annelides and Arachnides on the other. In like manner the animal we have to describe may perhaps be found to connect this order with the Tunicata by some of the minute free gelatinous animals placed in this class.

We first discovered this animal six or seven years since in a small pond in this neighbourhood. It is found for a few weeks only, in the warmest weather, and in some seasons it disappears altogether. Last summer, and in other years, not a specimen could be found, but this year (1848) it has appeared rather plentifully.

The female (see Pl. VI. fig. 1) bears a general resemblance to *Notommata Syrinx* and *N. clavulata* of Ehrenberg, but it is somewhat larger than either species, and is without any caudal appendage whatever. It has also no anal opening, the fæces being rejected by the mouth.

The general arrangement of the internal anatomy is analogous to that of *N. Syrinx*. The stomach is a pyriform sac or bag with many cells, but without any lower opening. The two reniform bodies above the stomach, supposed to be hepatic or pancreatic, are very conspicuous in this species. Beneath the stomach and lying transversely and of a horse-shoe form is placed the ovarium, which in the young is a cylindrical bipartite organ, the parts being united by a central knob. On one side of the body is a very delicate membranous bag, often plicated. This organ is united to the ovisac, lying below, which ovisac receives the ova or fœtus, and is connected with a conspicuous opening in the side of the animal from which the ova and young are expelled. On the other side is placed the singular structure deemed by Ehrenberg the fertilizing organ. This consists of two or more delicate vermiform tubes running from the neck to the lower part of the body and curled at each extremity, and of a minute muscle or fibre running from the upper to the lower coil of the tubes internally, and upon which are arranged sometimes as many as twenty little cylindrical bodies somewhat resembling *Vorticellæ*, and in the interior of which may be discovered a strong spiral vibratile motion varying in intensity *.

At the bottom of the body of the female is generally seen a fœtus (see Pl. VI. fig. 3), which is found in all states, from the earliest period of gestation to a perfectly developed animal, and in which, in its maturer state, may be detected, while still in the body of the mother, the red eye, cilia actively playing, and most of the other organs of the adult animal. The young, when mature, are expelled from the side of the parent by the opening above mentioned, and are evolved by a violent parturition. They are for some days considerably smaller than the parent animal. The eye, the stomach, the two kidney-shaped bodies above it and the double ovary beneath may be most clearly seen in the female young. In other individuals, but more rarely, are seen one or two large round ova. When two ova are present they are placed one above the other, the lowest being always found opake and striated, and the upper one more or less transparent and reticulated, or covered with minute follicles. In these transparent ova may be detected the germ, or more advanced state, of the opake ova (see Pl. VI. fig. 4). The opake ova are dropped by the parent animal, but we have never seen any young in, or proceeding from, the ova.

* A quarter of an inch achromatic object-glass is necessary to see these organs.

The female preys on other Infusoria and Rotifera, and even on its own kind. Its most common food appears to be Infusoria of the genus *Gonium,* the cells of the stomach being constantly found distended with these animals. Large spinous Rotifers, such as *Brachionus Bakeri,* are not unfrequently seen entire in the stomach. The half or wholly digested food of the animal is rejected through the œsophagus.

The female is about half a line in length, and may be detected by the naked eye. The motion in swimming is slow and graceful, and the animal, having no prehensile organ, of course never rests.

The jaws of the female (see fig. 5) are curiously toothed, but seem more calculated for nipping and holding than for mastication.

The male animal (see Pl. VI. fig. 2) is about half the size of the female, and differs from it in form, being much shorter and of a rude triangular shape. It is more difficult to detect than the female, being exceedingly transparent, and from the emptiness of the body appearing little more than a transparent ciliated bubble. It is very active, and occasionally puffs out the sides of its body, so as entirely to alter its form, and remains thus distended some time.

On the most careful examination of the males we have never been able to discover any jaws, gullet, stomach, or hepatic organs in them, nor any appearance whatever of extraneous matter being received into the body.

At the bottom of the body on one side is a conspicuous round sperm-vessel or testis, in which, under a high power, spermatozoa in active vibratile motion may be seen, and at its external side a duct, closed by distinct lateral muscles. Connected with the testis is a well-defined intromittent organ and a conspicuous passage or opening for its extrusion from the body of the animal. In the opposite lower angle are three small irregularly-formed kidney-shaped bodies connected with an angular lobe or muscle lying beneath them. The male is also furnished with the delicate membranous plicated bag and rudiments of the curled tubular structure found in the female.

Observations upon the Ova.

June 15*th.*—Placed a female in a trough, having one of the transparent ova above and a dark ovum beneath in its body.

June 16*th,* 8 A.M.—Could not find the dark ovum. The transparent ovum remained and was become nearly dark.

2 P.M.—Found the female dead. Examined the ovum occasionally for upwards of a week without perceiving the least change.

June 17*th*, A.M.—Placed four females with opake ova in a trough by themselves.

June 19*th*, 7 A.M.—Found two of the opake ova deposited and all the four females dead. These ova were preserved eight or ten days and underwent no change.

June 24*th*, 8 A.M.—Isolated a female which had one clear ovum and one opake as above. 4 P.M.—It had deposited the opake ovum, which was occasionally examined for eight or nine days, but no change was perceived.

July 26*th*, 9 A.M.—Isolated a female having a small imperfect dark ovum, about half the full size, adhering to the ovarium, and also in the lower part of the body a full-sized semitransparent ovum. 7 P.M.—Found the semitransparent ovum become opake, and the small imperfect ovum a full-sized semitransparent ovum.

July 27*th*, 9 A.M.—Found the opake ovum deposited.

The ovarium when fertilized becomes tumid, somewhat dark, and abounding in minute globules. From the centre, where it appears divided, the ova are extruded. At first the vesicle is very small and filled with the same fluid as the ovarium; as it enlarges the vesicle appears brownish and opake, enlarging by degrees into the above-mentioned beautiful semitransparent, follicled ova (see Pl. VI. fig. 6).

Observations as to the Union between the Sexes.

June 15*th*.—Placed a male and six females in a small glass trough by themselves, and two males and about thirty females in a large trough.

June 16*th*, between 7 and 8 A.M.—On examining the small trough observed that the male on approaching one of the females attached himself to its side by the spermatozoid projection, and remained so attached from twenty to thirty seconds. The same male acted precisely in the same manner with four other females. These five connexions took place in about fifteen minutes.

At 8 A.M.—Watched the two males in the larger trough more than half an hour, the males swimming close to many of the females, but no conjunction took place. Observed the males frequently attach themselves to the glass by their heads and distend their bodies.

At 5 P.M.—Saw one of the males in the larger trough attach himself to a young one of the other sex for about twenty seconds, and afterwards to a full-grown female for a somewhat longer time. Saw this last connexion in a clear light most distinctly. The end of the sperm-tube was attached to the side of the female, and the rest of the body of the male was quite free. Saw the same male soon after fix itself by its head to the glass and remain so for thirty seconds, and during this time it continued puffing out and drawing in the sides of its body as if to give them their utmost dilatation.

June 20th, 5 P.M.—Placed a young female and a male in a trough by themselves and watched them very frequently till eleven at night, and though they came very near each other no conjunction took place.

June 21st, 8 A.M.—Found the female dead and the male alive. Put three other females to this male, and in a few minutes saw the male as soon as he approached one of the females attach his sperm-tube to its side and remain so attached fifty seconds. Soon afterwards he attached himself to another very young female and remained so attached seventy seconds. Could discern this latter connexion of the end of the sperm-tube with the side of the female very distinctly.

4 P.M.—Saw in the trough, by the aid of the microscope with a one-inch achromatic object-glass, a conjunction of a male with a female. On approaching the female the male attached himself by the sperm-tube to her side, and remained so attached nearly a minute. Saw this most clearly, but owing to the movement of the animals in the water it is almost impossible to see more than that there is a distinct adhesion.

Most of the above observations were made with a single lens only, of two inches focus, and the others with the microscope.

The animals seldom live above two or three days in the water-troughs, but in larger vessels they may be kept alive three or four weeks if they are supplied with water having *Gonia* in it.

The question, as to the fertilization of the ova, remains to be solved. It seems probable that they remain some time before the young are produced, and it may be, that being buried in the mud they remain there during the winter, and that the young are not hatched till the warm weather of the ensuing summer. On the other hand it is possible that ova are only produced by the unimpregnated females, and that these ova are not fertile. Careful and long-continued observations are necessary to determine these points.

It is well known that several species of insects, in their imago or perfect state, take no food, though provided with the usual organs for that purpose; but the case of the male of this Rotifer, destitute of instrumenta cibaria and all digestive organs, is, we believe, without precedent.

Probably other diœcious animals of the same class exist which have not come under observation. The whole subject invites the further attention of naturalists, and we are glad to know that, with reference to the immediate subject of this paper, they may expect from the able pen and pencil of Mr. John Dalrymple those further details respecting it, which his eminent attainments and metropolitan opportunities will so well enable him to afford.

EXPLANATION OF PLATE VI.

Fig. 1. Female highly magnified.
— 2. Male ditto.
— 3. Very young fœtus in the female.
— 4. Semitransparent ovum with the opake ovum inside.
— 5. Jaws of the female. The internal parts of the male and female will readily be recognized from the descriptions.
— 6. Ovarium with ova vesicles proceeding from it.

XV.—*Characters of seven new species of* Helix, *with amended descriptions of some species previously described, and Notes on others requiring remark.* By W. H. Benson, Esq., late Bengal Civil Service.

The following seven species of *Helix* are not described in the valuable monograph of the genus lately published by Dr. L. Pfeiffer, a work which deserves to find a place in the library of every conchologist. The first volume, besides monographs of several allied genera of less extent, contains the characters of upwards of 1130 species of *Helix*, inclusive of *Nanina* and *Carocolla*. I have also recast the characters of three of the species described by me in 1836, and included in the monograph, but which Dr. Pfeiffer had not had an opportunity of inspecting when his work was published; and I have noticed a few points in which correction will be required, where a species has either been twice admitted under different names, or has been founded on the young of a shell belonging to a different genus.

Other new species of *Helix* collected in India, at the Cape of Good Hope, and the Mauritius, I hope to describe on a future occasion.

1. *Helix Orobia*, nobis, n. s.

Testa perforata, depresso-globosa, tenuiuscula, radiatim plicato-striata, striis concentricis granulato-decussata, luteo-cornea, fascia infra periphæriam rufo-fusca ornata, versus apicem rufescente, basi pallidiori; spira rotundata, apice planato; anfractibus $5\frac{1}{2}$, superioribus planulatis, ultimo prope suturam tumidiore, periphæria subangulata; apertura subquadrato-lunata, peristomate recto, intus late albido labiato; margine columellari subverticaliter descendente, vix reflexo, perforationem subtegente, angulum cum margine basali expansiusculo efformante.

Diam. maj. 35 millim., min. 31. Axis 16 mill.

Hab. Darjiling regione Sikkim montium Himalayanorum.

Mus. nost. et Soc. Ind. Orient. Angl. Lond.

This shell, like *labiata, monticola,* and other Himalayan Helices, has frequent varices, the edges of former apertures, distinguished by obliquely radiate bands of a darker colour. It was received by Dr. J. F. Bacon from Darjiling. A specimen from Dr. Pearson is in the East India Company's Museum in Leadenhall-street.

2. *Helix solata,* nobis, n. s.

Testa perforata, depresso-globosa, radiato-striata, nitida, cærulescente-albida, antice rufescente, versus apicem rufo-castanea, punctis plurimis brunneis translucentibus quasi solata, fascia unica castanea supra angulum anfractus ultimi usque ad apicem decurrente, 1–3 obsoletis subtus ornata; anfractibus 5 convexiusculis, ultimo subangulato, angulo antice evanescente; spira obtusata; apertura obliqua, transverse ovato-lunata, peritremate intus fusco-castaneo, albo-marginato; labro recto, deflexo, margine columellari subreflexo, umbilicum fere tegente.

Diam. major 23 mill., minor 18. Axis 11 mill.

Hab. montibus Nilgherries Indiæ meridionalis. D. Jerdon.

I owe this species to the kindness of Dr. Jerdon, who sent it to me, with other interesting shells, from the Madras Presidency. He found it on the western face of the Nilgherries. I have a larger specimen from the same source in bad condition.

3. *Helix crassicostata,* nobis, n. s.

Testa late umbilicata, depresso-planata, albida, plicis validis irregularibus obliquis, juxta carinam incrassatis, munita; spiræ apice lævigato, vix elevato; anfractibus 4 planatis, ultimo carinato, subtus valde convexo, antice deflexo; umbilico infundibuliformi; apertura subhorizontali, transverse ovato-rotundata, marginibus conniventibus reflexis, callo brevi junctis.

Diam. major 13 mill., minor 10. Axis 4 mill.

Hab. in dumetis Indiæ meridionalis. Jerdon.

This species belongs to the same group as *H. ruginosa, H. fallaciosa* and *H. asperella,* all inhabiting Hindustan. It is most nearly allied to the former, but differs in its flatness above, its keel, colour, and wider umbilicus. Dr. Jerdon sent it to me, with *H. ruginosa,* from the jungles of Salem. Leschenault is quoted as an authority for the occurrence of *H. ruginosa* in Bengal, but it has never been met with by me nor by my correspondents in that Presidency. *H. fallaciosa* is also noted as a Bengal species by Pfeiffer in the 'Zeitschrift für Malakozoologie' for 1846, but in his monograph, Coimbatore and Ceylon are given on the authority respectively of Leschenault and Templeton. Dr. Jerdon sent it to me as occurring in jungles in the Carnatic. For *H. asperella* Dr. Pfeiffer has given only the locality of the specimens which I sent to Mr. Cuming, viz. Bithoura (not Bithonia) in the Gangetic Doab, where I first met with it in 1824. It occurred to me in greater abundance in Bundelkhund, and it is found in other places near the river Jumna, and to the south-west as far as Mhow in Malwah and Neemuch. I never met with it to the north and east of the Ganges.

4. *H. Capitium*, nobis, n. s.

Testa perforata, globoso-conica, subtrochiformi, lævigata, absque nitore, rufescente-cornea, subdiaphana, opaciter albido-laciniato-strigata et marmorata; spira conica, apice obtuso; anfractibus $5\frac{1}{2}$ convexiusculis, ultimo carina filiformi cincto, basi convexa; sutura impressa, marginata; apertura rotundato-tetragona; peristomate recto, supra expansiusculo, infra subreflexo; margine columellari late reflexo perforationem semitegente.

Diam. major 14 mill., minor 13. Axis 11 mill. Mus. nost. et D. Boys.

Hab. in palude prope Sicrigali provinciæ Bahar Indiæ Orientalis. D. Boys.

This remarkable species, the colours of which remind the observer of some of the Philippine shells, was found by Capt. W. J. Boys, 6th Bengal Light Cavalry, in a marsh between the detached hill washed by the Ganges, and the main range at Sicrigully in Bahar.

5. *H. Infula*, nobis, n. s.

Testa subperforata, globoso-conica, subtrochiformi, albido-cornea, pellucida, supra minime nitente, lineis distantibus parum elevatis cincta, subtus subnitente, radiato-striata, striis remotiusculis concentricis ornata; spira subconica, apice obtuso; anfractibus sex convexiusculis, ultimo angulato, infra convexiusculo; apertura subquadrato-lunata, peristomate acuto, margine columellari verticali, prope perforationem subreflexo.

Diam. maj. 7 mill. Axis 5 mill. Mus. nost.

Hab. prope urbem Murshedabad Bengaliæ, necnon prope collem Patharghata, provinciæ Bahar.

Formerly indicated as *H. turbiniformis*, mihi, in the Journal of the Asiatic Society of Calcutta. This name being used by Pfeiffer for another species, I have altered it for one of nearly similar signification. *H. Infula* occurred to me in 1835 on the leaves of trees and shrubs at the two places above-noted. The animal has a caudal protuberance like *Nanina*, but no expansion of the mantle, and is whitish spotted with brown, which, appearing through the translucent shell, gives the species a beautiful appearance when newly captured. At first sight it appeared as if the colours resided in the shell.

6. *H. radicicola,* nobis, n. s.

Testa perforata, subglobosa, tenui, virescente-cornea, translucente, subtus nitidiori, radiato-striata, striis concentricis delicatissimis decussantibus; spira elata conoidea, apice obtuso; anfractibus 4 convexis, ultimo obtuse angulato; apertura obliqua, subquadrato-rotundata; peristomate recto (acuto), margine columellari verticaliter descendente, supra late reflexo, perforationem semitegente.

Diam. major 10 mill. Axis 7 mill. Mus. nost.

Hab. prope Landour et Masuri, ad montes Himalayanos Mesopotamiæ Gangeticæ.

Obtained in the hollows at the roots of sycamores by Dr. J. F. Bacon and myself in a dark and precipitous ravine running down the north side of the Queinty range, behind Rockville, Landour. A few were once found by Dr. Bacon on the leaves of a shrub, poisonous to goats, called Aikhár, on the same range; and a single deserted specimen by Capt. Hutton in the deep valley behind Mussoorie. The animal is obscurely variegated with brown and whitish when seen through the shell.

7. *H. Trotteriana,* nobis, n. s.

Testa imperforata, globosa, tenuissima, translucente, corneo-virente, radiatim obsolete plicatula; spira brevi, conoidea; apice obtusato, lævigato, rubente; anfractibus 4 convexiusculis, ultimo ventricosiore; apertura obliqua, ovato-lunari; peristomate simplici, acuto; margine columellari filiformi, albido, polito, subverticali, leviter arcuato, intrante.

Diam. major $19\frac{1}{2}$ mill., minor 17. Axis 12 mill. Mus. nost., Cuming, &c.

It has much of the habit of *H. ravida* (mihi) of Chusan (Pfr. no. 69), but is imperforate and differs in other important points. It was taken alive near Uitenhage, South Africa, on the route from Graaf Reynett, by Robert Trotter, Esq., Bengal Civil Service (brother of the Commander of the late Expedition to the Niger), who kindly undertook to collect for me in a trip from Cape Town to the interior, and who got this new form in addition to others already known to science.

In the 'Zeitschrift für Mal.' for 1846, Dr. Pfeiffer states that *Helix Cestus,* Benson, is *H. similaris,* Fér., of which *H. Woodiana,* Lea, is another synonym. In his monograph, *Cestus,* Bens., also appears as a synonym of *H. similaris.* Dr. Pfeiffer cannot have seen an authentic specimen of *H. Cestus* from the N.E. frontier of Bengal, but possibly one of Dr. Cantor's Chinese specimens, which were referred, without sufficient examination, to that species, as, although allied, the former is sufficiently distinct from my specimens of *H. similaris* from the Mauritius and Southern India, as well as from the Chinese examples of the shell which

Lea described as *H. Woodiana*. I annex a more extended and accurate description than that given by me in 1836. The characters "testa perforata, subdepressa, spira subconoidea," already indicated a sufficient difference from *H. similaris*, which is "anguste umbilicata, subdepresso-globosa."

AMENDED CHARACTER.

H. Cestus, Bens. J. A. S. vol. v. p. 353, 1836 (Pfr. 884).

Testa perforata, subdepresso-conoidea, fuscescente-cornea, subplicato-striata, supra angulum castaneo-unizonata; spira subconoidea, apice obtusato; anfractibus 5, leviter convexis, supra subplanulatis, ultimi periphæria angulata, basi convexiuscula; apertura obliqua, depressa, minime transversa (altitudine latitudinem æquante), rotundato-lunari, superne labro antrorsum arcuato, expansiusculo, margine columellari basalique reflexis, illo dilatato, perforationem semitegente.

The greater narrowness of the perforation which is nearly concealed by the reflected columellar lip, the more obtuse apex, more planulate whorls, less convex base, the oblique, sinuous and less transverse depressed aperture, and the more angular periphery, serve, independently of colour, to distinguish *H. Cestus* from any of the varieties of *H. similaris*.

H. Cestus is from the same quarter as *H. serrula*, Benson, 1836 (Pfr. no. 540), of which *H. Bensoni*, Von dem Busch (Pfr. 568), is clearly a variety, *H. delibrata**, Bens. 1836 (Pfr. no. 959), of which *H. procumbens*, Gould, Bost. Journ. vol. iv. (Pfr. 1012), redescribed and refigured in Philippi's 'Abbildungen,' is a synonym, *H. plectostoma, climacterica, tapeina*, and the fine species *H. Oxytes*, Bens. The German conchologists mark these species as from Bengal, but they come from the mountainous region beyond the north-east border of that province, which is geographically a portion of the eastern peninsula beyond the Ganges; and it appears that *H. delibrata* is also found at Tavoy, in a lower latitude of that peninsula. The continental zoologists are apt to give a too extended signification to the term Bengal, confounding the province with the presidency; thus we have "Almorah Bengaliæ," "Meywar Bengaliæ," situated respectively in the Western Himalaya, and Rajpootana in Western India, the productions of which are quite distinct from those of Bengal and of each other, and the inhabitants of which speak a different language, and would hold themselves aggrieved by being confounded with the enervated occupants of Bengal proper.

* The character "depresso-plana" should have excluded *H. delibrata* from Pfeiffer's division No. 69, and should have placed it in No. 71, in which he has classed *H. procumbens*.

AMENDED CHARACTER.

H. tapeina, Bens. J. A. S. vol. v. p. 352, 1836 (Pfr. 541).

Testa depresso-conoidea, albido-cornea, irregulariter oblique striata, minutissime granulato-corrugata, subtus tumida; spira convexa, apice obtuso; anfractibus 6, subplanulatis, ultimo obtuse angulato; apertura valde obliqua, orbiculato-lunata, peristomatis margine superiori recto, antrorsum arcuato, exteriori expansiusculo, inferiori subreflexo, columellari dilatato reflexiusculo; umbilici infundibuliformis, omnes anfractus exhibentis, margine subangulato.

Diam. maj. 15 mill., min. $13\frac{1}{2}$. Axis $5\frac{1}{2}$ mill.

AMENDED CHARACTER.

H. climacterica, Bens. J. A. S. vol. v. p. 352 (Pfr. 577).

Testa imperforata, depresso-conoidea, carinata, albida, supra argute radiato-plicata, infra læviore, tumida; spira subconoidea, gradata, apice obtuso; anfractibus 8 angustis, arcte convolutis, omnibus carinatis, ultimi carina compressiuscula; apertura angusta, transversa, securiformi; peristomate acuto, infra subsaliente, expansiusculo; umbilici loco excavato, clauso.

Diam. maj. 19 mill., minor 18. Axis 9 mill.

H. Barclayana, Pfr. Monogr. Hel. Viv. p. 118. no. 305.

On an examination of this Mauritian shell in Mr. Cuming's collection, it struck me (from my observation of the adult and young of one of the smaller *Pupæ* of the Isle of France while alive in their native haunts, and which, at first sight, appeared to belong to different genera) that this supposed *Helix* was the young of *Pupa Pagoda,* Fér. (*Hel.*), which inhabits the woods around Curepipe in the same island. Mr. Cuming's stores affording specimens of *Pupa Pagoda* in different stages of growth, a comparison was instituted, which left no doubt of the specific identity of the two separated shells. *Helix Barclayana* will therefore require to be erased from the catalogue, a circumstance which I regret the more, as the name commemorated the conchological zeal of an old friend and schoolfellow.

H. petrosa, Hutton, J. A. S. vol. iii. p. 83 (Pfr. no. 114).

This species must be erased from the catalogue. Capt. Hutton's specimens were *H.* (*Nanina*) *vitrinoides,* Deshayes, and were imperfectly described by him in 1834.

H. (*Nanina*) *fragilis,* Hutton, J. A. S. vol. vii. p. 216, 1838 (Pfr. no. 89).

This is another species which Pfeiffer has not seen. In the note which I took of the shell when I had an opportunity of inspecting it, I find recorded "last whorl ventricose, slightly angular at the periphery," and "an angle at the base of the columella," characters which were not noted in Capt. Hutton's description. Capt. Hutton also describes the shell as "conico-discoidea." My note gives "conoid depressed." Pfeiffer says, "Habitat in Himalaya prope Kirmalliah." Capt. Hutton's habitat is "Kirmalliah, five miles from Neemuch," which is 100 miles south of Ajmere in Rajpootana, and 400 miles from the nearest point of the Himalaya.

H. proxima, Fér. (Pfr. no. 980).

The habitat "Coïmbator" is stated on the authority of Leschenault and Deshayes, as in the "presqu'île au delà du Gange," instead of "en deça du Gange," Coimbatore being south of Seringapatam.

Anostoma Boysii, Bens. (Pfr. no. 3).

The habitat of this singular little species of a rare genus, which I named after its discoverer, Capt. W. J. Boys, is given as Bengal, communicated by Dr. V. d. Busch, who doubtless received it, with other Indian shells (the source of which is not acknowledged in the 'Abbildungen' of Philippi), from Capt. Boys. This gentleman found *A. Boysii* among the stones of the Sâkà in the hill-fort of Chittore in Rajpootana. He got also a single specimen at Ajmere. The species has occurred in no other part of India.

Dublin, June 21st, 1848.

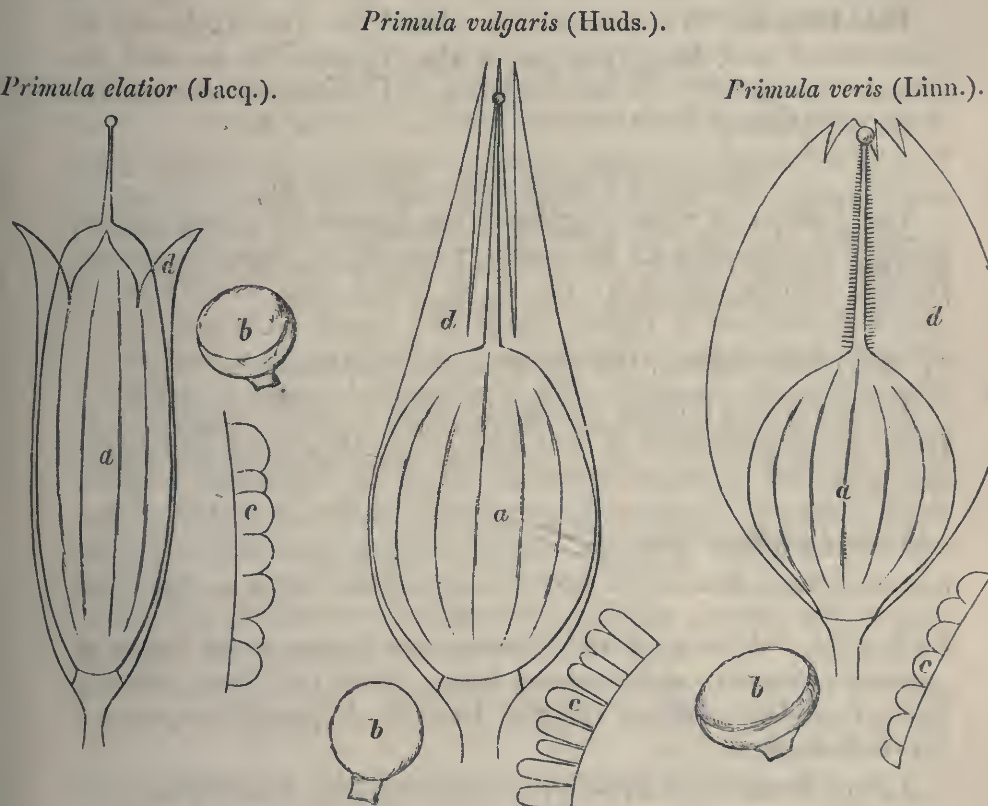
XVI.—*On the form of the Capsule and Seeds as affording a specific character in* Primula vulgaris (*Huds.*), P. veris (*Linn.*), *and* P. elatior (*Jacq.*). By the Rev. W. A. Leighton, B.A., F.B.S. E. & L.*

Very much has been written from time to time on the Cowslip, Primrose and Oxlip, both to prove their specific identity and the contrary; and many experiments have been undertaken with similar views, but as it appears to me without having arrived at any certainty. The question seems still an open one. Most of these writers, whose papers I have had the means of consulting, whilst they duly describe the forms and peculiarities of the leaves, flowers, scape and other parts of the above plants, never take any notice of the capsule and seeds. The same may be said of both English and continental botanists, whose works I have referred to.

It occurred to me that possibly good specific characters might

* Read before the Botanical Society of Edinburgh, July 13th, 1818.

exist in the form of the capsule and seeds. Accordingly, having a plant of the Bardfield Oxlip (*P. elatior*, Jacq.) in my garden, given to me in 1842 by my friend Mr. C. C. Babington of St. John's College, Cambridge,—and also Cowslips (*P. veris*, Linn.) and Primroses (*P. vulgaris*, Huds.), transplanted thither from the neighbouring fields, I determined to examine and compare the three plants in these particulars; and I was agreeably surprised to find my conjectures realized. The result of this comparison will be best exhibited by the accompanying drawings



a. Capsule. *b*. Seed. *c*. Surface of seed. *d*. Calyx.

of these parts in the three plants, in which the relative proportions of each to the other have been carefully preserved.

The capsule of *P. vulgaris* is ovate, half the length of the calyx, the seeds globose, their surface elongato-papillose, the style glabrous, the subulate teeth of the calyx straight and meeting together at their apices.

In *P. veris* the capsule is elliptical, scarcely half the length of the calyx, the seeds forming round flattened discs, their surface rotundo-papillose, the style hairy, the short triangular teeth of the calyx incurved and converging, but not meeting together at their apices.

In *P. elatior* (Jacq.) the capsule is linear-oblong, as long as, or even slightly longer than, the calyx, the seeds forming round flattened discs, their surface rotundo-papillose, the style glabrous, the ovato-lanceolate teeth of the calyx curved outwards.

Luciefelde, Shrewsbury, June 6th, 1848.

XVII.—*Notes, &c. on the genera of Insects* Erirhinus, Notaris, *and* Procas; *with descriptions of two new species.* By John Walton, F.L.S.

Fam. CURCULIONIDÆ.

Genus Erirhinus, *Schönh., Steph., Curt.*

It will be useful to remark, that the females of this genus have the rostrum long, slender, somewhat smooth, shining, minutely punctured in rows, and indistinctly striated; the males have it shorter, rather thicker, less shining, rugose-punctate, distinctly striated, and the antennæ placed nearer the apex.

1. *Erirhinus Festucæ,* Herbst, Gyll., Steph., Schönh.

There are two foreign specimens of this insect labelled '*Festucæ*' in the collection of Mr. Kirby from Gyllenhal, and I possess a British specimen returned to me by Schönherr with the same name; it is accurately described by Gyllenhal and Stephens, and chiefly differs from *Er. Nereis* in being much larger (length $2\frac{1}{2}$—3 lines); specimens however sometimes occur of the same size as that species, which are consequently extremely difficult to distinguish. It is recorded to be rare in England, but its rarity appears to arise from its habitat being strictly local; I believe a British specimen did not exist in any collection until I discovered its '*metropolis*.'

I have found it plentifully by brushing the salt-marsh club-rush (*Scirpus maritimus*) on both sides of the Thames, about low-water mark, between Blackwall and Woolwich, in July; and also near Lyndhurst on aquatic plants. "Ditches below Gravesend," Mr. Smith.

2. *E. Nereis,* Payk., Gyll., Steph., Schönh.
— *inquisitor,* Steph. Illustr.
— *lunula* et *Arundineti,* Kirb. MSS.

I have British specimens returned to me from Schönherr as *Er. Nereis.* It is generally about half the size of the preceding insect (length $1\frac{1}{2}$—$2\frac{1}{2}$ lines), and also differs in having the rostrum and antennæ shorter, with the articulations of the latter also shorter, rather stouter, and somewhat different in form; the elytra linear-elongate; these differences however are very slight when compared with specimens of equal magnitude, and require a practised eye to catch them.

Frequently found upon aquatic plants, in ponds and ditches, in June.

3. *Erirhinus scirrhosus,* Schönh., Steph. Man.
Rh. Nereis, Gyll. Ins. Suec. app. iv. p. 556.

Gyllenhal was undoubtedly correct in the subsequent change of his opinion as to the specific identity of this insect, by elaborately describing it under the first name*; it evidently differs in its general form from *Er. Nereis,* and the rostrum is decidedly stouter and more distinctly rugose; the thorax more deeply and closely punctured, with the punctures confluent; the elytra profoundly crenate-striate, especially on the interior towards the suture, clouded with testaceous and piceous black; and clothed with flavescent scales variegated with fuscous.

British specimens were identified by Schönherr as *Er. scirrhosus.*

I purchased five specimens from a dealer at York of the name of Chapman, who obtained them with a collection of British insects taken in the neighbourhood of Cambridge. Mr. S. Stevens has a specimen taken by Mr. Bond near Kingsbury; these are all that I have seen of this insect.

Genus Notaris, *Germ., Latr., Dej., Steph.*
Erirhinus, Schönh., Curt.

1. *Notaris acridulus,* Linn., et auct. alior.

A very common and well-known species.

2. *N. Æthiops,* Fab., Gyll., Steph. Man., Curt., Schönh.

Foreign specimens in the collection of Mr. Kirby from Gyllenhal, and others in my possession from Schönherr, confirm the name of this very distinct insect.

First discovered in Yorkshire by the late Rev. G. T. Rudd, who kindly furnished my cabinet with specimens.

3. *N. bimaculatus,* Fab., Gyll., Steph., Schönh.

A rare and very distinct insect.

4. *N. Scirpi,* Fab., Schönh.

Elongate-ovate, piceous, sparingly clothed with elliptical-lanceolate pale scales. Head small, punctulated; eyes subdepressed; rostrum rather longer than the head and thorax, moderately curved, black, shining, carinated above, distinctly striated and

* Schönh. Syn. Ins. iii. p. 312.

punctured. Antennæ as long as the rostrum and head together, slender, rufo-piceous. Thorax rather broader than long, a little narrowed in front, emarginated behind the eyes, rounded at the sides, convex above, piceous, thickly and coarsely punctured, the punctures confluent; a smooth narrow line in the middle; and an oblique slightly curved line on each side composed of pale scales. Scutellum ovate, densely covered with cinereous scales. Elytra elongate-ovate, almost twice as broad as the base of the thorax, and three times the length, rather convex above, deeply punctate-striate towards the suture, indistinctly so towards the sides, interstices convex, transversely rugulose on the back, and thickly granulated towards the sides; decorated with scattered small spots of pale ferruginous scales, and a round patch on each elytron a little behind the middle towards the suture; the pleuræ and the margin of the abdomen densely clothed with minute tufts of whitish hairs or scales. Legs rather long, moderately stout, rufo-piceous or testaceous, thinly clothed with short depressed hair-like scales. Length $2\frac{1}{2}$—4 lines.

The striated rostrum and elytra, with the white pleuræ, will at first sight distinguish this new British insect from *N. bimaculatus*.

First discovered by Mr. S. Stevens in a marshy place near Hammersmith, where it hybernates with numerous other insects in the dead stems of the great reed-mace (*Typha latifolia*).

Genus Procas, *Steph., Schönh.*
Erirhinus, Schönh. olim.

This genus was constructed by Mr. Stephens, and subsequently adopted by Schönherr; it is founded upon *Curc. picipes* of Marsh, and chiefly distinguished by having the rostrum subclavate, or according to Schönherr slightly incrassated towards the apex; its other generic characters assimilate so closely to the insects in the genus *Notaris*, that its claim to rank as a new genus appears to me rather questionable; but I have not ventured to differ from the above-named eminent entomologists.

1. *Procas picipes*, Marsh., Steph., Schönh., Kirb. MSS.

I transmitted a specimen as *Curc. picipes* of Marsh. and Steph. to Schönherr, who remarked, "*Erirhinus Steveni*, iii. p. 287, idem genus."

Very rare: there are specimens in the collections of the British Museum, Entomological Society, and of Mr. Stephens.

2. *P. granulicollis*, Walt.

Oblong-ovate, black, opake, clothed with cinereous and fuscous hairs. Head subglobose, closely punctured; front with a deep fovea; eyes subdepressed; rostrum as long as the head and thorax united, stout, moderately curved, obsoletely carinated above, thickly and closely punctured, the punctures confluent, sparingly pilose, slightly incrassated towards the apex. Antennæ rather long, rufo-piceous, pilose. Thorax transverse, abruptly narrowed in front, greatly dilated and rounded at the sides a little before the middle, slightly convex above, obsoletely carinated and thickly and closely granulated. Scutellum elevated, tuberculiform. Elytra oblong-ovate, the shoulders elevated, rounded, the sides not distended, moderately convex above, punctate-striate, the interstices broad, plane, closely granulated; rather thickly clothed with hairs, variegated with cinereous and fuscous. Legs moderate piceous-black; femora subclavate, simple; tibiæ straight, densely pilose, rufo-piceous, dentate at the apex internally; tarsi rufo-piceous. Length 3 lines.

Formerly I referred this to the preceding insect, but upon a closer examination I think it is sufficiently distinct, and may be discriminated, independent of minor differences, by having the head foveolated, the rostrum slightly incrassated at the apex, and the thorax granulated. *P. Steveni* of Schönherr agrees with this insect in many of its essential characters, and possibly may turn out a variety; but the thorax is described by Gyllenhal as very closely punctured, and the interstices between the striæ on the elytra as coriaceous.

The only specimen I have seen was found amongst moss and decayed vegetable matter from a wood at some distance from Carlisle in December by T. C. Heysham, Esq., who kindly presented it to me.

XVIII.—*On the Structure of the Shell of the Egg in Birds, and the nature and seat of the Colour.* By G. Dickie, M.D., Lecturer on Botany in the University and King's College of Aberdeen.

[With a Plate.]

Some remarks under the above title formed the subject of a communication read at a meeting of the Aberdeen Philosophical Society, March 6th, 1841. Not having since that time, in the course of my reading, met with any recorded facts of a similar nature, they are now offered, with some additions, as a contribution to that branch of ornithology termed Oology. Through the liberality of my friend Professor MacGillivray of Marischal College, I have recently had an opportunity of examining eggs not previously in my possession.

In Carpenter's 'Manual of Physiology' the following statements are made respecting the development of the outer coverings of the ovum. "As the ovum passes along the oviduct of the parent it receives its coating of albuminous matter, of which layer after layer is thrown out by the vessels of the oviduct. When a sufficient supply has thus been furnished, it appears that fibrinous instead of albuminous matter is poured forth, and this in coagulating forms a very thin layer of fibrous tissue which envelopes the albumen. Layer after layer is gradually added, and at last, by the superposition of these layers, that firm tenacious membrane is formed, which is afterwards found lining the egg-shell. The process is then continued with this variation, that carbonate of lime is also secreted from the blood in a chalky state, and its particles lie in the interstices of the fibrous network, and give it that solidity which is characteristic of the shell. If they be removed by the agency of a weak acid, or if the bird be not sufficiently supplied with lime at the time of laying, the outer membrane has the same consistence as the inner; and either may be separated after prolonged maceration, by dextrous manipulation, into a series of layers of a fibrous matting." I am indebted to Professor Fleming for an extract from Purkinje's essay on the Development of the Egg previous to Incubation. He describes the membrane of the shell as composed of two layers, the internal consisting of minute interwoven fibres; the outer, he says, presents no peculiar structure. The calcareous matter first appears in the form of polygonal crystals, which afterwards coalesce.

Sometimes the surface of the shell is smooth and glossy, occasionally unpolished but smooth, in other cases rough and granular, and in not a few covered with a superficial layer which may be easily removed. Such differences (as well as those having reference to colour) will of course affect the transmission of caloric to or from the contents of the egg, and these differences are accounted for by facts now to be stated.

My aim had been originally to ascertain merely the nature and seat of the colouring matter of the shell; it is freely acknowledged that the observations were begun with a preconceived idea that the calcareous part might be the seat of the colour. It was expected therefore that on placing a coloured egg in diluted muriatic acid, a coloured solution might be procured which could then be examined by chemical tests. The egg of the common guillemot (*Uria Troile*, Temm.) was first tried; its colour is usually bluish green with dusky blotches, sometimes the ground colour is white. The application of an acid soon proved the colour to be partly superficial; shreds of a fine membrane were detached; these on examination with the microscope were found to possess a distinctly cellular structure; a pale membrane of like appearance could be separated from the surface of the white variety. A similar structure was readily detected in other eggs, as those of the common fowl, bantam fowl, thrush, hedge-sparrow, &c. Careful examination of this superficial membrane led to the discovery of a finer, almost structureless, but membranous film beneath it. There had thus been detected a layer not alluded to by Purkinje, and in addition it was found that, contrary to the statement of that observer, the outermost covering of the shell really has a peculiar structure. In a word, the shell of the egg has the same general arrangement of parts as a mucous membrane or the skin: a superficial layer composed of cells, and another generally of finer texture on which it rests; the former corresponding to the epithelium, the latter to the basement membrane, as they are denominated by histologists.

In some cases the superficial layers are so delicate that the action even of very weak acid tears them into shreds, and when they are colourless or nearly so they may escape observation altogether.

It may not be irrelevant to state generally the facts ascertained regarding tissues similar to those under consideration. The epidermis or cuticle which covers the external surface of the body is composed of layers of cells, the most superficial continually wearing away or falling off; the deeper layers consist usually of nucleated cells; the more external do not necessarily include nuclei. The corresponding layer on the free internal surfaces of the body, and which is usually called epithelium, has a similar structure, consisting of flattened, often polygonal cells, sometimes in contact with each other, and forming consequently a continuous layer, but in some cases separated by considerable interstices; this variety is usually called tessellated or pavement epithelium, to distinguish it from that kind furnished with cilia. Beneath the epithelium we have the fine tissue denominated basement membrane. In its simplest form it is of extreme delicacy; "in some cases, to all appearance, perfectly homogeneous, presenting no trace of regular structure, appearing like a thin film of coagulated gelatine." Sometimes it is distinctly granular or even composed of nucleated cells.

The texture and consequently general appearance and thickness of the epithelium differ very much in different eggs. In that of the ostrich (Pl. VII. fig. 1) it is composed of contiguous thick-sided polygonal cells very much resembling the horny epidermis found upon the conjunctiva covering the cornea. In that of the emeu there exists a structure nearly similar, only the cells are smaller, and sometimes they are not contiguous but scattered. The surface of the egg of the emeu is very irregular, being covered with ridges and intervening furrows; it is quite possible that the structure of the epithelium on the ridges may differ from that in the grooves, but the small morsel of shell at my disposal prevented me from fully ascertaining this. I have not met with any other instance in which the epithelium presents a structure so decidedly cellular as in the former of the two above mentioned; still there are some in which there can be no doubt as to the nature of the tissue, the cells being, however, less distinct and rather irregular in size and form; as examples may be mentioned the guillemot, missel thrush, land rail, common grouse, redstart, greenfinch, &c. I have met with several instances in which the cellular structure of the superficial layer is not so evident, as in the blackbird, hedge-sparrow, chaffinch, common lark, &c. I am indebted to Mr. Strickland for an opportunity of perusing remarks on Oology by M. Des Murs, published some years ago. He speaks of the connexion between the appearance of the surface of the egg and the habits of birds and the climates in which they permanently reside, or in which they pass the breeding-season. He alludes to those of aquatic birds generally as having a shell, whose surface is usually unpolished; in some, as the cormorants and others, the superficial layer is easily detached. I may mention as an instance of this, the egg of the *Carbo Floridanus*; the surface is rough and without gloss, and appears as if it had been white-washed. This is owing to the nature of the epithelium, which is strong and composed of numerous crowded granules and cells. The use of an acid is not necessary for the separation of this epithelium, for if the surface of the egg be moistened, the superficial layer may be peeled off in pieces of considerable size. The fragments thus separated effervesce strongly with acid, and require its application previous to the use of the microscope, proving that in this instance at least, a quantity of calcareous matter is deposited in the epithelium and not in the fibrous layer only. A perpendicular section of the shell in this particular case shows that the thick epithelium with its calcareous deposit forms about one-fourth of the entire thickness. The egg of the *Ardea Herodias* (Linn.), like that just mentioned, has a superficial layer which may be easily removed;—it will be found to contain calcareous matter, and in some cases I have seen this deposit arranged in radiating crystals, presenting an appearance like that observed by Dr. Carpenter in the tooth of *Mya arenaria*, and compared by him to radiating arragonite or wavellite.

Des Murs alludes to a remarkable example, and, as he says, unique in the entire family of birds denominated terrestrial or non-aquatic: the case mentioned is that of the egg of the *Crotophaga Ani*; the surface is rough and covered with a chalky layer, on detaching which the egg is of a deep blue.

The nucleus of the epithelium cells is usually absent; it is however evidently present in those of *Ardea Herodias, Fuligula mollissima, Sterna arctica*, &c. In some instances the most superficial layer which I have been able to detect possesses no distinct cellular structure properly so called, but might be described as mostly granular, as in the wheat-ear, kestrel, mocking-bird, &c., or granulo-cellular, as in the egg of the darter from S. Carolina. In the epithelium of the egg of the wheat-ear, the granules when highly magnified seem to be often in linear and branched series, presenting therefore a faintly fibrous appearance.

Basement Membrane.—This layer, which is very evident in some instances, is not so easily observed in others. It is usually of very delicate structure, rendering careful manipulation necessary to demonstrate its presence. It is well-developed in the egg of the ostrich, in which its structure is densely granular. In the egg of the lapwing, &c., the granules under a high power appear to have a linear and sometimes branched arrangement, thus apparently presenting a transition to the fibrous structure.

In eggs of considerable size with a strong shell there appear to be several layers, at least of epithelium if not also of basement membrane, and in several instances the structural difference between the two is not very evident, there being a passage of one into the other.

In some cases, as in the egg of the blackbird, &c., there may be observed, first a delicate epithelium, beneath it a basement membrane, and lastly a single layer of loose fibrous tissue.

The colours of eggs may be viewed under two heads, first the ground colour, second the spots or blotches; these last are of various forms and sizes, and may either have a well-defined distinct outline, or their outline may be ill-defined.

M. Des Murs, in his remarks on this subject, inquires whether these colours are due to the chemical combination of sanguineous matter with the calcareous shell, or whether they are specially secreted by peculiar glands. He states that the minute papillæ which line the oviduct, and which pour into it the calcareous matter to form the shell, do also give vent at the time of egg-laying to sanguineous exudations which may cause the colour. But on the other hand he relates that he once found a lapwing's egg of a uniform green, almost wholly spotless. On blowing out the yolk and albumen, he further expelled a black and glairy lump, consisting of an agglomeration of the colouring matter, of a greenish brown, floating in albumen, and inclosed in a transparent follicle. This he says would seem to show that the colouring matter is a special secretion prepared beforehand in the oviduct, and in the present case he supposes that the mass of colouring matter had by some accident become inclosed within the shell instead of being distributed over its outer surface.

Nevertheless having failed to discover any special receptacle for such a secretion he adopts the first hypothesis, and supposes that the egg in descending the oviduct presses against the papillæ and causes sanguineous exudations, the ferruginous matter of which produces the brown spots on the shell. The *forms* of these spots he believes to afford proof of the opinion. The ground colour of eggs (whether uniform or spotted) he considers not to be a property of the calcareous matter as originally secreted, but to be subsequently superinduced, as is the case with the spots, the difference being that in the case of the ground tints the chemical combination of blood with calcareous salts which produces the colour takes place *uniformly,* and not *partially* as in the spots.

It may not be irrelevant to state briefly the facts recorded by histologists regarding coloured deposits in animal tissues. In the coloured races of men and in some portions of the skin of the white race, the colouring matter is usually deposited in some of the deeper-seated epidermic cells. In the substance of the choroid coat of the eye, in the iris, and in some parts of the sclerotic coat, there exist pigment-cells of irregular form. The epithelium cells of the inner surface of the choroid are also filled with colouring matter. This matter, differing somewhat in colour and intensity, consists of oval or oblong grains usually of very small size, $\frac{1}{10000}$th of an inch or less, and crowded in the interior of the cells.

The ground colour of the egg-shell may reside partly in the epithelium and partly in the deeper layers; in the former case the action of an acid by removing the epithelium scarcely affects the colour, rendering it only rather paler. As an instance may be mentioned the egg of the hedge-sparrow (*Accentor modularis,* Temm.); its most superficial layer or epithelium is readily detached on the application of weak acid; it is of great tenuity and mostly of a granular structure; the granules in the mass are of a very faint bluish green; the separation of this layer scarcely affects the general blue colour of the egg. When all the calcareous matter has been removed the remaining membranes are still blue, the colour residing in the deeper layers; the same general arrangement will be found in the eggs of the redstart (*Sylvia Phœnicurus,* Temm.), the wheat-ear (*Saxicola Œnanthe,* Bechst.), and *Turdus mustelinus,* Gmelin, in all of which the colour is nearly similar, differing only in its intensity.

As already mentioned, the spots may have a well- or ill-defined outline; both kinds are often to be observed upon the same egg, as in *Larus glaucus,* Temm., *Larus Rissa,* Mont., *Sterna arctica,* Temm., and others.

The egg of the common thrush (*Turdus musicus,* Linn.) is usually blue with generally well-defined black spots; the epithelium is very thin; the black spots mostly reside in it, and are produced by the congregation of minute pigment-granules which are of a dark brown; the ground colour is seated in the layer beneath.

In the egg of the kittiwake the epithelium is thin and almost colourless; the well-defined spots are seated in it. The deeper layer is of greater density, and is the principal seat of the ground colour and of those spots which have an indistinct outline. A similar arrangement occurs in the egg of *Larus glaucus*. In some cases the pigment-granules do not appear to be contained in cells, but merely densely congregated; in other cases, the *Sterna Hirundo*, Linn., for example, the pigment-cells are quite evident. If after removing the calcareous matter by means of an acid, the remaining coloured membranes of the egg of *Turdus mustelinus*, hedge-sparrow, &c., be macerated in alcohol, a blue solution will be obtained, which, when allowed to evaporate on white paper, leaves a permanent blue stain.

My friend Mr. Peter Grant has contributed the following notes respecting the action of certain agents upon the membranes (bluish green) of the egg of the foolish guillemot, after the calcareous matter has been removed. They are not changed by cold concentrated nitric acid, but are bleached by chlorine; strong fuming nitrous acid changes the colour to orange-brown; the addition of water changes that colour to grayish yellow. Iodine colours the membrane a deep orange-brown; on adding potash this colour is destroyed; the potash being removed by washing and iodine added, the same colour is produced as before; potash again decolorises it, and so on repeatedly. The membranes by long digestion in concentrated solution of potash gave a yellow solution, which with acetic acid in excess gave copious white flocks. The supernatant liquor afforded distinct indications of the presence of copper. The white flocks when washed and treated with iodine became gray, but were decolorised by potash. Concentrated nitrous acid was coloured yellowish by standing over them; the addition of water gave grayish flocks; the supernatant liquor with carbonate of ammonia yielded more flocks of a gray-yellow, which dissolved in dilute sulphuric acid; the ammoniacal liquid gave slight traces of copper.

The shell first deprived of epithelium and then boiled during two hours in concentrated solution of potass gave a dark yellow solution leaving a purple-olive sediment. This solution afforded evident indications of the presence of copper and manganese.

The olive sediment after being washed was found to be insoluble in muriatic or even strong nitro-muriatic acid. Boiled in nitric acid it gave a deep yellow solution, leaving a slight residue of colourless silica. The yellow solution afforded distinct evidence of the presence of manganese and iron.

The deeply-seated black and brown spots of the pale variety of the guillemot's egg were found to contain manganese, iron, and silica.

When muriatic acid is employed to remove the epithelium and dissolve the calcareous part of the egg of the lapwing, the natural colour is changed to green. If the shell, not deprived of epithelium nor the membrane of the albumen, be boiled two or three hours in concentrated solution of potass, it yields a dark yellow solution; the deeply-seated dark spots are now changed to red-brown. The yellow solution supersaturated by acetic acid yielded a brown flocculent precipitate; the supernatant fluid, still yellow, afforded traces of the presence of copper. If the shell, after being treated with potass, be now dissolved in very dilute muriatic acid, there only remain a few cobweb-like flocks. The solution contains lime, phosphate of magnesia, and phosphate of lime.

The pale variety of the guillemot's egg affords no trace of magnesia, but contains carbonate and phosphate of lime.

EXPLANATION OF PLATE VII.

Fig. 1. Epithelium and basement membrane of ostrich's egg.
— 2. The same from the egg of the emeu.
— 3. Superficial layer of the egg of the foolish guillemot; it may be most properly described as a cellulo-granular membrane having a tendency to become cracked into polygonal pieces. A few pigment-cells? are seen at one corner.
— 4. Epithelium from the egg of the missel thrush.
— 5. Epithelium and basement membrane of an imperfectly calcified egg from the dilated oviduct of a land rail.
— 6. Epithelium from the egg of *Carbo Floridanus*, Audub.
— 7. Epithelium from the egg of *Ardea Herodias*, Linn.
— 8. Epithelium from the egg of the redstart.
— 9. Deep-seated pigment-cells from the egg of *Sterna Hirundo*, Linn.
— 10. Epithelium from the egg of the greenfinch.
— 11. A layer subjacent to the true epithelium; it is the seat of the colour. From the egg of *Turdus mustelinus*, Gmelin.

XIX.—*On the Insects of Jamaica.* By Philip Henry Gosse.

[Continued from p. 114.]

21. *Heliconia Charitonia.* Of the extensive family *Heliconiadæ*, almost peculiar to tropical America, this is the only species that I ever met with in Jamaica; a circumstance which is the more remarkable, as several others have long been known as common to that island and the other Antilles. This however is perhaps the most abundant Lepidopterous insect we have; I do

not recollect any situation (except the interior of the forest) nor any season of the year in which it was not common. It was one of the very first objects that arrested my attention on first setting my foot on shore at Alligator Pond in December: its beauty and singularity of form, the great length and little breadth of the wings, the length and slenderness of the body, and the brilliant contrasts of colour, lemon-yellow and velvety-black, together with the very peculiar flapping of the wings, as if their length rendered them somewhat unwieldy, gave me a sensation of delighted surprise. It is very easily captured, being slow of flight and fearless: it flutters heavily along over low herbage at the sides of roads, &c., rarely mounting as high as one's head, except when alarmed. Low situations and the immediate neighbourhood of the sea-shore appear to be most affected by it. The commonness of this species has not presented to me any facts to lessen the profound ignorance that exists concerning the earlier stages of the insects of this elegant family.

The following note, though it has already appeared in print, I may add, as its omission would render the history of the species imperfect. Just behind the cottage of Content, a narrow, almost impassable foot-path winds along the steep mountain side, through tall bushes, to a secluded little plantation at some distance, embosomed in the forest, and known from its produce as the Coffee-walk. As we climb over the fragments of stone that lie in irregular masses blocking up the way, or scramble round their projecting points, we discover several cavernous recesses of greater or less depth and darkness, between the rock. In one of these, over the mouth of which hung down some bushes and trailing plants, I observed one evening just before sunset, near the end of August, a little swarm of these butterflies. They were about twenty in number, and were dancing to and fro, exactly in the manner of gnats, or as the *Hepioli* play at the edge of a wood. After watching them awhile, I noticed that some of them were resting with closed wings at the extremities of one or two slender depending creepers. One after another fluttered from the group of aërial dancers to the reposing squadron, and alighted close to those already settled, so that at length, when only about two or three of the fliers were left, the rest were collected in groups of half-a-dozen each, so closely packed together that each group might have been grasped in the hand. When once one had alighted, it did not, in general, fly again, but a new-comer, fluttering at the group and seeking to find a place, sometimes disturbed one recently settled, when the wings were thrown open and one or two would fly up again. As there were no leaves on the hanging stems, the appearance presented by these beautiful butterflies, so crowded together, their long, erect wings pointing in different directions, was not a little curious. An observant young friend residing near the spot, to whom I have been indebted for much valuable information in natural history, assured me, that every evening these *Heliconiæ* assembled in the same manner and performed the same evolutions, and that I had not seen a third part of the numbers often collected in that spot for the night's repose.

I should add, that this association, at least as far as I am acquainted with the habits of the species, seems exclusively nocturnal: during their diurnal flight I have never observed anything like sociality, with the exception of pairing individuals.

22. *Colænis Delila.* Nearly equally abundant with the preceding, this species is generally to be seen in the same localities. It is a low flier, flitting with fitful irregularity over the shrubs and herbaceous plants that are almost always in blossom by the sides of roads, on which it frequently alights. It is captured with ease, though, when alarmed, it is capable of powerful and rapid flight.

23. *Agraulis vanillæ.* This richly-silvered Fritillary is also an abundant species in the lowlands at all seasons. It affects waste fields, pastures, road-sides, the rank and tangled vegetation that fringes the edges of woods and similar situations, beating with irregular undulating motion over the flowers. It usually keeps near the ground.

The Jamaican specimens of this butterfly are all much smaller and less richly coloured than those of the same species which I have taken in Alabama, U.S.

The three species just mentioned, with *Cystineura Mardania, Anartia Jatrophæ* and *Paphia Portia,* are the most commonly occurring Lepidoptera in the winter months: in the spring, though these do not diminish in abundance, the *Pieridæ* begin to be abundant, and as the summer advances, the *Papilionidæ, Nymphalidæ* and *Hesperiadæ* become sufficiently numerous to divide the attention of the observer with the former.

24. *Euptoieta Hegesia.* This insect occurred sparingly at all seasons; chiefly at Sabito and other low situations around Bluefields, and in the neighbourhood of the sea-beach. Its manners are much like those of the preceding species, and as it hovers about flowering plants it is not difficult of capture.

25. *Melitæa Proclea.* Not far from the building known as Bluefields Tavern, on the road leading to the Creek, there is, immediately above the sea-beach, a little patch of ground on which formerly stood a negro-hut, now in ruins. The castor-oil plant (*Ricinus palma-Christi*), and the physic-nut (*Jatropha curcas*), which are always planted around the houses of the peasantry, have increased on this little spot with unchecked luxuriance, and,

mingled with the spinous *Bromelia pinguin* and the equally formidable *Guilandina bonduc,* present a tangled and almost impenetrable maze. In this very limited space, not exceeding the length of about a hundred yards along the road, this new species of *Melitæa* is plentiful from the end of March, onward through the summer. Yet I have scarcely found it elsewhere. It flits in and out among the bushes, dancing over them, and alighting every moment; yet manifests no perceptible preference for blossoms. From its indifference to the presence of man and its local attachment, it is netted with the greatest ease.

26. *Melitæa Pelops.* Not less local than the preceding, this pretty, pigmy butterfly haunts a very different scene, where however it is found in the most profuse abundance. At the spot where the Short Cut through the Paradise morass crosses the Sweet River by a ford available only in the dry season, a few square yards of the western bank have escaped from the dominion of the spreading bushes of black withe and cockspur, and are covered with a soft, dense, and deep carpet of what, from its aspect and perfume, I suppose to be a species of thyme, out of which spring scattered shrubs of the pretty *Cleome pentaphylla.* Hundreds of these diminutive *Melitææ,* the most minute butterfly with which I am acquainted, throng this secluded spot*, hovering about the fragrant herbage a few inches above the ground, or resting on the slender stems; many fly to and fro, united in sexual *copula.* Not one is to be seen on the opposite bank of the narrow stream, half-a-dozen yards distant, nor does the species extend its haunt beyond the space named, on its own side: its limits are commensurate with those of the thyme. I have found it equally abundant whenever I have visited the place, but as this is not accessible in the rainy seasons, I can speak only of the winter and spring months. Nowhere else, however, have I at any time seen a single specimen.

There is little except difference in dimensions and peculiarity in local habitat to distinguish this species from the preceding; yet I feel satisfied that they are distinct.

27. *Melitæa* (sp. nov.? near *Tharos*). Less common than its congeners, this species yet occurred in some numbers in the summer months in the same locality as *M. Proclea,* and thence onward to the Creek. Its habits differ little from those of that species.

28. *Anartia Jatrophæ.* Throughout the year this delicately tinted butterfly is the constant companion of *Heliconia Charitonia,* with which species it might dispute the palm of abundance.

* In my note of *Galeruca Domingensis* (*v. ante,* p. 110) the allusion to *Melitæa Proclea* is an error of nomenclature; *Pelops* is the species intended there.

In its fondness for ditches, banks, and other situations of dense rank herbage, in its swift but irregular and vacillating flight, often interrupted by the temptation of a flower, and in its general habits and aspect, it reminds the observer strongly of the common European *Vanessæ.*

29. *Vanessa Lavinia* (var. *Genoveva*?). Rather common in the winter and spring at Sabito and other lowland localities.

30. *Eurema Tecmesia.* This beautiful species, which in the markings of its wings both above and below cannot fail to recal the varied pattern of our own *Cardui* and *Atalanta,* I met with but rarely, and only in mountain localities. About the end of March I took two specimens playing around the summits of some flowering bushes, three or four yards high, at the brow of Bluefields Mountain. They often alighted to suck the blossoms, but were shy of approach, easily alarmed, swift but irregular and fitful in flight, and therefore captured with difficulty. In the middle of June I took another in the Bamboo Walk on Grand Vale Mountain, a sombre spot environed by the tall forest on one hand, and by the graceful overshadowing bamboos on the other, much resorted to by that striking butterfly *Gynæcia Dirce,* a species rarely met with in other localities. These are almost the only instances in which I obtained the present species, except once or twice on the Hampstead Road.

31. *Cybdelis Hyperipte*? Near the end of June 1846, as I was proceeding along the coast from Bluefields to Kingston in a little trading smack, we were lying windbound in a bight of the dreary, rocky and inhospitable shore, marked on the charts with the sufficiently appropriate name of Starvegut Bay. Having nothing to do on board, I took a walk on shore, climbing over the immense masses of fragmentary rock, against which the surf was beating and boiling with furious violence, and shooting up ever and anon white jets of vapour-like spray through the sea-worn holes. In the woods, which consisted largely of the cashaw (*Prosopis juliflora*), intermingled with some species of *Inga* and the great *Cactus Peruvianus,*—a vegetation totally different from that in the neighbourhood of Bluefields,—I observed a Vanessa-like butterfly, of brilliant blue iridescence, and some white spots near the tip of the fore-wings, which I doubt not belonged to this species. I had never met with it before, and as I had no net with me, I did not capture any now. It was however in some abundance; flitted along close to the ground, in the shadow of the woods, allowing an approach within a distance which would have rendered its capture with a ring-net an easy matter. Its manners bore some resemblance to those of the *Satyridæ.*

32. *Cystineura Mardania.* This again is one of the most abundant of insects in those parts of Jamaica with which I am

familiar, more especially those which are of low or moderate elevation. Around Bluefields and along the neighbouring shore it is particularly numerous at all seasons. It flies low, alighting but little, proceeding with a dancing or jerking motion over the herbage, with no great rapidity, so that it becomes an easy booty to the entomologist.

33. *Nica Cadma.* I took this once in April, in a pasture behind Bluefields, and two or perhaps three times, on the Hampstead Road in June and July. When in good condition the purple flush upon the red of the posterior wings is very rich and beautiful.

34. *Eubagis Zetes.* In the month of June I first met with this little butterfly about midway between Bluefields and Savanna le mer; two or three specimens then occurred, not exactly associated, and yet not far from each other. They were playing about some shrubs by the road-side and were easily caught. A few others occurred in July, after which I saw it no more. I think on all occasions that I met with the species, which were but few, I found several at no great distance from each other. It seems a lowland species, and limited in the season of its activity to the middle of summer.

[To be continued.]

XX.—*An Account of the Germination of* Isoëtes lacustris. By Karl Müller*.

[With two Plates.]

[Continued from p. 93.]

5. *From the epoch when the Germ-plant breaks through to the formation of the second Leaflet.*

In the germinal body (*Keimkörper*) may be distinguished: 1, the reservoir for nutrient matter mentioned in foregoing paragraphs. To facilitate the descriptions I will call this the *alimentary organ* (*Nahrungsspeicher*); 2, *the matrix of the root*; 3, *the vagina*; 4, *the scale of the first leaf*; 5, *the cell of the second leaf*, or to describe it in more general terms, the point of gemmation for all the following leaves; 6, *the first leaf*. I shall have to consider these in a somewhat different order, in accordance with the development of the plant.

1. The *Alimentary Organ.*—This part of the germinal body

* Translated by Arthur Henfrey, F.L.S., from the Botanische Zeitung, April 28, 1848.

first becomes distinctly visible in the stages just preceding the breaking-through of the ovule (Pl. II. fig. 15 *c*). It here lies close to the matrix of the root (fig. 15 *f*), which at this period it wholly resembles in shape. Each of these constitutes one-half of the germinal body, the matrix of the root that one on which the vagina of the leaf-bud occurs, the alimentary organ the opposite. Upon the two rests the first leaf, so that the vagina is pushed a little to one side.

The alimentary organ is composed of very small, parenchymatous cells, which are so densely filled with granular contents that the organ is clearly defined, in contrast with the matrix of the root, as a darker-coloured body. The manner in which this kind of cell-contents is restricted to the cells of one-half of the germinal body is exceedingly striking. This matter takes a deep blue colour with iodine, and thus clearly displays its amylaceous nature. By means of this reagent also we find that the amylum has not been deposited all at once in this region. Even in much earlier stages, for instance in fig. 11 *a*, the formation of it has commenced, and it continues gradually from that time till the alimentary organ is perceptible as an independent part of the germinal body.

Amylum-cells are indeed found in very early stages in other parts of the embryo, for example in fig. 11 at *d* also; but at this point they become rapidly absorbed and applied to the further development of the embryo. As for the rest, the amylum originates from one and the same matrix in all parts of the plant, namely from the cytoblast. This is but a new confirmation of the observations which I had an opportunity of making formerly in *Chara crinita**, and which have been confirmed by English botanists, especially by Quekett†. It here appears that single cytoblasts become decomposed into many starch granules (Pl. II. fig. 17 *f*, Pl. III. figs. 18 *d*, 20 *f*, 21 *c*), since in those cells where the starch granules occur, the cytoblasts have wholly disappeared, and yet no other matter is present. This agrees also with the formation of chlorophylle; for in those cells where this occurs, nothing but cytoblasts are to be found at an earlier period. These suddenly vanish and a quantity of granules appear in their place, which at first acquire a blue colour with iodine, and consequently have been transformed into starch; subsequently they become perfectly green.

By degrees, accompanying strictly the gradual development of the germinal body, the starch of the alimentary body undergoes

* Bot. Zeitung, 1845, p. 833, "Einige Bemerkungen über die Bildung des Amylums." (Remarks on the Formation of Starch.)

† Bot. Zeit. 1846, p. 767 (from the Annals of Natural History, Series 1. vol. xviii. p. 193).

solution. It does not wholly disappear until the time when the second leaflet emerges from the vagina and acquires a green colour. Then the cells of the alimentary body which have step by step become looser and more transparent are found quite empty (figs. 22 *c*, 23 *c*), and their membranes of a brown colour. I have never observed them to become again filled with any kind of matter. It appears to me probable, that we have here, on a small scale, what afterwards happens on a large one in the rhizome of *Isoëtes*, where the outermost layers, so soon as they have fulfilled their functions in the service of the leaves, when these decay are also destroyed, since they are then to be met with only as a brown spongy tissue forming the brown lamellæ on each side of the rhizome.

2. The *Matrix of the Root*.—Although it is impossible to perceive where the first root will be developed, in the stage where the matrix and the alimentary body have exactly the same form (fig. 15 *c*, *f*), there is no doubt about the matter in the stages of development which soon succeed, since the root now unfolds very rapidly.

In this we find conditions exactly opposed to what occur in the alimentary body. The matrix of the root is composed of the same small parenchymatous cells. As in that, these originally possess distinct cytoblasts. But unlike what we found there, these do not become transformed into starch, but are dissolved at once into an almost transparent cytoblastema. This is the first stage of the development of the root; by this the matrix obtains nutrient matter, by means of which its further unfolding is rendered possible. The formation of new structures takes place here, as may usually be seen very distinctly in all rootlets, at the apex. And it must be noticed that the cytoblasts are first dissolved at the very apex of the matrix, this process gradually extending to the remaining portion (fig. 17 *e*, *g*). The primordial cells of the apex of the rootlet, which are of extremely delicate texture, appear empty at this stage.

An important alteration soon succeeds. All the cells of the matrix are empty, while this has become elongated gradually and in such a manner that the apex appears rather thin and the back part thicker and club-shaped (fig. 18 *e*). The most external layer of the cells of the matrix may also be easily distinguished from the internal. The former have become firmer and inclose the latter as an epidermis. It is striking here that the cells of its extreme point contain cytoblasts within them (fig. 18 *g*).

The most essential change however that occurs in this stage is the first appearance of the vessels (fig. 18 *f*). These emerge as two short cords from the interior of the alimentary body, and I have never been able to discover the point whence they originate.

In *Selaginella* this may be seen very distinctly, as it manifests itself as a darker point in the interior of the germinal body. Perhaps a similar condition may exist here. The vessels themselves are darker where they emerge from the interior of the alimentary body; they run gradually out into the more anterior cells of the matrix, becoming continually more transparent.

In all the stages up to this point the root still remains inside the coat of the nucleus. Now however it breaks through this. Its escape takes place exactly opposite to the point where the first leaflet emerged (fig. 20 *g*). If the plant is extricated from the coat of the nucleus in this stage, it presents the appearance shown in fig. 20 *c*. We have here no longer any doubt of the existence of a root; it has become considerably elongated, but internally it has not altered essentially since the stage of fig. 18, where it still remained within the ovule. The external layer of cells still appears in the likeness of an epidermis, the internal cells have not altered in size or form, the point of vegetation at the apex remains still composed of the small-celled tissue, and the vessels alone have become elongated.

This condition however does not persist long; for as we pass next, in fig. 21 *a*, to a stage where the second leaflet begins to emerge from the vagina (fig. 21 *d*), in the first place the epidermoid, external layer of cells has disappeared, since the membranes of the internal cells having acquired greater consistence, no distinction between the outer and inner cells now exists. Moreover the cells are empty and transparent, differing from what was the case in the former stages, where they were always densely filled with a very delicate, clear cytoblastema; only the cells of the point of vegetation, situated at the apex of the root, are now provided with cytoblastema. Since these cells are here still small and extremely delicate, the cells of the outermost layer, which are of firmer texture, again appear like an epidermis (fig. 21 *c*), which has now altogether ceased to be the case with those cells lying further back. These latter are now much elongated in proportion to what they were in the former stages, and the result of this is an elongation of the whole root generally. This explains why they are quite empty, since their contents have been applied in all probability to the enlargement of the membranes.

The vessels have equally undergone a change. These are no longer seen to run as two distinct cords through the interior layers of the cells of the root; they are rather blended into a single mass which now runs almost to the point of vegetation of the root. But notwithstanding this combination, each vascular bundle runs forward in an independent condition. If one of these is extracted from the root, it appears, in the shape of the figure 21 *b*, as a longish utricle of an extremely delicate, hyaline membrane. At the extremity by which it penetrates through the cellular tissue of the leaf, it appeared to me to end in a point, while the other portion which extends through the root ended abruptly. The most interesting matter to me in the vessels was the formation of the spiral fibre. The rudiments of this consist of a number of hyaline granules, which originally have a quincuncial arrangement (fig. 21 *f*), but subsequently become blended into rows in the form afterwards presented by the spiral band. I never saw more than *three* globules in one plane, which was wholly in focus at once beneath the microscope, and comprised about one-half of the utricle of the vessel, and these lay one upon another in various directions. Consequently six of these globules must belong to each turn of the spiral. In my case, as in that of many others, all observations have failed to demonstrate the origin of the vessel. So far as I have seen, the vessel could never be reduced to a cell, since cross septa could never be discovered in it. It appeared to me almost as if the utricle of the vessel, having its origin in the alimentary body or between it and the matrix of the root, went forth at once as an independent utricle into the leaf and root, for it could not be difficult at this time for it to penetrate through the tissue of the leaf and root, since this was extremely delicate and mucilaginous at the first origin. However nothing definite can be said upon this point. But on the other hand, the origin of the spiral fibre is easier to trace here. It agrees in every respect with what I observed in *Selaginella*, and I have nothing further to add upon the subject. Subsequently, when the second leaflet has begun to rise out of the vagina, the vascular bundle divides into two (fig. 22), each of which is composed of two cords.

3. The *First Leaf*.—The same events which occur at the lower part of the germinal body, in the root, take place above in the first leaf. The two organs are parallel with each other in many respects. The formation of the vascular bundle is exactly the same here. The cells, too, are at first small, delicate and parenchymatous, wholly as in the root. Thus they are when the leaf breaks through the coat of the nucleus. The next elongation of the leaf occurs by the expansion of these cells. Thereby they become longer but of a paler green (fig. 17 *a*), having previously had a very beautiful deep green colour (fig. 16 *b*). Not until much later does the elongation of the leaf appear to result from the formation of new cells, which in all probability occurs by division, since we never see a point of vegetation at the apex of the leaf like that of the root. Neither have I observed it at the base.

There is little to be said concerning the leaf itself. When it has emerged from the ovule, it always has a curved, often a hooked direction.

The most interesting point about this organ is, that, after the coat of the nucleus is burst, the germ-plant no longer remains at the bottom of the ovule, and the leaf has not merely part of its apex but almost its whole length situated outside the opening (figs. 16, 17, where the drawing exhibits the condition more accurately). At a subsequent period only does the germ-plant reach the bottom of the ovule by means of the root, running downward and piercing through the coat of the nucleus below (fig. 20 *g*). This rising of the germ-plant in the nucleus certainly depends upon its being specifically lighter, the germinal body evidently not being heavy enough to retain the plant at the bottom of the nucleus.

It has already been mentioned above (§ 4.), that the future furrow of the leaf exists in a rudimentary condition very early, as a fold, in the embryo.

4. The *Leaf-scale.*—Of this also it has been previously seen that its rudiments are formed very early, since the mother-cell of it appears in that stage when the separation of the germinal body into alimentary organ, root, vagina, &c. scarcely exists (fig. 11 *c*). As such it is seen to remain for a long time, without essential alteration of its form (figs. 11 *c*, 12 *f*, 13 *d*, 15 *d*). In the mean time however a process of cell-formation has taken place similar to that previously occurring in the mother-cell of the embryo. New cells have been formed. By this means the shape of the mother-cell has been somewhat changed; it has become a body densely filled with cellular tissue. This stage of the scale is found in that germ-plant which is represented in Pl. II. fig. 15. The scale which previously had the appearance of a globule has now become a smooth disc which stands close against the cell of the second leaf lying below it (figs. 16 *c*, 17 *c*).

During the continuous growth of the germ-plant it attains its highest stage of development, when the vessel of the first root begins to show itself (Pl. III. fig. 18 *h*.) It is then a flat, broad, more or less reniform disc which is somewhat folded together, so that the succeeding leaflet is almost entirely surrounded by it, whence one might be led to imagine that it only existed on account of its connexion with that succeeding leaflet.

It is composed of very delicate parenchymatous cells which contain nothing in the young condition of the plant, when the cytoblasts of the cellular tissue have disappeared, though sometimes these are to be found persisting for a longer time. The scale is often toothed on the border with extraordinary regularity. In such cases one cell projects from the border as a sharp tooth while the next remains unextended, and then the third cell again projects as the second tooth. I have however also found the scale very irregularly toothed. This is indeed a disc, but not rounded off like the former, rather apiculate above, and furnished with horn-like projecting cells of considerable size.

The second scale, that of the second leaflet, is also a disc, and the one which I found as such deviated again from the forms of both the preceding, being of a more or less oval shape and furnished with some minute projecting cells at the apex.

By the sight of these scales I was reminded instantly of that accessory organ which I found in the *Selaginellæ*, and of which I have given a complete history of development. I at once concluded these to be of the same morphological import. In a treatise by Mettenius on *Azolla** which appeared just at that time, he compared the scale of *Isoëtes* with a *ligule*, while he referred the organ of the *Selaginellæ* to an axillary *stipule*. I will not venture to decide either for the one or the other, but I think, as I have said, that they are of similar origin and also of similar import.

To complete the characterization of the scale I will add the description of Mettenius (*op. cit.*), since this observer has examined it on the mature plant, which I have not:—"In *Isoëtes* this scale occurs on the fertile and barren leaves. In young leaves it is seated on the surface, in old ones apparently in an excavation, since its lower part is ensheathed by the substance of the leaf, and only the upper scale-like portion lies free upon the inner face of the leaf. The point of attachment of the scale is broader than the proximate ensheathed portion, and is formed of a cellular tissue distinctly defined from the parenchyma of the leaf. The nerve of the leaf runs up behind the point of attachment, and the cellular tissue surrounding this contains numerous spiral-fibrous cells, which extend down to the point of attachment of the sporangium."

5. The *Vagina*.—We found the first rudiment of this in the stage of fig. 11 *b*; there were then only isolated spherical cells, elevated above the surface indicating the vagina; subsequently they are raised up with the matrix of the root in such a manner that they are now connected in an uninterrupted line with the furrow of the first leaflet (figs. 12 *d*, 13 *c*, 15 *g*). At this time these single cells surround, as a cup, the second leaflet projecting out beyond them (figs. 17 *h*, 18 *i*, 20 *h*). They then become multiplied by division, and thus very delicate and minute, so that this tissue is now distinguished in a marked manner from that surrounding, by its greater delicacy (fig. 21 *g*). Thereby it may be observed that a peculiar delicate membrane, composed of a simple layer of cells, is in course of formation.

* Linnæa, 1847, p. 270.

This is very apparent when the second leaflet has become considerably elongated beyond the margin of the vagina (figs. 22 *d*, 23 *d*), and it is most closely connected with the furrow of the first leaf. Looked at from this point, the vagina appears abruptly cut off.

By the time the third leaflet appears, the vagina has vanished and the bases of the two first leaves surround the third as a sheath, as is the case in the full-grown plant (fig. 24 *d*).

6. The *Second Leaf*.—The rudiment of this also is formed at a very early epoch, and in fact at the time when the first leaf is still a mother-cell. Consequently two mother-cells, for two different organs, occur close together in the vagina, which itself is in the earliest stage of formation (figs. 12 *c*, 13 *b*, 15 *e*, 16 *d*).

While the mother-cell of the scale grows into a disc-shaped body, the mother-cell of the second leaf expands more and more in a globular form. It is soon observed that, already in this form, cellular tissue has been produced in its interior (fig. 18). This epoch is contemporaneous with the perfect formation of the scale of the first leaf. From this cause the vagina has become drawn so closely round the second leaflet (figs. 18 *i*, 20 *h*), that the latter is ensheathed in it, as an obtuse conical body.

Very soon, however, the first leaflet rises out far beyond the vagina, at the same period when this has acquired a rather delicate membrane (fig. 21 *d*, and the vagina *g*). The leaflet is by this time green, and when seen from the side, as in fig. 21 *d*, it appears somewhat compressed on two sides. No great changes go on meanwhile in the second leaflet until it emerges from the now much-elongated vagina (fig. 22 *e*). By that time the second scale has been formed at the base, inside the vagina. The most important change however has happened at the base, underneath the vagina. Here a gradually-formed protuberance displays itself, composed of very delicate cellular tissue (fig. 22 *f*). This is the rudiment of the second rootlet, or that of the second leaf. Its further development resembles that of the first rootlet. As it becomes elongated the vessels may soon be observed, of which two again display themselves here (fig. 23 *e*). The cells are at first delicate and full of cytoblastema. Subsequently, when considerable elongation has taken place, they become emptied and of longer shape, exactly as in the first rootlet, wholly as in the leaflet itself.

I have already mentioned that about this time the vascular bundle of the first rootlet has become divided into two (figs. 22, 23).

[To be continued.]

XXI.—*Observations on* Mr. M'Coy's *Paper on some Fossil Fish of the Carboniferous Period.* By Sir Philip de Malpas Grey Egerton, Bart.

To the Editors of the Annals of Natural History.

Gentlemen,

I have just perused a paper in the Number of your Journal for July last by Mr. M'Coy, in which he proposes a very important alteration of Agassiz's arrangement of the Ganoid Fishes from the Palæozoic formations. The passage I allude to is the following:—

"I provisionally propose to establish a distinct family under the above name (*Placodermi*), to include those Ganoid fish of the palæozoic rocks having the head and body encased in a series of odd or central, and of subsymmetrical or lateral, bony, variously tuberculated plates of large size. It might probably include all the genera described by Agassiz in his 'Monog. du Syst. Dévon.' &c., under the title *Cephalaspides*, except *Cephalaspis*, to which that family-name might be retained, the other genera having no obvious affinity with it; in addition to these, the present group will conveniently embrace the genera *Bothriolepis, Asterolepis* and *Psammosteus,* which, although widely separated from the former by Agassiz and placed by him in his family of Cœlacanths, are so obviously and closely allied to some of them (e. g. *Chelyophorus, Coccosteus,* &c.), that they cannot be separated either by general appearance or any points of structure with which we are acquainted; while they differ, on the other hand, from the other *Cœlacanthi* by the body not being covered by imbricating scales."

Not having seen the specimens which have induced Mr. M'Coy to propose this new classification, I am unable to form any opinion as to whether he is justified or not in making the change; I cannot however allow a charge to be brought against my friend Professor Agassiz, in his absence, of having grouped together genera under the title *Cephalaspides, having no obvious affinity* with the genus *Cephalaspis,* and having *widely separated* genera *so obviously and closely allied to some of them, that they cannot be separated either by general appearance or any points of structure,* without claiming that in justice to Agassiz, his opinions on this subject may be accorded in your pages the same publicity which Mr. M'Coy's observations have already received. The following passage must surely have escaped Mr. M'Coy's memory when he claims to have discovered affinities (supposed to have been overlooked or disregarded by Agassiz) of sufficient value to justify a re-classification of the Palæozoic Ganoids:—"Il y a un rapprochement évident entre les Coccostées et les genres large-ment cuirassés de la famille des Célacanthes, tels que les Asterolépis et les Bothriolépis. * * * Les Coccostées étaient évidemment déjà des poissons voraces, comme le montre leur dents coniques, aiguës, et leur longue queue plate et flexible. Il y a sans doute loin de là à cette armure formidable des Bothriolépis, à ces dents acérées des Dendrodes (Asterolépis); mais on en conviendra, il y a dans la famille des Céphalaspides un acheminement vers ce caractère rapace, et si l'on y joint la structure des plaques, la ressemblance que présentent les granules épars des Coccostées avec les astérisques des plaques des Asterolépis, l'on se convaincra facilement, qu'il n'y a pas un si grand pas à faire pour arriver des Coccostées aux Célacanthes cuirassés. Cette ressemblance serait encore bien plus grande, si des recherches ultérieures prouvaient que les Célacanthes cuirassés, n'avaient point de véritable écailles imbriquées sur le corps, mais seulement de larges plaques recouvrant la tête et la nuque. Rien ne prouve, il est vrai, jusqu'ici cette supposition, mais ce qui est pourtant curieux, c'est le fait qu'à côté de la grande quantité de larges plaques d'Asterolépis et de Bothriolépis, qui caractérisent certains terrains, on n'ait pas encore trouvé de véritables écailles, que l'on puisse leur attribuer. Je signale ici ce fait à l'attention des géologues, car rien n'est souvent plus instructif que le mode d'association des fossiles, surtout quand les débris appartiennent à des animaux dont la grandeur et la mollesse du squelette ont empêché leur conservation en entier. Mais il est nécessaire d'apporter la plus grande circonspection dans ce genre de rapprochement, avant d'en tirer des conclusions; car, trop souvent ces résultats se transmettent d'auteur en auteur, sans que l'on rapporte en même temps les faits sur lesquels ils sont basés, et passent quelquefois encore pour des vérités, lorsque l'état des faits a été modifié*." I need only recommend to your readers an impartial comparison of the above passages,

And subscribe myself your obedient servant,

PHILIP DE MALPAS GREY EGERTON.

Oulton Park, Tarporley, August 24, 1848.

XXII.—*Descriptions of* Aphides. By FRANCIS WALKER, F.L.S.

[Continued from p. 109.]

NINETEENTH GROUP.

THIS group contains a greater number of species than all the other groups of the genus, and comprises most of the blight in-

* Mon. des Poiss. Foss. du Syst. Dévon., Introduction, p. xxxi.

sects; many of them have so much mutual resemblance that they are easily confounded together under one name, and a single plant is often the food of several, and in some instances of nine different kinds; but on the other hand, their migrations from one plant to another have occasioned the number of the names to exceed that of the species. The winged and wingless forms are usually alternate with each other; the latter proceeds from the egg in the spring, and its descendants are winged, and thereby enabled to migrate to other plants where they have a wingless offspring, and these successive generations most often continue till the autumn, when the male and the oviparous female appear. This group will form several subgroups, and *Aphis Rosæ*, *A. Sonchi*, *A. Absinthii*, and *A. Millefolii* may be included in one of these lesser divisions; these species are of the largest size, and possess the full development of the peculiar structure of their tribe, such as the shape of the head, of the nectaries, and of the tip of the abdomen, which characters are more or less modified in most of the following species. I take this opportunity of inserting a translation of Kaltenbach's divisions of Aphides, with a list of the species described by him.

A. Seventh feeler-joint bristle-shaped and longer than the sixth.

a. The feelers seated on tubercles of the forehead.

*. Forehead deeply groove-shaped.

α. The wingless insects green.

1. Rosæ.	4. Urticæ.	7. Hieracii.	10. Pelargonii.
2. Millefolii.	5. Solani.	8. Tanacetaria.	11. Pisi.
3. Platanoides.	6. Cerealis.	9. Viciæ.	12. Rubi.

β. The wingless insects brown or red.

13. Serratulæ.	17. Sonchi.	20. Solidaginis.
14. Campanulæ.	18. Taraxaci.	21. Tanaceticola.
15. Jaceæ.	19. Absinthii.	22. Ribicola.
16. Picridis.		

**. Forehead flat or arched.

23. Galeopsidis.	29. Dianthi.	34. Ligustri.
24. Humuli.	30. Betulicola.	35. Loniceræ.
25. Lactucæ.	31. Cerasi.	36. Lythri.
26. Ribis.	32. Aparines.	37. Pruni.
27. Convolvuli.	33. Tanaceti.	38. Arundinis.
28. Chelidonii.		

b. Feelers seated immediately on the forehead which is flat or convex.

*. Body oval, highly arched, with a little tubercle on each side of the last but one abdominal segment.

39. Urticaria.	42. Scabiosæ.	45. Rhamni.
40. Capsellæ.	43. Symphiti.	46. Epilobii.
41. Plantaginis.	44. Sedi.	47. Cratægi.

48. Grossulariæ.
49. Jacobææ.
50. Ranunculi.
51. Sorbi.
52. Mali.
53. Padi.
54. Nasturtii.
55. Nepetæ.
56. Viburni.
57. Euonymi.
58. Rumicis.
59. Papaveris.
60. Sambuci.
61. Laburni.
62. Craccæ.
63. Galii.
64. Ilicis.
65. Hederæ.
66. Genistæ.
67. Lychnidis.
68. Persicæ.
69. Euphorbiæ.

**. No tubercles on the penultimate abdominal segment.

70. Berberidis.
71. Myricæ.
72. Vitellinæ.
73. Coryli.
74. Quercus.
75. Erysimi.
76. Rosarum.
77. Helichrysi.
78. Saliceti.
79. Nymphææ.
80. Pimpinellæ.
81. Brassicæ.
82. Chenopodii.
83. Avenæ.
84. Capreæ.
85. Xylostei.
86. Anthrisci.
87. Glyceriæ.
88. antennata.
89. Cardui.
90. Populea.
91. Nerii.
92. Betularia.
93. Salicti.
94. Camelliæ.
95. Prunicola.
96. Tragopogonis.
97. Aceris.
98. Populi.

B. Seventh feeler-joint slenderer, but shorter than the preceding.

99. Tiliæ.
100. Salicis.
101. oblonga.
102. quadrituberculata.
103. nigritarsis.
104. Quercea.
105. Alni.

Species unknown to Kaltenbach.

106. Fraxini.
107. Ligustici.
108. Pistaciæ.
109. Vitis.
110. Achilleæ.
111. Piceæ.
112. Cnici.
113. Alni.
114. Sanguisorbæ.
115. Verbasci.
116. Avellanæ.
117. Napelli.
118. Betulæ.
119. truncata.

45. *Aphis Rosæ*, Linn.

Aphis Rosæ, Linn. Syst. Nat. ii. 734. 9; Faun. Succ. 982; Gmel. ed. Syst. Nat. i. 5. 2204. 9; Fabr. Sp. Ins. ii. 387. 25; Ent. Syst. iv. 217. 30; Syst. Rhyn. 298. 30; Reaum. Ins. iii. t. 21. f. 1–4; DeGeer, Ins. iii. 65. 10. t. 3. f. 1–4; Rossi, Faun. Etrusc. 262. 1386; Götz. Ent. Beitr. ii. 296. 9; Sulz. Ins. t. 12. f. 79; Lederm. Micr. 53. t. 25; Schrank, Faun. Boic. iii. 117; Harris, Ex. 66. t. 18. f. 1–3; Dr. Richardson, Phil. Trans. lxi. 121; Bonnet, Hist. Nat. i. 48; Bingley, Hist. Nat. iii. 186; Latr. Gen. iii. 173; Enc. Brit. 7th edit. ix. 205; Kirby and Spence, Intr. Ent. ii. 436–454; Enc. Méth. i. t. 17. f. 1; St. Farg. et Serv. Enc. Méth. x. 240. 4; Lamarck, Anim. sans Vertèb. 2me édit. iv. 122; Westw. Mag. Nat. Hist. vi. 492; Haliday, Ent. Mag. ii. 78; Leon Duf. Rech. Hem., Mém. Inst. iv. 242; Kyber, Germ. Zeit. ii. 2. 3; Burm. Handb. Ent. ii. 94. 2; Sir Oswald Mosley, Gard. Chron. i. 628; Fonscol. Ann. Soc. Ent. x. 168. 8; Kalt. Mon. Pflan. i. 3. 1; Blanch. Ins. 206. 11;

Guér. Icon. Règne Anim. i. t. 59. f. 15; Amyot et Serv. Hist. Nat. Hemipt. 609. 1.

A. Dipsaci, Schrank, Faun. Boic. ii. 104. 1181.

Aphis, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 474. 1.

It feeds on roses, such as *Rosa spinosissima,* burnet rose, *R. centifolia,* Provence rose, *R. canina,* dog rose, *R. Eglanteria,* eglantine, and in the summer it may be found on *Dipsacus sylvestris,* wild teasel; *D. pilosus,* small teasel; *Scabiosa arvensis,* field scabious; *S. succisa,* devil's-bit scabious; and *S. columbaria,* fine-leaved scabious. It inhabits Europe and North America, and in mild seasons it lives through the winter, and multiplies rapidly in the beginning of February.

The viviparous wingless female. When young it is pale green, narrow, linear, and flat; but the full-grown insect is lively grass-green, oval and convex: the colour is paler towards the head, which is dull yellow: there is a rim on each side of the body: the feelers are dull yellow, and nearly as long as the body; the first and the second joints, the tips of the following, and the whole of the seventh joint are brown; the fourth joint is rather more than half the length of the third; the fifth is a little shorter than the fourth; the sixth is less than half the length of the fifth; the seventh is nearly as long as the third: the mouth is green; its tip and the eyes are brown: the nectaries are dull pale green with brown tips, and are nearly as long as one-fourth of the body: the legs are long and green; the tips of the thighs are brown; the shanks are hairy; their tips and the feet are dark brown.

1st variety. Pale red while young.

2nd variety. Yellowish green: the head and the feelers are brown.

3rd variety. The feelers are green; the tips of the third and of the following joints and the whole of the seventh joint are brown.

4th variety. The nectaries are brown.

5th variety. The nectaries and the tips of the thighs are black.

6th variety. Of a delicate pink colour mottled with yellow.

7th variety. Purple. In the autumn.

8th variety. Brown. In the autumn.

9th variety. Bright orange: the abdomen is green beneath, and has a large oblong grass-green spot on its back. In November.

10th variety. The feelers and the nectaries are white with black tips, and the latter are also white towards the base.

11th variety. Pale flesh-colour. There are sometimes whole colonies of this variety, and I have seen them living throughout the winter, and surviving a very severe frost.

12th variety. The body is green: the feelers are black, longer than the body, and pale yellow from the middle till near the base: the mouth is pale green; its tip and the eyes are black: the nectaries are also black, and as long as one-third of the body: the legs are pale yellow; the feet and the tips of the thighs and of the shanks are black.

13th variety. The body is green: the head is blackish green: the tip of the abdomen is pale greenish yellow: the feelers are black, and much longer than the body: the mouth is yellow; its tip and the eyes are black: the nectaries are black, and as long as one-third of the body: the thighs are pale green, black towards their tips; the shanks are dull yellowish green; their tips and the feet are black.

14th variety. Like the preceding, but the head is buff: the legs are black; the thighs are pale yellow for two-thirds of their length from the base.

When the wingless female has just shed its skin, it has a pale green colour; the head and the limbs are white, and the joints of the latter have brown tips. There are two or three short segments at the base of the abdomen beneath; the rest are longer. *Formica nigra,* the little black ant, often resorts to this species to feed on its honey, and the viviparous females are the prey externally of *Hemerobii* and *Syrphi,* and internally of *Aphidius Rosæ, Allotria erythrocephala, Ceraphron Carpenteri, Asaphes ænea, Coryna clavata, Cyrtogaster vulgaris,* and *Encyrtus Atheas.*

The colonies of this Aphis while feeding on the teasel are frequented by *Formica rufa;* this large black and red ant does not come within the precincts of gardens, but is replaced there by the small black ant as before mentioned.

The viviparous winged female. Its wings in mild weather are sometimes unfolded as early as the 24th of March: the head and the feelers are black, and the latter are as long as the body; the fourth joint is much shorter than the third; the fifth is hardly shorter than the fourth; the sixth is about one-third of the length of the fifth; the seventh is nearly as long as the third: the eyes are dark red: the mouth is dull green with a brown tip: the chest and the breast are dull olive-green; their sides are pale green: the fore-chest has a bright green band on its hind-border: the abdomen is grass-green with a row of black spots on each side: the nectaries are black, shining, and as long as one-fourth of the body: the legs are long and yellow; the thighs from the middle to the tips, the knees, the feet, and the tips of the shanks are black: the wings are colourless, and much longer than the body; the wing-ribs and the rib-veins are bright straw-colour; the veins are brown.

1st variety. Of a delicate pink colour mottled with yellow. A pupa.

2nd variety. The head and the feelers are brown, and the latter are nearly as long as the body: the nectaries are also brown.

3rd variety. The chest and the breast are almost black.

4th variety. In the beginning of June: it is red while a pupa, but is black when its wings are unfolded at the end of June: the abdomen is dark red: the feelers are longer than the body: the mouth is yellow with a black tip: the nectaries are rather more than one-third of the length of the body: the thighs are pale yellow towards the base; the shanks excepting the tips are dull yellow: the wing-ribs are pale yellow; the wing-brands and the veins are pale buff.

5th variety. The body is dark green: the head, the disc of the chest and that of the breast are black: the feelers are also black, and longer than the body: the mouth is dull green with a black tip.

6th variety. The body is black: the abdomen is green with a row of black spots on each side.

The following variations occur in the structure of the veins:—

1st variety. The lower branch of the first fork is divided like the upper branch.

2nd variety. There is no first fork.

3rd variety. The fourth vein is forked, and both the forks are curved.

4th variety. The upper branch of the second fork is obsolete towards the tip.

The part of the head on which the feelers are seated is produced on each side, so as to have the appearance of a basal joint to those organs; these projections are oblique at the tip, and thus form an acute angle on the inner side; their growth and the consequent narrowing of the front much increases as the insect approaches its full development: the first joint of the feelers is broad and is very slightly curved, being convex on the inner side and concave on the outer side; the second joint is rather more than half the length and half the breadth of the first; the third is much narrower than the second: the fore-chest is rather long, narrower in front, and slightly convex on each side: the nectaries are slightly curved and are somewhat narrower, and as it were compressed, near their tips: the tip of the abdomen is compressed, sickle-shaped, and nearly half the length of the nectaries: the legs are long; the thighs are slightly clavate; the shanks are somewhat bristly, and very slightly curved, as are also the second joints of the feet: the wing-rib at a little beyond half the length of the wing begins to widen very gradually into the brand, which is long, and irregularly spindle-shaped; the angle on its hind-border is very obtuse, and the line thence to the tip is slightly curved; the fourth vein is much curved at its base; the third is obsolete at its source, and is forked before one-third and again after two-thirds of its length, but this arrangement is subject to exceptions; the first and the second veins are almost straight, and the distance between them at the base is about half of that at the tips. The cultivation of the rose has much extended the habitation and increased the nourishment of this species, and its habits have been probably modified by an alteration of the temperature, as made known to us by geological investigations. In former ages, when severer frosts were the result of greater elevation of the land, the viviparous faculties of this Aphis must have been limited to the summer season. Among the particulars of its history yet to be ascertained are how far its presence is coextensive with the rose and other plants which are its food, whether it is confined to the rose where it has not the means of migrating to the teasel and the scabious, and in what regions the ants and its devourers accompany it or are replaced by other species.

The winged male. While a pupa it is bright red, and exhibits a striking contrast to the pale velvet-like oviparous female of *Aphis dirhoda,* which sometimes swarms on the rose-bushes in the autumn. When the wings are unfolded it is black: the abdomen is dark yellowish green; most of the disc is black, and there is a row of black spots on each side: the feelers are much longer than the body: the mouth and the nectaries are dull yellow with black tips, and the latter are nearly one-fourth of the length of the body: the thighs are pale yellow towards the base; the shanks with the exception of their tips are dark yellow; the wing-ribs and the rib-veins are pale yellow; the wing-brands and the veins are brown.

"The females (of the tenth generation) have at first altogether the same appearance with those of the former generations; but in a few days their colour changes from a green to a yellow, which is gradually converted into an orange colour, before they come to their full growth. They differ likewise in another respect, at least from those which occur in the summer, that all those yellow females are without wings. The male insects, when first produced, are not of a green colour, like the rest, but of a reddish brown; and have afterwards when they begin to thicken about the breast, a dark line along the middle of the back. These male insects come to their full growth in about three weeks time, and then cast off their last covering; the whole insect being after this operation of a bright yellow colour, the wings only excepted. But they soon change to a darker yellow, and in a few hours to a very dark brown; if we except the body, which is something lighter coloured, and has a reddish cast. They are all of the winged sort; and the wings, which are white at first, soon become transparent, and at length appear like very fine black gauze."—*Dr. Richardson.*

46. *Aphis Sonchi*, Linn.

Aphis Sonchi, Linn. Syst. Nat. ii. 735. 15; Gmel. ed. Syst. Nat. i. 2205; Fabr. Sp. Ins. ii. 390. 48; Ent. Syst. iv. 220. 53; Syst. Rhyn. 302. 53; Geoff. Ins. i. 497. 13; Réaum. Ins. iii. 333. t. 22. f. 3–5; Schrank, Faun. Boic. ii. 1. 120; Rossi, Faun. Etrusc. 265. 1402; Nouv. Dict. d'Hist. Nat. xxviii. 254; Kalt. Mon. Pflan. i. 28. 17; Sir Oswald Mosley, Gard. Chron. i. 628.

Sonchifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 475.

Aphis Serratulæ, Linn. Faun. Suec. 987; Schrank, Faun. Boic. ii. 1. 122; Kalt. Mon. Pflan. i. 26. 15.

Serratulifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 475.

Aphis Jaceæ, Linn. Faun. Suec. 991; Gmel. ed. Syst. Nat. i. 2206; Scopoli, Ent. Carn. 148. 403; Schrank, Faun. Boic. ii. 1. 124. 1244; Kalt. Mon. Pflan. i. 26. 15.

Jaceifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 475.

Aphis Picridis, Fabr. Syst. Ent. 737. 22; Sp. Ins. ii. 387. 26; Ent. Syst. iv. 216. 732; Syst. Rhyn. 299. 32; Gmel. ed. Syst. Nat. i. 5. 2204; Schrank, Faun. Boic. ii. 121. 1235; Kalt. Mon. Pflan. 1. 27. 16.

Picridifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 475.

Aphis Cirsii, Linn. Faun. Suec. 987; Gmel. ed. Syst. Nat. i. 5. 2205; Scop. Ent. Carn. 138. 402.

Aphis Cnici, Schrank, Faun. Boic. ii. 122. 1239.

Aphis Solidaginis, Fabr. Sp. Ins. ii. 384. 4; Mant. Ins. ii. 315. 5; Ent. Syst. iv. 211. 5; Syst. Rhyn. 295. 5; Gmel. ed. Syst. Nat. i. 5. 2202; Hausmann, Ill. Mag. i. 442. 5; Kalt. Mon. Pflan. i. 32. 20.

Solidaginifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 475.

Aphis Cardui, Fonscol. Ann. Soc. Ent. Fr. x. 170. 11.

Aphis Campanulæ, Kalt. Mon. Pflan. i. 26. 14.

Aphis Taraxaci, Kalt. Mon. Pflan. i. 30. 18.

This species feeds on *Sonchus oleraceus, S. arvensis, Chondrilla juncea, Leontodon taraxacum, Apargia hispida, A. autumnalis, Picris hieracioides, Hieracium sylvestre, H. sylvaticum, H. murorum, H. umbellatum, Crepis biennis, C. virens, Borkhausia fœtida, Lapsana communis, Cichorium intybus, Serratula arvensis, Carduus nutans, C. acanthoides, C. crispus, C. pycnocephalus, C. lanceolatus, Cnicus spinosissimus, Cynara Scolymus, S. Carduncułus, Solidago virgaurea, Centaurea nigra, C. nigrescens, C. cyanus, C. Scabiosa, C. collina, C. calcitrapa, C. Jacea, Cirsium arvense, C. oleraceum, Onopordum acanthium, Chrysanthemum segetum, Achillæa Millefolium, Campanula rotundifolia.*

The viviparous wingless female. It is large, oval, convex, shining, brassy, with six rows of tubercles along its back : the feelers are black, and very nearly as long as the body : the eyes and the mouth are also black : the nectaries are black, cylindrical, and as long as one-fifth of the body : the tip of the abdomen is prominent, and forms a short tail : the legs are long and black ; the base of the thighs is white. When the insect is very young it is dull dark red : the feelers and the legs are brown : the nectaries are as long as one-eighth of the body, or sometimes shorter : the bronze colour appears first on the fore-part of the body.

1st variety. Black, dull, slightly bristly, with transverse rows of tubercles across each segment : the head and the abdomen are dark reddish brown : the feelers are bristly and a little longer than the body : the nectaries are as long as one-fourth of the body : the legs are hairy ; the thighs are yellow towards the base. The young ones are dark red.

2nd var. The legs are yellow ; the feet and the tips of the thighs are black.

3rd var. The body is dark red with a bronze tint : there are four rows of very small tubercles along the back which is finely granulated : the limbs are black ; the base of the thighs and that of the mouth are yellow : the nectaries are as long as one-fifth of the body.

4th var. The body is green.

5th var. While young the body is rose-colour or pink : the limbs are white with black tips to the joints.

6th var. The back is tuberculate in transverse ridges : the feelers are a little longer than the body : the mouth is pale yellow with a black tip : the nectaries are as long as one-fourth of the body : the tip of the abdomen is pale red : the legs are yellow ; the feet, the tips of the shanks, and the thighs towards the tips are black.

7th var. The limbs are dull yellow ; the feelers are black at the base and towards the tips and longer than the body ; the mouth and the nectaries have black tips, and the latter are as long as one-fourth of the body ; the knees, the feet, and the tips of the shanks are also black.

It continues on the knapweed till the beginning of November, and often resorts to the base of the leaves for shelter during the latter part of the autumn : when punctured by an *Aphidius* it retreats to the top of the plant, and dies there.

The front is convex in the middle, and is narrow, being occupied on each side by the tubercles or apparent basal joints on which the feelers are seated : these tubercles are rather shorter than those of *A. Rosæ* ; the first joint of the feelers is very slightly curved ; the second is about half the length and breadth of the first ; the third is more slender than the second ;

the fourth is rather more than half the length of the third; the fifth is shorter than the fourth; the sixth is about one-third of the length of the fifth; the seventh is nearly as long as the sixth.

The viviparous winged female. This much resembles the wingless female in shape and colour, and is chiefly distinguished by the presence of wings and by the greater development of the chest. When its wings are just unfolded they are white for some little time, and then the wing-ribs, the wing-brands, and the veins are pale yellow. The pupa is grass-green: the winged insect is smooth, shining, and tawny: the head and the lobes of the chest are brown: the feelers are black, and a little longer than the body: the mouth is pale yellow with a black tip: the nectaries are black, and as long as one-third of the body; the legs are black; the thighs are yellow from the base to the middle: the wings are colourless; the wing-ribs, the rib-veins, and the brands are pale yellow; the other veins are a little darker.

1st var. Black: the abdomen is green, paler beneath, and has a row of black spots on each side of the back: the feelers are much longer than the body: the nectaries are as long as one-fourth of the body: the thighs are yellow towards the base.

2nd var. The pupa is dull greenish red; the legs are darker: the rudimentary wings are pale green.

The fore-chest is rather long, narrower in front; its sides are somewhat convex: the nectaries are tapering, but not abruptly narrower towards the tips: the tip of the abdomen is compressed and somewhat sickle-shaped, but not half the length of the nectaries: the legs are long; the shanks and the second joints of the feelers are slightly curved, and the former are bristly: the wings are much shorter than those of *A. Rosæ,* and together with the thick heavy body will not allow of a long flight; the brands and the veins are like those of *A. Rosæ.* During the summer and autumn it darkens the stems of plants with its thick clusters, and abounds especially on the knapweed, hawkweed, thistle and sow-thistle.

The winged male. Appears in the middle of September, and lives through the following month: it is black: the abdomen is dark green: the feelers are much longer than the body: the mouth is dull yellow with a black tip: the nectaries are black, and as long as one-fourth of the body: the legs are long; the base of the thighs is yellow: the wings are colourless; the wing-ribs, the rib-veins and the wing-brands are pale yellow; the other veins are yellow.

1st var. The wing-brands and the veins are pale brown.

47. *Aphis Millefolii,* Fabr.

Aphis Millefolii, Fabr. Sp. Ins. ii. 386. 16; Mant. Ins. ii. 316.

20; Ent. Syst. iv. 214. 17; Syst. Rhyn. 296. ; Gmel. ed. Syst. Nat. i. 5. 2206. 50; DeG. Ins. iii. 60. 9. t. 4. f. 1–5; Schrank, Faun. Boic. ii. 1. 1; Götze, Ent. Beitr. ii. 317. 29; Latr. Gen. Crust. iii. 173; St. Farg. et Serv. Enc. Méth. x. 246; Kalt. Mon. Pflan. i. 10. 2; Sir Oswald Mosley, Gard. Chron. i. 684.

Achillaphis, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 474. 2.

A. Achillææ?, Fabr. Sp. Ins. ii. 385. 13; Mant. Ins. ii. 315. 16; Ent. Syst. iv. 213. 15; Syst. Rhyn. 296. 15; Gmel. ed. Syst. Nat. i. 2205; Kalt. Mon. Pflan. i. 141. 110.

This and *A. Absinthii* are alike in structure, and may be one species: the latter has very bright red eyes, and its colour, which somewhat differs from that of the former, may be owing to the plants on which it feeds. *A. Millefolii* dwells on *Achillæa Millefolium*, milfoil, *A. Ptarmica*, sneezewort, *A. ageratum*, sweet maudlin, and *Chrysanthemum leucanthemum*, ox-eyed daisy, from June till November.

The viviparous wingless female. It is pale whitish green, oval, convex, somewhat hairy, and rather large: each segment of the back has three large dark green spots, and many small black dots: the head is dull reddish brown: the feelers are black, and longer than the body: the eyes are dark red: the mouth is black; its base is dull yellow: the nectaries are black, and as long as one-eighth of the body: the tip of the abdomen is also black, and has the appearance of a short tail, being long, compressed, and curved: the legs are long, hairy, and black; the base of the fore-thighs is yellow. The young one is more flat and linear and less spotted, and the base of its middle thighs is yellow. An *Aphidius*, an *Allotria*, *Ceraphron Carpenteri* and *Asaphes vulgaris* have been reared from this insect. After shedding the skin it is pale green: the head is pale red: the antennæ and the legs are yellowish white; the tip of the abdomen, the nectaries and the thighs are pale green.

1st variety. Deep green with a glaucous tinge, and having darker green spots and white bands; the latter interrupted along the back: the feelers are much longer than the body: the base of the middle and of the hind-thighs and the whole of the fore-thighs except their tips are yellow: the body is reddish towards the head: the underside of the abdomen is green.

The viviparous winged female. The body is black: the abdomen is green, and has a row of black spots along each side of its back: the feelers are black, and longer than the body: the eyes are dark red: the mouth is dull green with a black tip: the tip of the abdomen is hairy and like that of the wingless female: the nectaries are black, and as long as one-sixth of the body: the legs are black; the base of the fore-thighs is yellow: the wings are colourless or slightly tinged with gray, and a little longer than the body; the wing-ribs, the rib-veins and the wing-brands are pale green; the other veins are pale brown.

1st var. While a pupa it is brown: the head is red: the feelers are pale yellow towards the base: the mouth is pale yellow with a black tip: the nectaries are more than one-fourth of the length of the body: the legs are pale yellow; the feet and the tips of the thighs and of the shanks are black: the rudimentary wings are yellow.

2nd var. The body is green: the disc of the chest is dull tawny: the feelers are pale green at the base: the eyes are black: the mouth is pale yellow with a brown tip: the nectaries are pale yellow, and nearly one-fourth of the length of the body: the legs are pale yellow; the base of the thighs is pale green; the feet and the tips of the thighs and of the shanks are brown: the wing-ribs and the wing-brands are pale yellow; the veins are brown.

The oviparous wingless female. This appears with the male in the autumn, and does not seem to differ outwardly from the viviparous female.

The winged male. While a pupa it is red: the limbs are black, and the rudimentary wings are green with black tips: the wings at the moment when they are unfolded are milk-white, as are the other limbs, while the body is of a brillant red colour. The winged insect is black: the fore-border and the hind-border of the fore-chest, the fore-breast, and the abdomen are dark red: the nectaries are as long as one-eighth of the body: the wing-ribs and the rib-veins are yellow; the brands and the other veins are brown.

1st var. The abdomen is dark yellowish brown: the base of the fore-thighs and of the middle thighs is pale yellow.

The front is narrow, and slightly concave: the tubercles on each side have oblique tips, and are shorter than those of *A. Sonchi*; they form acute angles on their inner sides; the first joint is very slightly curved; the second is more than half the length and breadth of the first; the third is much more slender than the second; the fourth is a little shorter than the third; the fifth is shorter than the fourth; the sixth is about half the length of the fifth; the seventh is as long as the third: the fore-chest is rather long, narrower in front; the sides are slightly convex: the tip of the abdomen is compressed and sickle-shaped, and is longer than the nectaries, which decrease in thickness from the base to the tips: the shanks and the second joints of the feet are slightly curved, and the former are bristly: the wings are longer than those of *A. Sonchi*, but do not differ much in the structure of the veins and of the brands from those species, but the part of the brand beyond the angle is shorter, and its tip is more obtuse; the distance between the first and the second branches at the base is more than half of that at the tips; the third vein is forked long after one-third, and again after two-thirds of its length. The young ones are twelve and upwards in number.

48. *Aphis Absinthii*, Linn.

Aphis Absinthii, Linn. Syst. Nat. ii. 735. 19; Faun. Suec. 990; Gmel. ed. Syst. Nat. i. 5. 2206. 19; Fabr. Mant. Ins. ii. 315. 19; Ent. Syst. iv. 214. 20; Syst. Rhyn. 297. 20; Scop. Ent. Carn. 137. 401; Müll. Zool. Dan. Prod. 1270; Schrank, Faun. Boic. ii. 123; Burm. Handb. Ent. ii. 95. 4; Kalt. Mon. Pflan. i. 31. 19.

Aphis Tanaceti, Linn. Syst. Nat. ii. 735. 18; Faun. Suec. 989; Gmel. ed. Syst. Nat. i. 5. 2205. 18; Fabr. Sp. Ins. ii. 387. 31; Mant. Ins. ii. 316. 36; Ent. Syst. iv. 217. 36; Syst. Rhyn. 299. 36; Geoff. Ins. i. 496. 8; Schrank, Faun. Boic. ii. 123. 1241; Burm. Handb. Ent. ii. 14. 3; Kalt. Mon. Pflan. i. 47. 33? Sir Oswald Mosley, Gard. Chron. i. 684.

Aphis Balsamitæ, Müll. Zool. Dan. Prod. 109. 1252; Gmel. ed. Syst. Nat. i. 5. 2210. 71.

Aphis Artemisiæ, Fonscol. Ann. Soc. Ent. Fr. x. 162. 1.

Aphis Tanacetaria, Kalt. Mon. Pflan. i. 19. 8.

Aphis Tanaceticola, Kalt. Mon. Pflan. i. 33. 21.

Absinthifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 475.

Tanacetifex, Amyot, Ann. Soc. Ent. Fr. 2me série, v. 476.

This species feeds during the summer and autumn on *Artemisia vulgaris, A. Absinthium, A. Abrotanum, Tanacetum vulgare*, and *Balsamita vulgaris*.

The viviparous wingless female. The body is elliptical, convex, green, thickly covered with white powder, and thus resembling in colour the underside of the leaf on which it feeds*: the feelers are black, yellow at the base, and as long as the body, or much longer; the third and the fourth joints are rather hairy; the

* Perhaps this insect or a nearly allied species is mentioned in the following extract:—"One of the prominent characteristics in the face of the country in the region of the Rocky Mountains is the extraordinary abundance of the *Artemisia*, absinthe, or prairie-sage as it is variously called. It has its small fly of the same hue accompanying it through every change of elevation and latitude. It grows everywhere—on the hills, and over the river-bottoms, in tough, twisted, wiry clumps, and glitters like silver as the southern breeze turns up its leaves to the sun. As the country increased in elevation on our advance to the west, they increased in size; and the whole air was strongly impregnated and saturated with the odour of camphor and spirits of turpentine which belongs to this plant. This climate has been found very favourable to the restoration of health, particularly in cases of consumption; and possibly the respiration of air so highly impregnated by aromatic plants may have some influence." (Report of Capt. Fremont's Exploring Expedition to the Rocky Mountains, Oregon and North California, in the years 1842–44.)

fourth is much shorter than the third; the fifth is shorter than the fourth; the sixth is not half the length of the fifth; the seventh is thrice the length of the sixth: the front is narrow and slightly concave: the eyes are remarkably bright red: the mouth is yellow; its tip is black: the nectaries are black, and between one-seventh and one-eighth of the length of the body: the tip of the abdomen is hairy, dark green, long and curved: the legs are hairy, long and black; the base of the thighs is pale green; the fore-thighs and the middle thighs are blackish green; their tips are black; the shanks and the second joints of the feet are slightly curved. One individual had pale green hind-feet, and one of its hind-shanks excepting the base was of the same colour. When it has shed its skin all its limbs are white, and the colour of the body is fresh pale green without any white bloom.

The viviparous winged female. This does not much differ from the winged insect, but the disc of the head, the chest, and the breast are pale brown: the wings are colourless, and a little longer than the body; the wing-ribs and the rib-veins are pale green; the brands and the other veins are tawny.

Length of the body $1\frac{1}{2}$–2 lines; of the wings 3–$3\frac{1}{2}$ lines.

[To be continued.]

XXIII.—*Algæ Orientales:—Descriptions of new Species belonging to the genus* Sargassum. By R. K. Greville, LL.D. &c.*

[With a Plate.]

Vachellianæ.

1. *Sargassum Henslowii* (nob.); caule compresso, ramosissimo; foliis cartilagineis, ecostatis, cuneatis, subdentatis, superioribus versus apicem oblique excavatis, acute dentatis; vesiculis oblongo-ellipticis, apiculatis; receptaculis minutis, cylindraceis, subpaniculatis.

Hab. in mari Chinensi, legit G. H. Vachell.

Whole plant three or four feet long, slender, but at the same time bushy from the numerous secondary branches. *Root* unknown. *Stem* not thicker than a crow-quill, compressed, giving off branches at intervals of 1–2 inches, some of which are a foot or more in length; secondary branches 1–3 inches long, thickly clothed with very short tufted ramuli, bearing the fructification. *Leaves*; on the main stem an inch or more long, of a thickish and somewhat opake substance, spathulate or cuneate, much at-

* Read before the Botanical Society of Edinburgh, July 13, 1848.

tenuated towards the base, with one or two teeth towards the apex, which is more or less obtuse and oblique; on the branches the leaves are much smaller, more or less broadly lanceolate and acute, with generally a large tooth on one side above the middle, and the substance obliquely excavated as it were from the tooth to the apex. *Vesicles* 2–3 lines long, elliptical-oblong, with a slender foliaceous mucro, and supported on peduncles less than a line in length. Sometimes the vesicles are slightly margined, and they are, as well as the leaves, sparingly furnished with pores. Those intermixed with the receptacles are scarcely more than a line or a line and a half long. *Receptacles* not a line long, linear, cylindraceous, rarely single or once divided, but generally forming minute panicles or racemes composed of 3–5 receptacles, with one or two vesicles, and often with minute linear-lanceolate leaves. *Colour* in the dried state dark reddish brown.

This species was kindly communicated to me by my friend Professor Henslow in 1831, and had been transmitted to him by the Rev. G. H. Vachell, along with other interesting plants from Macao and the adjacent islands.

2. *Sargassum Vachellianum* (nob.); caule brevissimo, teretiusculo, muricato; ramis elongatis, planis; foliis lineari-lanceolatis, submembranaceis, repando-dentatis; vesiculis sphæricis, petiolatis, petiolis compressis dilatatis; receptaculis cylindraceis, subdichotome racemosis.

Hab. in mari Chinensi, legit G. H. Vachell.

Plant two to three feet long, of a slender and graceful habit. *Root* a cartilaginous disc, from which arise several stems about an inch in length, cylindrical, as thick as a crow-quill, rough with the conical bases of former branches. From the summit of the stem are produced one or more main *branches*, flat, about a line broad, giving off a second series of branches at intervals of 1–2 inches, 2–6 inches long, and bearing a numerous series of very short ones with the fructification. *Leaves* more or less linear-lanceolate, repando-denticulate, sometimes almost spinuloso-denticulate, distinctly petiolate; those arising from the lower part of the primary branches two to near three inches long and nearly half an inch broad, of a firmer and thicker substance than the rest; those on the secondary branches smaller, seldom exceeding two inches in length, and becoming gradually narrower till on the upper parts they are strictly linear and acuminate, being often not more than a line or even less in breadth. Midrib narrow, disappearing below the apex; pores small and scattered. *Vesicles* nearly spherical, rarely mucronate, on petioles 2–3 lines long, which are sometimes dilated and foliaceous; those on the main branches nearly as large as a small garden-pea; those on the ramuli considerably smaller and subpyriform. *Receptacles* cylindraceous, forming a subdichotomously divided axillary raceme of an inch or more in length, on the lower part of which are generally found several vesicles and minute leaves, the latter preserving all the characters of the larger ones; the divisions of the raceme are conspicuously divaricate, and even the extreme apices often terminate in a minute wide-spreading fork, as in some species of *Cladonia*. *Substance* of the whole plant between cartilaginous and membranaceous, somewhat translucent. *Colour* in the dried specimens pale olivaceous brown.

This beautiful species is probably very variable in its secondary characters, and a larger series than I have seen would be required before it could be satisfactorily described. Young plants before the fructification is fully developed might almost be taken for another species.

This was also communicated by Professor Henslow.

3. *Sargassum ornatum* (nob.); ramis teretiusculis; foliis oblongo-obovatis, costatis, repando-dentatis, membranaceis, petiolatis; vesiculis subsphæricis; receptaculis cylindraceis, obtusis, racemosis.

Hab. in mare Chinensi?

Root unknown. The whole plant is probably upwards of two feet in length, but the only specimen I have seen is sixteen inches long, slender, producing branches towards the base, four or five inches in length, at intervals of about an inch, and becoming gradually shorter upwards. On these branches are situated the very short ramuli, which, besides the accompanying leaf, consist of nothing more in general than a vesicle or two and the raceme of fructification. *Leaves* one to near two inches long, the larger ones above half an inch broad, oblong-obovate, rounded at the extremity, attenuated at the base into a slender stalk, irregularly and unequally repando-denticulate, thin and translucent, the midrib slender, disappearing beneath the apex, the pores minute and scattered. *Vesicles* nearly spherical, the largest about the size of a small garden-pea, rarely mucronate or marginate, the stalk filiform, about two lines long; those which often form a part of the raceme, somewhat pyriform. *Receptacles* axillary, cylindraceous, obtuse, forming an irregularly divided raceme 3–5 lines in length. *Substance* thin and membranaceous, and on being remoistened, very flaccid. *Colour* pale yellowish or olivaceous brown.

A very elegant species, native I believe of the Chinese Seas; but I regret that my note regarding it has been mislaid.

EXPLANATION OF PLATE IV.

Sargassum Henslowii.

Fig. 1. A leaf from the main stem.
— 2. Ditto from the branches.
— 3. Vesicles.
— 4. One of the little tufted ramuli composed of leaves and receptacles.
— 5. Ditto with vesicles. 4 and 5 magnified.

Sargassum Vachellianum.

Fig. 1. One of the ultimate ramuli.
— 2. A vesicle from one of the main branches.
— 3. Vesicles from the racemes of fructification.
— 4. Leaf.
— 5. Part of a raceme. 4 and 5 magnified.

Sargassum ornatum.

Fig. 1. Part of a branch.
— 2. Leaf from the stem.
— 3. Vesicles.
— 4. Raceme of fructification ; the last magnified.

XXIV.—*Remarks on the Identity of the Epoch of the Coal-beds and Palæozoic Rocks of New South Wales.* By the Rev. W. B. Clarke, M.A., F.G.S. &c.

Having read with great attention and interest the observations of Mr. M'Coy "On the Fossil Botany and Zoology of the Rocks associated with the Coal of Australia," published in the 'Annals of Natural History' for September, October and November 1847, I feel impelled to offer a few remarks which I trust will be admitted into the pages of that Journal.

The specimens which have undergone so close an inquisition on the part of Mr. M'Coy were, as he has already stated, collected by me in various parts of the colony of New South Wales, on the eastern or sea-board side of the Cordillera or Dividing Ranges of the Blue Mountains, with the exception of the plants from Mudgee and Guntawang, which localities are on the summit of the western plateaux. By what accident I know not, but it is certain a considerable part of the fossils which I sent to Professor Sedgwick have been lost, for the missing cask which should have accompanied those received by him cannot be heard of. Had that cask reached its destination, it would have been found to contain numerous species both of plants and animals, including Testacea, Zoophytes, Crinoids, &c., which would more fully have confirmed, in some respects, Mr. M'Coy's conclusions. Amongst them were various species from the neighbourhood of Musselbrook, Wollon Hills, Mount Wingan, and the country between Awaaba and Warrawolong; together with plants and zoological remains from the Wianamatta trough, in geological position higher than those recently examined. These species I trust to be able, at a future opportunity, to submit to inspection so soon as my engagements allow me to re-explore the different districts.

To Mr. M'Coy I am very greatly indebted for the patience, skill, and carefulness with which he has determined so many species in my collection. He has completely confirmed the conclusion at which I had long arrived, and which so late as June 1847 I expressed, in perfect ignorance of Mr. M'Coy's labours and conclusions, in my evidence before a Select Committee of the Legislative Council of New South Wales, inquiring into the existence and extent of coal in this territory. My words were these, speaking of the beds of the Australian coal-formation: "I do not mean to imply that they are on the exact horizon of the greater part of the carboniferous formation of Europe, for I believe them to be as old as, if not older than, the lowest beds of that formation." (Coal Inquiry, 7, June 3, 1847.)

Now in this remark I included not only those beds from which all the fossils examined by Mr. M'Coy were derived, but others much lower down in the order of deposits. Mr. M'Coy has arrived, however, at a conclusion which it is the express object of this notice to meet. He says: "With such evidence as I have mentioned, I do not think it improbable that a *wide geological interval occurred between the consolidation of the fossiliferous beds which underlie the coal and the deposition of the coal-measures themselves*; that there is no real connexion between them, but that *they belong to widely different geological systems, the former referable to the base of the carboniferous system, the latter to the oolitic*, and *neither showing the slightest tendency to a confusion of type*." (Annals, xx. p. 311.)

I have frequently expressed in letters to Professor Sedgwick my belief, that there is no break whatever between these various beds, but that the fossiliferous rocks are interpolated by the coal-beds containing the peculiar plants described; and Mr. Jukes, who examined with me in 1845 a portion of the Illawarra coast, has expressed the same opinion (Quarterly Journal Geol. Society, vol. iii. p. 244). Count de Strzelecki differs from this opinion; and Mr. Dana of the United States Expedition, with whom I examined the southern coast of Illawarra in 1840, far beyond that seen by Mr. Jukes in 1845, expressed at that time his doubt as to the transition mentioned by the latter gentleman. But Mr. Dana saw in the low cliff at Black Head, in the very midst of the organic remains as described from that locality by Mr. M'Coy, frusta of the identical fossilized wood mentioned by

Mr. Jukes as so extremely abundant not only on the descent of Mount Keera, in the midst of the great sandstone, *above the coal*, but also on the beach at Towrudgi Point to the northward.

Since the first part of Mr. M'Coy's paper reached this country, I have instituted an inquiry into some localities in order to re-examine the facts which I have stated elsewhere. The result is, that at Muree (which is a locality not far from Raymond Terrace) I found the same lumps of rock containing not only the palæozoic fossils described by Mr. M'Coy, but also impressions of stems and leaves of *Glossopteris lineata*; so that no doubt whatever can exist, that at Muree there *is* a distinct "*confusion of type*," or the plants and testacea, and crinoids and zoophytes are of the same age. Again, at Anvil Creek, west of Harpur's Hill, true coal of good quality is overlaid by beds of gray grit, scarcely distinguishable from one of the Mulubimba beds, charged with Spirifers and other fossils described by Mr. M'Coy. On the Page river, a tributary of the Upper Hunter, the same fossils occur over coal, and at Mount Wingan the conglomerate which lies considerably above the coal is filled with Spirifers, &c.

Stems and leaves of ferns occur also in fossiliferous beds on the Allyn, and in various parts of the Hunter River district. At Paramatta casts of shells have been found in quarries at the very top of the great sandstone and between it and the Wianamatta beds, which are on the Illawarra escarpment full 800 feet above the coal. And these Wianamattâ beds, at Clarke's Hill and elsewhere in the Cowpasture country, abound with ferns. Near Campbell Town the shales contain fish, as at Paramatta, and a new coral. It is my intention to forward to Europe a new series of specimens, as it is impossible to compare them here from want of collections.

In the meanwhile, I have to solicit of geologists that they will not too hastily admit the vast hiatus supposed between the coal-beds of Australia and the other fossiliferous beds, or refuse to the statements I now put forth their indulgence.

I am inclined to assent to the statement first made respecting the *Pachydomus* bed overlying coal at Spring Hill, Van Diemen's Land, having recently received some specimens of shells identical with some of those described by Mr. M'Coy, from Broadwater on the river Jordan, V.D.L., which fully bear out the evidence from Spring Hill.

My impression is, that our Australian coal-beds interpolate the series which Mr. M'Coy determines to be of a far older epoch; and that the coal is derived from drifted matter, for which latter conclusion there is abundant evidence. I shall be able to produce also some plants from our coal-field, which I feel confident will tend to unite the two disjointed portions of our series of rocks, and to afford additional testimony to the proof derivable from the rocks at Muree, that the supposed distinction of æra is not justified by actual knowledge of this country. Should my future explorations of the territory with which I am geologically familiar, extending over 15,000 or 16,000 square miles, not confirm my position, I will avow it; but the facts I have already mentioned require explanation, and I can see no other than this.

As the coal occurs always in patches or areas of limited extent, it may be supposed to have been drifted into hollows in the then sea-bottom, and so entangled amidst the fossiliferous beds. And as to the prevailing character of the plants, it is quite possible that formerly plants of oolitic character might grow at an earlier epoch in Australia than in Europe, whilst the oceans in each hemisphere might have a common fauna. It would be strange if the botany of Australia at any period was identical with that of any part of Europe at any one period, but there is nothing extraordinary in believing such a condition of oceanic life.

So long as the fossil wood of the coal-measures, and leaves and stems of *Glossopteris* occur in the same rock-specimens with the *Spirifers, Productæ, Conulariæ,* &c., which I maintain they do, and since Mr. M'Coy has without doubt assigned the true epoch to the latter, I must take the liberty of expressing my belief from what I have seen, and know from actual and careful and repeated examination of a very extensive region during several years, that there is no break in our Australian series of deposits, and that if the palæozoic fossils are of the lowest carboniferous age, so the age of the coal-plants is nearly identical with it, there being only such interval as is necessary to a succession of deposits.

The freshwater limestone containing *Bulimus* and *Helix*, described by Strzelecki (p. 139), in connexion with the variegated sandstone, has in this colony, where it abundantly occurs, no connexion whatever with that sandstone. It is clearly a tertiary or more recent travertine, and I have found it in numerous localities, containing in some places impressions of leaves, casts of branches and seed-vessels of *Casuarinæ,* and in one locality, Stone-quarry Creek, *bones* apparently of kangaroo.

Lastly, I may mention, that I have examined the manner of growth of our *Casuarinæ,* since Mr. M'Coy suggested their proximity to the *Phyllotheca* of the Australian coal-beds, and must confirm the general resemblance pointed out by him. But I have nowhere in the bush seen any species of *Casuarina* which in any manner exhibits the expansion of its leaves in the way exhibited by the Mulubimba plants. There can be no doubt that the branches spring from within the sheaths in all our *Casuarinæ,* but I have never found in many thousand examinations a whorl of leaves more than a few lines in length, and then only at the extremity of the stalks; so that the identity is not complete.

St. Leonard's Parsonage, North Shore, Sydney, April 7, 1848.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 25, 1848.—Dr. Gamble in the Chair.

ON A NEW SPECIES OF PARROT. BY G. R. GRAY, ESQ., F.L.S.

I have compared the drawing of a Parrot now living in Lord Derby's collection at Knowsley with all the descriptions and figures of the different known species, but have not succeeded in meeting with one to which it can be referred. I am however somewhat doubtful whether the bird represented belongs to the genus *Platycercus*, or to *Coracopsis*; I have given the preference to the latter, leaving it to those who may have a better opportunity of examining the specimen than I had, while it was in London in the summer of 1847, to decide this question; and I feel that it is even possible that it may prove to be the type of a new form altogether. I propose to characterize it provisionally as

CORACOPSIS ? PERSONATA.

Sp. Ch.—Smaragdina; fronte, periophthalmis mandibularumque basi atris; pectore abdomineque medio aurantiacis, hoc saturatiore; remigibus rectricibusque cyaneo-nigris.

The habitat of this fine bird is supposed to be New Guinea. It appears to be about fifteen inches in length.

February 8.—William Yarrell, Esq., Vice-President, in the Chair.

Three communications were made to the Meeting:—

1. DESCRIPTION OF A NEW SPECIES OF GALIDICTIS FROM MADAGASCAR. BY JOHN EDWARD GRAY, ESQ., F.R.S.

Geoffroy St. Hilaire, in the manuscript catalogue of the Mammalia in the Paris collections, notices a specimen from Madagascar which had been collected by M. Sonnerat, which he described in the following manner, under the name of *Mustela striata*: "Supra saturatè fusca; striis quinque longitudinalibus angustis parallelis albis; gastræo pallidè canescente, caudâ basi fuscâ, reliquâ albâ; statura Mustelæ vulgaris."—*Fischer, Syn.* 224.

M. Cuvier in the 'Règne Animal' (ed. 2de. 144) described the same specimen under the name of "La Belette rayée de Madagascar, *Putorius striatus*, Cuvier, de la taille de la belette d'Europe, d'un brun roussâtre avec cinq lignes longitudinales blanchâtres; de dessous et presque toute la queue blanchâtre."

M. Isidore Geoffroy St. Hilaire, in the notes to a paper on some Madagascar animals in M. Guerin's Magasin de Zoologie for 1839, p. 32, informs us that the specimen above described then existed in the collection, and that he had convinced himself that it was a young specimen of an animal rather more than two feet long, which had been sent to the Museum in 1834 by M. Goudot, under the name of *Vonsire blanc*, and called *Vontsira foutche* by the Medecasses; and he gives a description and figures of the animal and its skull, t. 18, 19, forming for it a genus which he names *Galidictis*.

A few months ago the Museum purchased of Mr. Tucker of the Quadrant an animal from Madagascar, which is evidently nearly allied to the *Galidictis striata*, but differs from it in some particulars, which induce me to regard it as a second species of that genus. I may remark that it agrees with all the characters assigned to that genus by M. Isidore Geoffroy, except that the soles of the hind-feet are more naked than he described those of his genus *Galidia* to be, though he observes that *Galidictis* has the feet "presque entièrement semblable" to that genus; for the naked part is nearly as broad as the foot, almost to the top of the heel. The chief difference between the Museum specimen and that described and figured by the two Geoffroys and Cuvier is in the colour of the tail, and I might think this depended on age, if the elder Geoffroy and Cuvier did not describe the young animal as being of the size of a weasel, and the younger Geoffroy the adult as having the same peculiarity, viz. a white tail; while our specimen has the tail the same colour as the back, and even more distinctly variegated with black and white. The stripes are narrower, rather differently placed, and more equal in width than in the description and figure above quoted, and they do not extend so far up the neck towards the head. I propose to designate the species

GALIDICTIS VITTATA.

Grey, black and white grizzled; back and sides eight nearly equal, parallel, narrow, black-brown streaks; chin and beneath pale brown; hind-feet and outer sides of fore-legs reddish brown. Tail subcylindrical, bushy, black and grey grizzled, white towards the ends; hairs elongate, brownish white, with two (rarely three) broad black rings.

Hab. Madagascar. British Museum.

Length of body and head (when stuffed) 14 inches; tail 12 inches.

The skull, which shows that the animal was not quite full-grown, agrees in all the particulars with that figured by M. I. Geoffroy, t. 19, but is about one-fourth smaller in all its parts, and it has one more very small roundish false grinder on each side in front of the other (between it and the canines) in the upper jaw, which is not noticed in M. Geoffroy's figure nor description, and which probably falls out when the animal arrives at adult age.

Dr. T. R. H. Thomson, Surgeon R.N., who had one of these animals for six months on board ship, says it was procured at Tulyah Bay, Madagascar. It was at first extremely timid, but soon became tame and acquainted with the different parts of the vessel, and very partial to those who bestowed any attentions on it. It was remarkably agile, keeping its long bushy tail somewhat erect in running about, and uttering a sort of chirp not unlike a rat. Its chief food was uncooked meat, but it preferred raw eggs above all other articles when they could be procured. Its method of breaking them was not a little amusing: on receiving one it would roll it towards a projecting timber or gun-slide; then, lying down on its side, the little creature would grasp the egg with all its feet and throw it by a sudden jerk, repeating the attempt until the contents were obtained. Turtles' eggs being so soft and rich were always eagerly sought by it. It was very irascible while feeding, and would attack those who interfered with it at such a time, although at others it delighted in being fondled, and would play like a kitten with those it knew. The habits of this interesting animal were not nocturnal. It died from convulsions, under which it had suffered for five weeks.

Its mode of breaking the egg is somewhat different from that of Herpestes fasciatus, which Dr. Thomson had also under observation for some time. This latter, after getting the egg close to a projecting object, seizes it with the two anterior feet, and then jerks it through between the hinder legs, which are raised somewhat to let the egg pass.

2. Description of a new genus of Insectivorous Mammalia, or Talpidæ, from Borneo. By John Edward Gray, Esq., F.R.S. etc.

Mr. Low brought with him from Borneo some mammalia and reptiles in spirits; amongst them, he informed me, was "a rat-like animal with a pennated tail, which he caught in the Rajah's house at Sarawak." On examining the collection, I was much pleased at discovering in the animal so characteristically described, a new genus of Insectivora, nearly related to *Tupaia*, but differing from it both in the conformation of its tail and the form of the skull, and adding another genus to the subfamily of *Tupaina*, the geographic range of which appears to be confined to the Asiatic islands. Borneo may be regarded their more proper home, as possessing all the genera, viz. *Tupaia*, *Hylomys*, and the one under consideration, which, from the form of its tail, may be called *Ptilocercus*.

The true *Tupaia* have a broad hairy tail like the squirrels; the *Hylomys* have a very short, slender, cylindrical tail, covered with short close adpressed hair; and the *Ptilocercus*, on the other hand, have an elongated cylindrical tail, covered with rings of square broad scales like the long-tailed rats, but the end of the tail is furnished with a series of rigid hairs on each side, like the barb of an arrow. I may remark, that besides the genera here noticed, the Dutch naturalists have described an animal under the name of *Hylogale murina*, 'Verhand. Mamm.' t. 26, f. 3, t. 27, f. 17–18, also from Borneo, which differs from the *Tupaia* (or *Hylogale*) in having a cylindrical tail covered with short hair, but furnished with a pencil of longer hair of the tip, which I propose to separate from the other under the name of *Dendrogale*. Each of these genera have a peculiar livery: the *Tupaia* are grisled yellow and brown, with a yellow streak across the shoulders; the *Hylomys* are uniform dark-coloured; the *Dendrogale* and *Ptilocercus* have no shoulder-streak, but a dark streak on the side of the face inclosing the eyes; the former having a white spot on the forehead not observable in the latter.

At first sight *Ptilocercus* has much the appearance of a marsupial animal allied to *Cuscus*, but this resemblance proves to be only in the mere external form, when the characters are examined, as for example, it wants the large great-toe of that group.

The skulls of *Tupaia* and *Ptilocercus* have a considerable resemblance to that of the *Lemuridæ*, and particularly in having the orbits entire. The *Tupaia* are peculiar in having a large elongated aperture on the hinder part of the middle of the zygomatic arch, while the *Ptilocercus* has only a small round perforation in the front part of the middle of the same part, which is probably the analogue of the hole in the former genus.

PTILOCERCUS, n. g.

Head moderately tapering; whiskers elongated, rather rigid. Ears moderate, naked, exposed. Body slender, fur soft. Limbs moderately elongated, nearly equal. Toes 5·5, rather compressed, free. Thumb moderate, like the toes, but shorter. Claws short, compressed, triangular, acute. Tail elongate, cylindrical, hairy quite at the base, then naked, covered with rings of square, broad, adpressed scales and short scattered hairs, and the hinder third with a series of elongate hairs, forming a barb on each side. Skull conical; face rather short. Cutting teeth $\frac{1.1.1.1}{3.3}$: upper elongate, far apart, rather curved; lower shelving, front pair conical, small, shorter than the middle pair, which are elongate, curved, acute; the hinder smallest and shortest. Canines none. Grinders $\frac{7-7}{7.7}$, the front 3 . 3 in each jaw, small; the hinder 4 . 4 large, square, acutely tubercular.

The skull is shorter, broader, and the face less elongated than that of the different species of *Tupaia*, and it differs from them in the two front teeth of the lower jaw being smaller and shorter than the succeeding one, while in all the species of *Tupaia* (including the genus *Dendrogale*) figured by Temminck, the four front teeth of the lower jaw are equally elongated.

The hinder cutting tooth in the upper jaw is placed on the suture of the intermaxillary (and hence may be a true canine) and not in front of the suture of the intermaxillary, as is the case with the skull of *Tupaia tana* and *T. ferruginea* in the British Museum collection.

PTILOCERCUS LOWII.

Blackish-brown, very minutely grizzled with the yellowish tips of the hairs; lips, lower part of cheeks, chin, and beneath yellowish: sides of the face inclosing the eyes black. Tail black; barbs white, except a few hairs near the scaly part, which are black.

Length, $5\frac{1}{2}$ inches; tail, $6\frac{1}{2}$; hind-foot, 1. Skull: length, $1'' 4'''$; tooth line, $7\frac{1}{2}'''$; of face, $5'''$; of zygomatic arch, $7\frac{3}{4}'''$; width at zygomatic arch, $9\frac{1}{2}'''$; at temples, $6\frac{1}{2}'''$; between orbits, $3\frac{3}{4}'''$.

Inhab. Borneo, Sarawak.

I have named this species after my friend Mr. Hugh Low, who has much enriched our knowledge of the natural productions of Borneo.

3. On the Habits of Ameiva dorsalis. By P. H. Gosse.

This species is one of the most common of the reptiles of Jamaica, and is as beautiful as abundant. Its colours are striking, but not showy; its countenance has a very meek expression, not altogether unlike that of a deer or antelope. All its motions are elegant and sprightly; when it is proceeding deliberately, its body is thrown into lateral curves the most graceful imaginable; but when alarmed, its swiftness is so excessive that it appears as if it literally *flew* over the ground, and the observer can scarcely persuade himself that it is not a bird.

The Ground Lizard (as it is provincially termed) is generally diffused, as far as my knowledge of the island extends, but chiefly affects sandy places. Near the sea-side it is particularly abundant, beneath the shore-grasses, nickers, and black-withes that form an almost impenetrable belt of thicket a few yards above high-water mark. Here the dry leaves and twigs are rustled all day long by the fleet-footed Ameiva, as it shoots hither and thither among them, or walks at leisure, picking up little atoms of food. Though excessively timid, so that it is almost impossible to approach them, I have found that by sitting down in their haunts, and remaining for some time perfectly still, one and another will come forth from their coverts and pursue their avocations without fear. They pick among the sand exactly in the manner of a bird, and scratch it away with the long and flexible fore-feet, using them alternately as the common fowl does, now and then stopping and raising the hind-foot to scratch the head.

I am told (and have no doubt of the fact) that it digs for itself the burrow in which it resides. It is accused too of digging still deeper, to get at the seed-corn when just sprouting, and of eating the germinating grain to such an extent as to be mischievous. Of such as I dissected, however, I found the food to consist principally of insects. Thus on one occasion the stomach was occupied with a whole cockroach, and the intestines were filled with fragments of another. In the stomach of one shot in November I found many dipterous maggots, fragments of beetles, and one or two seeds of berries. A third contained cockroaches, a caterpillar, some maggots and small beetles.

On one or two occasions, as when one has been suddenly alarmed, I have noticed a singular action in this animal, which then carries its body the whole height of the legs above the ground, and runs as it were on tiptoe in a very ludicrous manner.

While speaking of its progression, I may observe, that though the toes are not formed like those of the Geckos and Anoles, for holding on against gravity, I have seen a large Ameiva run with facility on the side of a dry wall, along the perpendicular surfaces of the large stones.

A gravid female was brought me early in May, in whose dilated abdomen I found four eggs, two on each side, disposed longitudinally, each lateral pair connected by membrane, or rather by the oviduct. They were in form long-oval, $\frac{7}{10}$ inch long by $\frac{4}{10}$ wide, of a dull white, but covered with a fine membrane, over which spread a few blood-vessels. On making an incision into one I found no glaire, but the whole interior filled with a yellow yolk, exactly resembling in colour and consistence that of a pale hen's egg.

Two eggs were brought me about the middle of the same month, taken from a Ground Lizard's burrow; their form was a perfect oval, measuring $\frac{9}{10}$ inch by $\frac{7}{10}$; their colour white, except that the surface was a little stained by contact with the moist earth; they were covered with a calcareous shell, which however appeared very thin, and even flexible.

The Ground Lizard is exclusively terrestrial; it never climbs trees, nor does it voluntarily take to the water. A large male which was brought me one day was said indeed to have been taken in the river, but upon inquiry I found that the little lad who obtained it had discovered it by suddenly lifting a large stone at the very margin of the water, and that the lizard in its alarm had leaped into the stream. In order to ascertain its powers, I carried it to a deep pool of the river and put it in: it instantly began to swim with much rapidity, and in a peculiarly elegant manner, throwing the body into horizontal serpentine curves, while both the fore- and hind-feet were stretched out behind, and remained quite motionless. It was thus able to cross a small stream with ease, but if prevented from landing it soon became weary, and abandoned all effort, resigning itself to the current, and became in a short time much exhausted.

On the inner surface of the thigh there is in this genus (as in many other of the Lizards) a series of scales, each of which is perforated with a conspicuous pore. From these pores exude during life minute cylindrical bodies like amber or hard yellow gum. On removing the integuments we find lying immediately beneath this range of pores, adhering to the skin but not to the muscle, a compound body, apparently glandular, composed of yellow threads, lying parallel to each other, but twisted exactly like the strands of a rope, in a regular spiral. Undoubtedly this gland secretes the yellow gummy matter that exudes, but of what use this is I do not know; perhaps it is a sexual attraction.

The variations of surface, which take the form of broad plates on the head, throat, breast, legs and vent; of minute tubercles on the body generally, and of transverse rows of square plates on the belly and tail, are not really plates or scales, but are produced merely *by lineal depressions* of various forms *in one continuous surface*; as is distinctly seen when the integument is sloughed off in large irregular pieces, bearing all these characters.

The tongue is protrusible to the length of nearly an inch and a half from the muzzle; it is slender, flat, fleshy, and covered with shining papillæ. The extremity is cleft to the extent of half an inch, and the two tips run out to attenuated round points, which are horny, but very flexible.

As the colours of reptiles in spirits are fleeting, and as published descriptions of this species convey little notion of its beauty, I subjoin the following notes made from living specimens.

Adult male.—Length $17\frac{1}{2}$ inches, of which the tail was 12. Head and sides of neck pale reddish brown; outer surface of fore-legs and sides a deeper tint of the same hue; medial portion of back light green, brightest in front, where it runs up to a point; posteriorly it merges into a dusky hue. Upper part of tail and outer surface of hind-legs dark brown. Throat, breast and under part of fore-legs white; belly and under surface of hind-legs pale blue; under surface of tail pale blue, medially white. On each shoulder two black spots. The sides of the body and tail, and the front of the hind-legs and feet, are studded with round spots of brilliant azure-blue.

The female differs from the male only in inferior size. The young has no green point on the back, but two rows of bright dots on each side: the tail brilliant azure, metallic-green at the base.

BOTANICAL SOCIETY OF EDINBURGH.

This Society held its last meeting for the session on Thursday the 13th of July, at the Royal Botanic Gardens.

The Rev. Dr. Fleming, President, in the Chair.

Donations to the Herbarium were announced from Dr. Philip W. Maclagan, Canada; Colonel Low, Penang; and Chas. C. Babington, Esq., Cambridge.

The following communications were read:—

1. "On the form of the Capsule and Seeds as affording a specific character in *Primula veris*, Linn., *P. vulgaris*, Huds., and *P. elatior*, Jacq." by the Rev. W. A. Leighton, B.A., Shrewsbury. (See p. 164 of the present number.)

2. "Algæ Orientales:—Descriptions of new species belonging to the genus *Sargassum*," by Dr. Greville (part 1). (See p. 203 of the present number.)

3. "Notice of an Excursion to Lanark on 24th June 1848," by Dr. Balfour.

In this excursion Dr. Balfour was accompanied by upwards of 100 pupils. The party visited Cartland Crags, the Falls of Clyde, and other interesting localities. Among the plants picked were *Vicia sylvatica, Neottia nidus avis, Melica nutans, Vicia Orobus, Jasione montana, Carex pendula, paniculata* and *intermedia, Aquilegia vulgaris, Trollius europæus, Equisetum umbrosum, Asplenium viride,* and *Saxifraga oppositifolia*; the two last-mentioned plants were found on the rocks near the Falls at Corra Linn.

4. "Notes of an Excursion to Dunfermline with pupils, on July 8, 1848," by Dr. Balfour.

On this occasion the party visited Charleston, Limekilns, Dunfermline, the banks of the Black Devon, and Knock Hill. Among the more interesting species gathered were *Pyrola media* and *rotundifolia, Gymnadenia albida, Eleocharis multicaulis, Botrychium Lunaria, Allosorus crispus, Lycopodium Selago, Trientalis europæa, Hieracium* *inuloides* and *rigidum*, *Polygonum viviparum*, *Glaucium luteum*, *Reseda lutea* and in Broomhall Woods *Luzula nivea* and *Lilium Martagon*; the latter probably introduced.

Dr. Balfour also exhibited specimens of *Rosa Brounonii* in fine flower, and stated that the plant had been allowed to spread its branches on the slates of Mr. M'Nab's house, in the Botanic Garden, and that it was then covered with a profusion of showy white blossoms.

Specimens of a secretion resembling mannite, procured from *Eucalyptus dumosa*, were exhibited. The specimens were sent by Sheriff Cay, who had received them from near Melbourne, in Australia.

MISCELLANEOUS.

Kellia rubra.

I have stated, in the Catalogue of the Mollusca of Northumberland and Durham, that the animal of this species has an anterior siphonal tube, as in *Kellia suborbicularis*. While lately stopping in the Isle of Man, I had an opportunity of examining the animal of this minute species more carefully, and have ascertained that the anterior siphon differs from that of *K. suborbicularis* in being open at the base, and is in fact a prolongation of the mantle, folded over on the lower side, like the siphon of the zoophagous Gasteropods; while that of *K. suborbicularis* is a perfect tube, though in both cases it performs the same function, forming a channel for the ingress current of water to the branchiæ, as may be readily seen under the microscope. This new modification of a remarkable form in the bivalve mollusca I wish to take the first opportunity of mentioning, as in the above-named Catalogue I have instanced the similarity of the animals as one argument for retaining this species in the genus *Kellia* in opposition to the opinion of M. Recluz, who forms of it, with other small species, his genus *Poronia*. M. Recluz's description of the animal of *Poronia* is, as applied to this species, entirely erroneous.

J. Alder.

Notice of a fractured and repaired Argonauta argo. By C. B. Adams, Prof.

The familiar examples of the repair of the shells of Mollusca are interesting, since they illustrate the mode of growth of the shell.

We have before us examples in which the whole of the last whorl has been destroyed and reproduced. On account of the extraordinary relations subsisting between the animal and the shell in the genus *Argonauta*, a fractured and repaired shell possesses more than usual value.

In the collection of shells in the cabinet of Amherst College is an individual of the *Argonauta argo*, which appears to furnish an additional argument in support of the opinions which are based on the researches of Madame Power. In this shell a portion has been broken out near the middle of the left side, and not far from the sinus of the aperture. The opening was of a semilunar form, about $1\frac{3}{4}$ inch long, with an average breadth of half an inch. A new deposit of testaceous substance, together with a broken fragment, has closed the opening in the rude manner common in the shells of Mollusca.

But the most extraordinary circumstance is this: that a fragment, which was broken out in the accident which befell the animal, now constitutes two-thirds of the repaired portion, and that the originally inner surface is now the outer surface, as is evident from its concavity, style of undulation, and texture. It is also nearly at right angles to its original position. These facts show that the piece was totally detached from the shell by the accident.

We apprehend that a case could scarcely occur, especially in a shell moving in water, except in consequence of the functions now ascribed to the vela of the Argonaut. These once-reputed sails, performing the less poetic function of clasping and enveloping the shell, prevented the loss of the large fragment.

It is obvious also that the new deposit of testaceous matter was secreted from the part of the animal within the shell, and not from the vela, since the edges of the original shell around the fracture appear exclusively on the outside.

Since none but the original inhabitant of the shell could repair it, the case described is corroborative of the opinion, that the animal usually seen in these shells is the original owner.—*From Silliman's Journal for July* 1848.

Notes on Chalcidites *and other Insects.* By Francis Walker, F.L.S.

A large woody gall is not uncommon on the twigs of the willow; it is inhabited by the grub of *Cecidomyia Salicis*, which is often a victim to its enemies, and does not attain the fly state; this is in accordance with the law of nature which ordains a rapid diminution of the individuals of most kinds before they attain their last form, and thus their increase and the consumption of their food is lessened, and their consequent starvation is prevented. Some of these galls which I collected in the spring produced six or seven of the *Cecidomyia*, and the following numbers of parasites:—

Pteromalus (*Seladerma*) *Salicis*, 67 males and 71 females = 138. (I have also found it in Finmark.)

Encyrtus Tennes, 10 males and 64 females = 74.

Platygaster niger, 115, chiefly females.

Tetrastichus flavo-varius (*Eulophus flavo-varius*, Nees = *Tetrastichus Armæus*, List of Chalcidites in the British Museum, 74). This fly has been reared from a larva in the buds of *Ulex nanus* by Mr. Clear of Cork, who has also obtained *Encyrtus serricornis* from a pupa of one of the *Hepialidæ*?; "the original inhabitant was completely consumed, and nothing left but a transparent film."

Aglenes brunneus. This little beetle, remarkable for having no eyes, is not uncommon near London, and at Aix-la-Chapelle it was given to me by M. Foerster, in whose work on Chalcidites (Monographie der Pteromalinen) there are the following synonyms :—

Pteromalus multicarinatus,	*Foerster*	=	Pteromalus Catillus, *Walker*.
prætermissus,	,,	=	longicornis, ,,
chalcolampus,	,,	=	bracteatus, ,,
delectus,	,,	=	herbidus, ,,
chalcophanes,	,,	=	apertus, ,,
nubeculosus,	,,	=	fumipennis, ,,
statutus,	,,	=	affinis, ,,
psittacinus,	,,	=	{ muscarum, ,, Thessalus, ,,
vorax,	,,	=	Mutia, ,,
acuminatus,	,,	=	mesochlorus, ,,
crassus,	,,	=	berylli, ,,
quæsitus,	,,	=	hilaris, ,,
operosus,	,,	=	futilis, ,,
subniger,	,,	=	subniger, ,,
opulentus,	,,	=	decisus, ,,

Callimome Nephthys, fem. *Cyaneo-viridis, antennis nigris, pedibus viridibus, tarsis piceis basi flavis, oviductu thoracis longitudine, alis sublimpidis.*

Head and thorax finely granulated; head blue, a little broader than the thorax: antennæ black, clavate, compact, not longer than the body; first and second joints dark blue: thorax green, tinged with blue: abdomen smooth, shining, bluish green, shorter than the thorax; base bright blue: sheaths of the oviduct black, about half the length of the body: legs dark green; knees and tips of the tibiæ pale yellow; fore tibiæ yellow with a piceous line above; fore tarsi pale brown; middle tarsi and hind tarsi piceous, pale yellow at the base: wings slightly tinged with brown; squamulæ fulvous; nervures brown. Length of the body $1\frac{1}{4}$ line; of the wings 2 lines.

Found by Mr. Hardy near Newcastle. It has some resemblance to *C. gracilis*, but is quite distinct.

Callimome Ærope ?, fem. *Aurea, antennis piceo-fulvis basi flavis, pedibus flavis, oviductu brevi, alis flavescentibus.*

Bright gold colour, tinged with green: head a little broader than the thorax: eyes and ocelli dark red: antennæ clavate, shorter than the thorax; first and second joints yellow; third and following joints pale rust colour with a black streak above which ceases before the tips of the antennæ: head and thorax finely punctured; the transverse striæ not so apparent as in some other species: abdomen elliptical, smooth, shining, shorter than the thorax; metapodeon slightly impressed at the base, occupying nearly one-half of the dorsum; octoon short, visible on each side but hidden above; ennaton rather short, finely striated; decaton longer than the ennaton, also finely striated; the following segments very short, slightly hairy: abdomen keeled beneath; the keel extending in a nearly straight line for almost two-thirds of its length, and thus terminating abruptly: sheaths of the oviduct black, hairy, about two-thirds of the length of the abdomen: legs bright yellow; tips of the tarsi black: wings limpid; fore wings slightly clouded with yellow beneath the ulna; nerves yellow; ulna much shorter than the humerus; radius not more than one-third of the length of the ulna; cubitus extremely short; stigma very small. Length of the body $1\frac{1}{4}$ line; of the wings 2 lines.

Found on the banks of the river Lea in July. This is probably the female of *C. Ærope* (see Ann. of Nat. Hist. xiv. 182).

On the Habits of the Tawny Owl, Strix Stridula. By Ralph Carr, Esq.

This bird does not seem to be known as a bold and rapacious robber of the nests of some of our stronger birds at the time when it is feeding its own young. It has been protected now for a few years at Dunston Hill. In 1844 a pair of tawny owls reared and ushered into the world three hopeful young, after having fed them assiduously upon the trees for many weeks after they had left the nest. The food must often have consisted in great part of worms, snails, and slugs, for the old birds brought it every minute from the ground in the immediate vicinity of the trees where the young were perched. This however might only be considered as a whet to their appetites before dinner; for the parents made repeated and persevering attacks upon three or four magpie nests, sometimes during half an hour at a time. As the defence was spirited and gallant, they were often repulsed; but, finally, I found the remains of young magpies under the favourite perch of the young owls, and one morning the bloody head and feathers of an old magpie, conspicuous from its size and the want of any cerous skin about the beak. This then, I thought, must have been taken when roosting. In 1845 the old owls alone were seen, and they passed the summer in sedate retirement, and seemed to rest from the labours of propagation; neither did they molest the magpies. But in 1846 they began to be very active early in the spring, and by the beginning of May again had their young owlets out upon the branches. Walking out about nine o'clock one evening, I heard a pertinacious attack going on against a pair of magpies that had their nest in the top of a very tall sycamore. At last, instead of the frantic chattering of the poor magpies, one of them began to shriek in agony like a hare when caught in a noose; and it was evident the owl was endeavouring to drag it out—the mother bird—by the head from the entrance of the nest. I ran down to the spot to prevent the perpetration of such murder, and arrived in time to separate the combatants by striking against the stem of the tree with a stick. Before the next morning the young of our only pair of rooks had disappeared from the nest, in a situation where nothing but the owls could have injured them. This was too bad; a decree went forth against the young owls, and they paid the penalty of their voracious appetites.

It is thus evident that the magpie's instinct in arching over her nest is necessary to enable her and her mate to defend it against rapacious birds. Probably the raven, the buzzard, and the kite, may be all disposed to make unfriendly visits, wherever their race has not been exterminated by pitiless gamekeepers. But it is evident that the tawny owl is a formidable enemy. The reluctance of the rook to build out of society may also be better understood, as it cannot defend its open nest against the owl at night; and also one reason why the instinct of the daw leads it always to seek the shelter of a hole, although, as Mr. Waterton remarks, it appears to be as hardy a bird as the rook. That wisdom and beneficence which never err may have given them instincts for other and more important ends than human eyes may ever be able to descry, but it is always gratifying when we think we can in part understand the utility and design of differences so striking.—*From the Transactions of the Tyneside Naturalists' Field Club*, vol. i. part 1. p. 20.

Description of a species of Haliotis, *supposed to be new.* By C. B. Adams, Prof.

Haliotis ponderosa. H. magna, ovata, crassissima, convexa; striis incrementi magnis, irregularibus; rugis concentricis, irregularibus, subnodosis; spira elevata, subterminali; foraminibus quatuor, magnis; externe rubra, intus maculis plurimis rubris viridibusque iridescente.

Shell ovate, convex, ponderous, with coarse unequal incremental striæ and concentric ridges (not folds), and a few broad low tubercles on the ridges; spire elevated, subterminal; four perforations open, the inner one very large; exterior surface brick-red; inner surface elegantly iridescent with innumerable shades of delicate red, purplish red, and green.

Length $8\frac{1}{2}$ in.; breadth $6\frac{2}{3}$ in.; depth within $3\frac{1}{8}$ in.

Comparison with the well-known *H. rufescens*, Swains., will render a figure unnecessary. A large specimen of Swainson's shell before me has exactly the same superficial dimensions, but is only $2\frac{1}{2}$ inches deep. *H. ponderosa* is nearly or quite destitute of the spiral waves of *H. rufescens*, is of a darker red without, wants the red inner margin of the outer lip, and within has the clouds of iridescent colours remarkably small and numerous, while in *H. rufescens* they are remarkably large. It is more ponderous than any Haliotis which we have seen, weighing 2 lbs. 2 oz. avoirdupois.

Zoological Museum, Amherst College. Hab. —— ?

Not finding this species in Reeve's very complete and excellent monograph, I have ventured to describe it as new.—*From Silliman's Journal for July* 1848.

Cremastochilus *in Ant Nests.* By S. S. Haldeman.

Our ant-nests are similar to those of Europe, in harbouring various insects. Among these are *Aphis, Coccus, Batrisus, Hister, Hetærius*, and the singular genus of Lamellicornia mentioned above.

About the end of April, I found beneath a flat stone, in a cavity occupied by a large flavous species of ant, a living *Cremastochilus variolosus*, but laid no stress upon the occurrence, as I supposed it to be accidental. On the 16th of May I took three individuals of *C. Harrisii* together, under similar circumstances, and kept them alive for twelve days. On the 25th of May I found a second individual of *C. variolosus*, in an ant's nest. The locality is a southern hill-slope covered with *Castanea*, *Pinus mitis*, *Acer*, *Carya*, and *Kalmia*, the soil siliceous. The genus is extremely rare; although tolerably successful in collecting, and my residence is near the locality, these are the first living individuals I have seen. In confinement they burrow beneath the earth in which they are placed, the head, from its peculiar form, being well adapted for this purpose.

The genus *Chelifer* is also found in ant-nests, where it is probably attracted by the immature *Thysanura* which occur there; but I recently found nine individuals apparently parasitic, lodged near the extremity of the abdomen, beneath the wings and elytra of a living *Alaus oculatus*, the early stages of which are passed in ash-trees.—*From Silliman's Journal for July* 1848.

Myochama Anomioides.

To the Editors of the Annals of Natural History.

Gentlemen,—The following notice may perhaps prove of interest to your conchological readers:—

It is generally asserted that *Myochama Anomioides* is strictly confined to *Trigonia pectinata*, but such is not the case, as I have dredged it on the following genera, *Pandora*, *Pectunculus*, *Struthiolaria*. Two specimens I dredged last January in sixty feet of water in Port Jackson, on a bottom of coarse sand and shells. The first specimen I procured was on a dead valve of a species of *Mytilus* which I sent home, since which I have dredged for days in the same spot and procured four, three of which were on dead valves of *Cleichthænus*, and one was on a round piece of sandstone.

I remain, Gentlemen, yours truly,

Fore Street, Sydney, 1st March, 1848. F. Strange.

On the Eyes of the Balanus. By Dr. Leidy.

Dr. Leidy remarked, that the existence of eyes in the perfect condition of the Cirrhopoda has been denied by all anatomists up to the present time, but its presence in the larva or imperfect stages is very generally acknowledged. Several years since, having received some living specimens of *Balanus rugosus* adhering to an oyster, he submitted them to dissection, in the course of which he noticed upon the dark purple membrane which lines the shell and muscular columns running to the opercula, on each side of the anterior middle line, a small, round, black body, surrounded by a colourless ring or space of the membrane, which, upon submitting to a low power of the microscope, he found to be an eye, composed of a vitreous body, having nearly two-thirds of its posterior part covered by pigmentum nigrum, and attached to a nervous filament, which he afterwards traced to the supra-œsophageal ganglia. The presence of this organ in other species or genera, he had not yet had an opportunity of determining.—*Proc. Acad. Nat. Sci. Jan.* 11, 1848, p. 1. vol. v.

METEOROLOGICAL OBSERVATIONS FOR JULY 1848.

Chiswick.—July 1. Clear: cloudy and cold: clear. 2. Fine: overcast. 3. Drizzly: overcast. 4. Overcast. 5, 6. Very fine. 7. Sultry: cloudy. 8. Fine: heavy showers. 9. Constant rain. 10—13. Very fine. 14. Very fine: thunder, lightning and rain at night. 15. Cloudy and fine: clear at night. 16—18. Very fine. 19. Cloudy. 20. Cloudy and boisterous. 21. Clear: cloudy: rain. 22. Clear: cloudy. 23. Cloudy: fine: rain. 24. Cloudy and fine. 25. Rain. 26. Overcast: boisterous, with slight rain. 27. Cloudy. 28, 29. Very fine. 30. Overcast: rain. 31. Rain: overcast.

Mean temperature of the month	62°·9
Mean temperature of July 1847	65 ·84
Mean temperature of July for the last twenty years	63 ·14
Average amount of rain in July	2·36 inches.

Boston.—July 1. Rain: rain A.M. and P.M. 2. Fine: rain P.M. 3. Fine. 4. Cloudy. 5. Fine. 6. Fine: thermometer 84° 2 P.M. 7. Cloudy. 8. Windy. 9. Rain. 10. Cloudy. 11. Fine. 12. Cloudy. 13. Fine. 14. Fine: rain and thunder P.M. 15. Cloudy. 16—18. Fine. 19. Cloudy. 20. Cloudy: rain, with thunder and lightning P.M. 21. Fine: rain P.M. 22. Fine. 23, 24. Cloudy: rain P.M. 25. Cloudy: rain A.M. 26. Rain: rain A.M. and P.M. 27. Cloudy. 28. Fine. 29, 30. Cloudy. 31. Cloudy: rain A.M.

Applegarth Manse, Dumfries-shire.—July 1. Dull A.M.: cleared and fine. 2. Heavy showers. 3, 4. Fair and fine, though sharp. 5. Cloudy P.M., but fair. 6. Heavy rain A.M.: cleared. 7. Heavy shower. 8. Very heavy showers. 9. Rain A.M.: cleared P.M. 10. Fine, but cloudy. 11. Fine: warm. 12. Very fine. 13. Very sultry: thunder. 14. Fine soft shower P.M. 15. Fine: thunder. 16. Fine bracing air. 17. Fine, but cool. 18. Drizzling day. 19. Rain all day. 20. Frequent showers. 21. Bright and dry: shower P.M. 22. Wet nearly all day. 23. Occasional showers. 24. Fine: slight shower. 25. Wet. 26. Fine throughout. 27. Heavy shower: thunder. 28. Showery: fine P.M. 29. Fair and fine. 30. Rain all day. 31. Fine, though cloudy.

Mean temperature of the month	56°·5
Mean temperature of July 1847	61 ·5
Mean temperature of July for the last twenty-five years .	58 ·1
Average amount of rain in July for twenty years	3·91 inches.

Sandwick Manse, Orkney.—July 1. Bright: drops. 2. Bright: clear. 3. Clear. 4. Cloudy: damp. 5. Bright: cloudy. 6. Rain: cloudy. 7. Bright: thunder and rain. 8. Bright: fog. 9. Fog. 10. Cloudy: clear. 11. Bright: rain. 12. Bright: damp. 13. Cloudy. 14. Cloudy: clear. 15. Bright: drizzle. 16, 17. Damp: drizzle. 18. Showers: cloudy. 19. Rain: damp. 20. Damp: rain. 21. Bright: drops. 22. Bright: rain. 23. Showers: clear. 24. Bright: clear: showers. 25. Bright: heavy showers. 26. Bright: drops. 27. Rain: damp. 28. Clear. 29. Clear: fine. 30. Showers: rain. 31. Clear: cloudy.

Meteorological Observations made by Mr. Thompson *at the Garden of the Horticultural Society at* Chiswick, *near London; by* Mr. Veall, *at* Boston; *by the* Rev. W. Dunbar, *at Applegarth Manse,* Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse,* Orkney.

Days of Month.	Barometer.							Thermometer.							Wind.				Rain.			
	Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.
1848. July.	Max.	Min.		9 a.m.	9 p.m.	9¼ a.m.	8½ p.m.	Max.	Min.		Max.	Min.	9¼ a.m.	8½ p.m.								
1.	29·783	29·530	29·07	29·54	29·60	29·58	29·63	65	40	53	58½	46	47½	46	nw.	w.	w.	wnw.	·04	·12	......	·06
2.	29·876	29·838	29·36	29·60	29·59	29·63	29·59	68	50	62	57½	38½	50	50	w.	calm	w.	ese.	·07	·33	......	......
3.	29·813	29·728	29·32	29·57	29·69	29·61	29·68	67	52	61	61	40½	52½	53	sw.	calm	w.	w.	·29	·01	......	......
4.	30·137	29·940	29·50	29·80	30·04	29·75	29·97	73	48	59·5	60	41	55	52	e.	w.	w.	nw.	......	......	......	......
5.	30·186	30·121	29·71	30·08	30·02	30·08	30·06	82	50	66	66	38	54	52	s.	calm	s.	ese.	......	......	......	·02
6.	30·085	29·969	29·56	29·94	29·99	29·89	29·93	88	59	73·5	60	54	55	59	s.	calm	sw.	s.	......	......	......	·28
7.	29·876	29·849	29·23	29·69	29·58	29·73	29·58	74	51	74	70	55	55½	58	sw.	s.	se.–s.	se.	·03	......	......	......
☽ 8.	30·063	29·983	29·35	29·60	29·72	29·43	29·51	70	51	63	60	52	63	54	sw.	wsw.	sw-w.	w.	·22	......	0·72	·22
9.	29·989	29·742	29·34	29·68	29·68	29·61	29·77	68	52	56	60	50	53	53½	sw.	s.	w–nw	ne.	·36	·24	......	......
10.	30·283	30·003	29·54	29·98	30·18	30·11	30·24	72	47	61	67	46½	54½	51	n.	nw.	nw-n.	e.	......	·65	......	......
11.	30·417	30·380	29·90	30·29	30·33	30·26	30·22	72	48	63	68½	47½	62	55	n.	nw.	nw.	w.	......	......	......	......
12.	30·448	30·439	29·93	30·38	30·39	30·30	30·35	81	48	65	73	54½	57	55	e.	calm	sw.	w.	......	......	......	·31
13.	30·423	30·358	29·90	30·37	30·31	30·34	30·32	82	52	72·5	76	53½	55	53	ne.	e.	sw.	w.	......	......	......	·04
14.	30·310	30·198	29·70	30·28	30·24	30·28	30·30	87	60	75	72½	56	53½	54	e.	calm	ne-e.	wnw.	·04	......	......	......
15.	30·260	30·225	29·70	30·24	30·20	30·20	30·09	71	41	65	68½	54½	61	52½	ne.	ne.	w.	w.	......	·05	......	......
○ 16.	30·296	30·230	29·66	30·19	30·15	30·10	30·06	78	49	69	71½	50	54½	51	ne.	calm	n.	nw.	......	......	0·47	......
17.	30·171	30·122	29·60	30·09	30·07	30·02	29·92	76	47	67	64½	53	53½	52	w.	calm	nw.	wnw.	......	......	......	......
18.	30·088	29·913	29·50	29·92	29·72	29·77	29·64	80	51	65	61	52½	53	50	w.	calm	sw.	calm	......	......	......	·22
19.	29·776	29·499	29·19	29·37	29·10	29·21	29·07	74	59	59	61	53½	51	51	sw.	w.	sw.	ne.	......	......	......	·32
20.	29·512	29·299	28·83	28·98	29·16	28·98	28·95	72	44	66·5	60½	54	58	49	sw.	w.	s–nw.	w.	·07	......	......	·15
21.	29·758	29·677	29·23	29·38	29·44	29·11	29·20	71	51	63	60½	45½	53½	51	sw.	w.	s–sw.	sw.	·21	·20	......	·29
22.	29·836	29·812	29·25	29·49	29·44	29·43	29·44	73	65	67	61	49½	57½	53½	sw.	w.	sw.	se.	......	·34	......	·05
☾ 23.	29·854	29·819	29·26	29·58	29·62	29·29	29·53	76	53	69	63	49½	55	52	sw.	w.	wsw.	s.	·38	......	1·78	·23
24.	29·903	29·863	29·30	29·65	29·60	29·57	29·54	73	51	64	61½	45½	58	53	sw.	calm	s-ssw.	calm	·08	·06	......	......
25.	29·794	29·753	29·20	29·44	29·45	29·37	29·33	68	53	61·5	61½	54	58	51	sw.	w.	ssw.	calm	·11	·11	......	·10
26.	29·720	29·695	29·16	29·50	29·48	29·31	29·36	67	51	62·5	65	51½	56	54	sw.	w.	sw.	calm	·08	·21	......	·42
27.	29·950	29·823	29·25	29·45	29·66	29·22	29·49	70	53	63	60½	52½	53	52	sw.	w.	sw.	w.	·01	·21	......	·40
28.	30·084	30·006	29·50	29·82	29·95	29·78	29·93	73	56	63·5	64	49½	53	51	w.	calm	w.	w.	......	......	......	·02
29.	29·096	29·005	29·60	30·00	29·92	30·04	29·99	78	48	62	68	42½	51	48½	sw.	w.	w.	ese.	......	......	......	......
● 30.	29·927	29·654	29·40	29·70	29·40	29·66	29·48	71	58	65	68	55½	58	55	sw.	calm	sw.	se.	·18	......	2·00	......
31.	29·512	29·360	29·40	29·38	29·29	29·37	29·30	72	51	64	61½	50	55	54	sw.	calm	sw.	se.	·04	·36	......	·24
Mean.	29·974	29·865	29·43	29·773	29·776	29·710	29·724	73·93	50·25	64·6	61·3	49·5	55·05	52·45					2·21	2·89	4·97	3·37

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

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XXV.—*On the Boring of the Mollusca into Rocks, &c.; and on the removal of portions of their Shells.* By ALBANY HANCOCK, Esq.*

[With a Plate.]

FEW subjects in connexion with malacology have caused so much discussion as the well-known excavating power possessed by many of the *Acephala*. Numerous attempts have been made to explain the manner by which these creatures work out their habitations: and this matter is indeed fraught with much interest, not merely in a philosophical point of view, but also on account of its immediate relationship to the affairs of man, as all persons connected with submarine works are too well aware. The ravages perpetrated by some of these animals, and especially by the smaller individuals of the group, the *Teredines*, are occasionally of the most fearful extent, and are carried on with a rapidity scarcely to be credited.

Of the many theories advanced to explain the nature of these operations, the one most generally received is, that the animal works with the shell in the manner of a rasp or an auger: another theory extensively believed requires a solvent; particularly when the burrows are in calcareous substances: and a third, which has received distinguished notice, was proposed by Mr. Garner in his well-known paper "On the Anatomy of the *Lamellibranchiate Conchifera*," published in the second volume of the 'Transactions of the Zoological Society;' which theory accounts for the phænomenon "by the vibratile action of the parts exciting constant currents of water against the substance, aided by its impetus when drawn in down the elongated body of the animal; and in some cases, perhaps, by the rasping of the valves."

In a short notice published in the 'Annals of Natural History,'

* Read at the Meeting of the British Association held at Swansea, August 9th, 1848, and communicated by the Author.

vol. xv. p. 114, I advanced an opinion that the animal itself is the boring instrument, and that those portions of it which come in contact with the bottom of the excavation are furnished with a peculiar armature for the purpose. But before entering further into this view, it will be better to inquire how far any of the above theories are likely to be correct*.

In the first place, then, are the excavations effected by the mechanical action of the shell? The *Teredines* are the only species that are stated to bore in the manner of an auger, and are consequently supposed to have extensive rotatory motion. On examination, the perforations of *Teredo* are found to be nearly cylindrical, perfectly circular, and frequently very tortuous, with their inferior terminations always exactly rounded. The animal, which in *T. norvegica*, according to Mr. William Thompson (Edin. New Phil. Journ. 1835), is sometimes nearly two and a half feet in length, occupies the whole channel from end to end; and is stated by Sir Everard Home to be attached to the calcareous sheath at the siphonal extremity. This attachment is alone sufficient to prevent anything like complete rotation in a continuous direction, and indeed of any rotation at all at the commencement of the burrow; but the difficulty is much augmented when the direction of the bore is taken into account, which, as above stated, is often exceedingly tortuous, turning from side to side in the most abrupt manner, and twisting in every possible direction. It is very common to find the bore turn suddenly at right angles to its original course, and after running a short way to bend again, as suddenly, and return in a parallel direction to the commencement of the track; thus forming three sides of a parallelogram, the angles at the turns being very perfect. In such a burrow as this it appears quite evident that rotation must be excessively limited, and consequently that the valves cannot cut in the manner of a centre-bit or auger. To this fact almost every piece of wood riddled by the *Teredo* bears testimony.

Many of the borers have the anterior portion of the valves covered with spines and raised striæ, which has induced the belief that these shells are able to rasp down the substances into which they penetrate. Such an opinion, however, cannot be maintained respecting those which have the valves smooth and covered with a decided epidermis, as *Saxicava, Lithodomus* and *Gastrochæna*: and after a little consideration it will be apparent that the shells with spines and raised striæ are likewise inade-

* Since drawing up this communication I perceive by the third part of the 'History of British Mollusca,' that the authors of that work adopt Mr. Garner's theory, which however they modify; the rasping of the valves being considered the principal agent, and the currents produced by the animal only secondary.

quate to the task assigned to them. The bottom of the excavations of all the boring bivalves,—of the *Pholades* as well as the *Teredines,*—is regularly rounded or scooped out in a manner that could scarcely result from the rasping of shells formed like those of these genera: certainly not without extensive rotatory motion, and for reasons before-mentioned it seems pretty clear that in *Teredo* the power to rotate is very limited. In *Pholas,* too, it would appear that there is not much rotatory action, as we shall afterwards endeavour to show. Indeed, it seems quite impossible to bring what is usually considered the rasping portion of the valves of *P. crispata* into contact with the bottom of the burrow; consequently in this species they can hardly be considered as boring instruments, even supposing that the spines were capable of rasping the softer sandstones, shale, chalk, wood, and limestone. In *Xylophaga* we have a pretty good proof that the anterior portions of the valves do not come into contact with the bottom of the burrow. This genus has the habit and general appearance of *Teredo,* but is distinguished from it chiefly by two accessory valves, which are so placed as to preclude, apparently, the possibility of this taking place. And in further proof that the spines are not used for such a purpose we have but to examine them: they are frequently quite sharp and perfect, bearing neither scratch nor blemish of any kind. It may be urged, undoubtedly, that nearly all these animals penetrate only the softer substances, such as chalk and shale; but it must not be forgotten that these bodies contain siliceous particles, and that *P. striata,* and most of the *Teredines,* burrow in the hardest oak. On the coast of Northumberland *P. crispata* is not unfrequently found in shaly sandstone—a material quite capable of reducing a much harder shell than it possesses. This species also occurs in the softer limestones in the same locality and on the Durham coast, and *P. dactylus, P. parva* and *P. papyracea* occur in the lias, which is hard and compact. There can be no doubt, however, that the softer substances alluded to above can reduce shell. I possess specimens of *P. dactylus* which are worn quite smooth towards the back of the valves by coming into contact with the sides of the excavation, while the spines on the front remain uninjured. This frequently happens with *P. crispata* and *P. candida,* which in the north of England are generally found in shale. But the most conclusive evidence that the valves are not used as rasping instruments is, that their anterior portions are frequently covered with a fine epidermis. Montagu says that this is always so in fine specimens of *Teredo navalis.* I have recently examined more than one species of this genus, and find that the striated,—that which is usually considered the cutting portion of the shell,—is sometimes covered with a fine yellowish epidermis which can be easily removed with the point of a penknife. The *Pholades* have also a delicate, wrinkled epidermis, which spreads over the anterior spiny portions of the valves. It is sometimes imperfect, but more or less of it may be always detected: in fine specimens it even covers the spines. All the British species have it. I have seen it very finely exhibited in specimens in Mr. Alder's cabinet; particularly on *P. crispata, P. dactylus* and *P. papyracea.* This epidermis is so delicate that it is liable to be removed by the washing-brush, and it is probably owing to this cause that it has been so little noticed. Some years ago Mr. Gray pointed out the existence of an epidermis on these shells. After this it may seem unnecessary to say anything more on this branch of the subject, for a stronger proof than that just noticed of the inefficiency of the spines as rasping instruments can scarcely be produced. But another fact has come under my notice, and as it relates to *P. candida,* the species which Mr. Osler describes as boring with its valves, it should not, perhaps, be passed over in silence. On the coast of Northumberland this species, old and young, is generally incrusted with a fine dark sediment, which frequently covers the whole of the shell, including the spines. On the back of the valves, towards the umbones, it is very commonly removed by rubbing against the sides of the burrow, and the shell, at this part, is often nearly worn through. It is, therefore, pretty certain that in these cases no rasping by the spines in front could have taken place.

It is also worthy of remark, that the *Pholades* commence to bore immediately after leaving the parent. I have removed from excavations the fry of *P. crispata* about one-fiftieth of an inch in length, being scarcely more than the mere nucleus, of excessive tenuity, brilliantly glossy, and as yet unprovided with spines, except two or three on each valve in a state of growth. They had nevertheless made for themselves regularly-formed excavations. How?—The advocates for the mechanical rasping of the valves will find much difficulty to explain.

The excavations at first are only one-sixtieth of an inch in diameter; but as the shell grows and sinks deeper into the substance the bore widens; and as the increase is more below than above, it is of a conical form with the apex upwards. What I wish to draw the attention to here is, that the burrow does not only deepen and increase in diameter *below,* but also that it widens *above* the shell; and that the orifice, in adult individuals, is often augmented to *one-fourth* of an inch in diameter. Were the shell the only boring instrument, this could not happen; for the channel above it incloses the siphonal tubes, and after the shell has once passed through this part of the burrow it cannot again return on account of its increased size. It is clear, therefore, that the soft fleshy wall of the siphonal tubes widens this part of the channel: and this would appear to establish the fact that a hard shelly or spinous surface is not necessary to reduce the substances into which these animals penetrate, and is strongly in favour of the opinion that the valves are not instrumental in boring.

Many naturalists, feeling convinced that the shell of these animals is too soft to cut or rasp down the hard substances into which they excavate, and being anxious to explain the phænomenon, have had recourse to the theory of a solvent. The prevailing opinion however is, that whilst *Teredo* and *Pholas* burrow by the rasping power of their valves, *Saxicava* and its allies penetrate by the aid of an acid solvent secreted by the animal. Mr. Osler maintains this opinion in his memoir on the subject published in the 'Philosophical Transactions' for 1826, but entirely failed to detect the least trace of such an acid after the most careful investigation. I have also endeavoured to ascertain the presence of a solvent of this nature, but equally without success. After having determined, beyond a doubt, that the anterior portion of the animal is the boring instrument, as will be afterwards shown; and presuming, if an acid existed, that it would be secreted by follicles in the skin of this part, I removed it from the living animal, and placing the part so removed on litmus-paper, pressed it gently between two pieces of glass, so as to force the fluids out of it: this experiment I have frequently repeated, but never succeeded in detecting an acid. Another method was also adopted for this purpose. Several specimens of various growths were taken from burrows, and placed in a vessel of fresh sea-water with the anterior portion of the animal in contact with litmus-paper. Here they remained for upwards of a week: three or four attached themselves by their byssus to the test-paper, and continued so with the excavating portion of the animal resting upon it for several days; but the result was again negative—not the slightest stain was apparent.

Mr. Osler candidly acknowledges that if *Saxicava* were ever found to penetrate non-calcareous substances, it would be fatal to this theory. Now, several observers have stated, and Mr. Garner and Mr. Clark are amongst the number, that this species does not confine its operations to calcareous bodies. I have not been able to satisfy myself on this head; but *Clavagella*, which has the mantle closed and thickened in front as in *Saxicava*, and which cannot be supposed to bore by the action of the valves, has been found, according to Mr. Broderip, "in siliceous grit like that of the coal-measures." Few will doubt that the instrument is the same in these two genera; and if we are to believe that all the *Acephala* excavate by the same means and that a solvent is the agent, then we must allow that its powers are of the most extraordinary nature; for whilst it must be able to dissolve limestone, shell, shale, shaly sandstone, siliceous grit and wood, it appears incapable of injuring the shell of the animal that secretes it.

It has been urged by those naturalists who advocate the existence of such an unknown solvent, that it may be applied in such a way as not to touch the calcareous covering of the animal, and that vitality may resist ordinary chemical action. It is difficult to understand how this can be; and it is quite certain that the shell of the living *Saxicava rugosa* cannot retard the penetrating power of another individual of its own species. Mr. Osler states "that when the holes communicate, it is common to meet with one animal which has attached its byssus to another, and that in such case the second is always acted on by the assailant; and also that it frequently happens under such circumstances for the one to penetrate completely through the shell of the other." And this gentleman supposes, that when an animal is thus wounded, a "firm yellow substance" which it secretes is sufficient to resist the further progress of the intruder. It seems strange that if this substance, which is of a coriaceous or horny appearance, does really retard the progress of the animal, the epidermis should not have done so in the first instance. I have seen nothing in confirmation of Mr. Osler's supposition, though I have frequently observed what he describes; but can readily understand that the infliction must cease on the destruction of the shell to which the byssus, as before stated, was attached: this will be evident when we come to consider the animal, and the mode by which I think it penetrates.

Mr. Osler further states, that "the cuticle which had necessarily been exposed to the same agent remains uninjured and overhanging the breach." This no doubt occasionally happens, but in all the cases that I have seen, the epidermis has been entirely destroyed. I cannot however conceive that this favours the solvent theory, as Mr. Osler supposes: on the contrary, it seems to prove that friction must have been used, for how could a solvent that is unable to reduce the epidermis ever reach the shell beneath it? This can only be explained by supposing that it had been torn by friction, and pushed aside so as to expose the surface of the shell.

When the burrows communicate, which they frequently do, the edges of the passage of communication are always very sharp, so much so, indeed, as to favour strongly the theory of friction; for had a solvent been used, the probability is that those edges must have been more or less rounded. It is the same when the burrows of *Teredo* run into each other, which sometimes happens. And when the shell of *Saxicava* has been completely cut through by an assailant, the plane of the section is quite flat, and forms sharp and perfect angles with the inner and outer surfaces of the shell. The edges of small cavities cut through remain also perfectly sharp.

It is not uncommon to find at the bottom of the burrows of *Saxicava* a fine sediment, apparently arising from the scourings of the excavation. If this be carefully removed with the point of a pen and immersed in acetic acid, effervescence ensues. A similar sediment on the back of the shell of *Gastrochæna* also effervesced when treated in the same way. And if a little of the same acid be applied to the anterior portion of the animal of *Saxicava*,—that portion where Mr. Osler rightly considers the excavating instrument is situated,—the same result occurs; a convincing proof that calcareous matter was adhering to it, and strongly in support of the opinion that the boring instrument is not armed with an acid solvent. These experiments seem much in favour of mechanical action.

And after all, how is a solvent to be applied with effect under water? One way suggests itself. The surface of an adhesive disc firmly attached to the part to be eroded might secrete, and at once apply the necessary fluid: but even in this case there is a difficulty; for in exact proportion to the quantity secreted, the attachment of the disc would be diminished, and the surrounding element coming in contact with the solvent, it of course must be diluted. May the solvent be of an oily nature, or of such a character as not to mingle with water? If so, how is it to act on a substance saturated with water? But with *Saxicava* the difficulty is increased, for it is not furnished with such an adhesive disc: in this respect it differs from *Pholas* and *Teredo*.

The burrows of *Saxicava* on the Northumberland and Durham coasts occasionally pass through the soft, porous parts of the magnesian limestone, which are completely saturated with water. It might, therefore, be supposed that any solvent secretion would be so diluted as to be rendered impotent. And it is common for *Lithodomus* and several other borers to bury themselves in corals, some of which, on account of their open texture, must contain large quantities of water. Mr. Fryer of Whitley possesses a specimen of coral thus excavated, which has the cells so large that the sides of the burrows resemble a section of a bundle of small crow-quills. In this case it is almost impossible to conceive how any solvent could act on the thin laminæ that divide the cells, which, of course, would be filled with water ready at every point to mingle with and to destroy the corrosive effect of any fluid secreted by the animal.

Turton entertains the opinion that the *Pholades* penetrate by the aid of phosphoric acid. He adopted this notion from having investigated the habits of *P. dactylus*, *P. parva* and *P. candida* on the Devonshire coast, where, according to his account, they all burrow in a soft sandy material cemented by lime. But all these species are stated by Montagu to occur in wood. On the coast of Northumberland, *P. candida* and *P. crispata*, as before mentioned, burrow in shale; the latter occasionally in shaly sandstone; and Mr. Hogg has found these two species in wood at Seaton. There can be little doubt, however, that all the *Pholades* penetrate by the same means; and as *P. striata* bores into the hardest oak, it is evident that its excavating powers are equal to those of *Teredo*: and from the close alliance of the two, it is but fair to assume that the instrument is the same in both. Now, since the discovery of excessively fine sawdust in the body of *Teredo*, we cannot deny that it bores mechanically; and must therefore conclude that *Pholas* does the same, or at least, that such is probable.

Some, indeed, have doubted the nature of the impalpable sawdust found by Sir Everard Home in the interior of *Teredo*; but having had the opportunity of examining a great number of specimens, I feel perfectly satisfied of his accuracy, and also of that of Mr. Hatchett, who had this substance submitted to him, and found it unaltered by the action of the stomach or otherwise chemically changed. In many instances I have taken the reduced wood from the half-decayed and dried-up bodies of these animals: it fills nearly one-third of the worn-like portion of the creature. In a piece of deal in my possession, well filled with *Teredo*, every individual contains more or less of this microscopic sawdust, which is of a pale yellow colour of the same tint as the wood, and when moist is soft and pulpy: it readily separates in water, and exhibits a granular appearance: when dry it burns freely with a flame, chars, and emits a smell exactly like that of burnt wood. I have also taken this comminuted wood out of animals buried in mahogany: in this case the sawdust is a dark obscure red resembling the colour of the wood. Sir Everard is not inclined to believe that the animal derives any nourishment from the wood, and, indeed, its unaltered state goes far to prove that it does not. The passage of the reduced wood through the body of the animal would appear to be necessitated by the great length and tortuous direction of the bore, which we have already seen is entirely filled up by the *Teredo*. The partial attachment of the siphonal extremity to the calcareous sheath would also tend to prevent an exit in the usual way.

The theory of Mr. Garner, that the currents of water produced by the vibratile cilia of the animal are sufficient to work out the excavations, appears to be very unsatisfactory, and quite inadequate to explain the phænomena attending this interesting subject.

In the first place it must be borne in mind, that the burrows are made with great rapidity. It is stated by Mr. Thompson, in the paper before alluded to, that *Teredo* is known "to have destroyed the keel of a vessel afloat in the short space of four or five months." And a piece of deal is said to have been riddled by it in the course of forty days *. *Saxicava* and its allies, as well as the *Pholades*, make their excavations of a pyramidal form, increasing downwards as the animal enlarges. The boring must, therefore, cease so soon as the shell has attained its full size, or the excavations would be continued with the sides parallel. From this it would appear that the burrows of these animals are the work of a very limited period—that of growth. Neither must it be forgotten, that the usual currents produced by cilia are so exceedingly feeble and limited as to require the aid of a lens to exhibit them. But Mr. Garner supposes that their velocity, and consequently that their strength, may be increased by being drawn through the elongated body of the animal. Should the currents be the ordinary siphonal currents,—and this seems to be Mr. Garner's opinion,—it is difficult to conceive how they could subserve their ordinary functions; and how the delicate tissues of the gills could escape injury, were the water hurried over their surfaces in the manner supposed.

The foot of *Pholas* is, undoubtedly, ciliated; but the external wall of the siphonal tubes, which we have seen enlarges the channel of the burrow, is not; neither is the mantle, and it, as will afterwards appear, is a very material agent in boring. The foot of the *Acephala* is usually—perhaps always—clothed with vibratile cilia; there is therefore nothing extraordinary in their presence in this case. They are probably for the purpose of cleansing the surface, and may in this way be eminently useful to the boring mollusks. Mr. Garner, however, appears to apply his theory more particularly to *Saxicava* and its allies. But the mantle of *Saxicava rugosa* is completely closed in front, and consequently there is no outlet for the currents at the very place where the greatest friction is required: further back there is a small opening for the foot and byssus; but were the currents to pass by this orifice, the byssal attachment would be destroyed and operations thereby stopped. *Gastrochæna* also has no frontal outlet, neither has *Clavagella*. There are no cilia on the anterior portion of the animal of *Saxicava*—that portion which is the excavating instrument. Towards the end of the foot, which is small and narrow, there are certainly cilia as in the other *Acephala*; but it is impossible for a moment to entertain the opinion that the currents produced by these could work out the excavations of this species.

* Penny Cyclopædia, vol. xxiv. p. 224.

Some of the Gasteropods,—*Patella, Hipponyx* and others, are well known to make holes in rocks and other hard substances. On the coast of Northumberland *Patella vulgata* occasionally sinks half an inch into the softer kinds of stone; and Mr. Garner asserts that it often forms holes an inch deep. Mr. John Edward Gray, in his valuable paper on the Œconomy of the Molluscous Animals, published in the 'Philosophical Transactions' for 1833, expresses an opinion that these holes are produced by the dissolving powers of the animal, not having observed *Patella* or the boring *Acephala* to penetrate any but calcareous substances, and those cemented by lime, wood and clay excepted. At Cullercoats, however, where there are rocks of various kinds, *Patella* does not confine its operations to such as contain lime; it sinks equally deep into shale and shaly sandstone, and even slight impressions are occasionally made into the less compact siliceous sandstones. The idea of a solvent would, therefore, appear untenable. *Patella* certainly does not bore into the compact siliceous freestones; even the very hard limestones are never deeply penetrated by it: into the softer rocks above-named it sinks deeper, and still deeper in proportion to their softness.

Mr. Garner, in following up his views, maintains the opinion that it is by the action of the ciliated branchiæ that these excavations are made. But on examining them we find that there is generally an elevated ridge corresponding to the space between the mantle and foot; in which space the gills are placed, and where, of course, the currents are strongest. Were these excavations effected by the branchial currents, there ought, certainly, to be a depression in the place of this ridge.

The holes made by *Patella* vary considerably in different materials. In hard stone not more than a mere circle, corresponding to the edge of the mantle, is produced: in soft limestone the mantle sinks to some depth, leaving the portion on which the foot rests projecting up in the centre, sometimes more than one-eighth of an inch. In the sound shales the bores are frequently almost flat; but in those that are friable, the foot, by its strong grasping powers, tears up the stone, and thereby makes a deepish cavity in the centre of the burrow: the surface of this cavity has a rough and broken appearance, and is surrounded by a smooth elevated rim sunk a little beneath the general surface of the stone: this rim is produced by the mantle*.

* The form of the shell of *Patella* is modified in consequence of this diversity of the burrows. When they are flat, the shell attains its normal growth; when the centre is elevated and the margin corresponding to the mantle depressed, the shell becomes very much raised: but it is flattened in a most extraordinary manner when the foot sinks deep into the centre of the excavation.

The under surface of the foot of *Patella* is clothed with vibratile cilia; but, as just stated, that part of the animal does not sink so deep into the rock as the mantle, except when the surface breaks up under the grasp of this powerful adhesive disc. There are no cilia on the mantle, therefore the reverse of this might be expected to take place were Mr. Garner's theory correct. The cilia on the foot are not at all peculiar to this animal: I have detected them also in *Doris, Limapontia, Purpura* and *Littorina*; and it is worthy of remark that in all these they are very much larger and more vigorous than in *Patella,* in which they are so extremely small that it requires the greatest care and high magnifying powers to make them out.

Let us now for a moment suppose that these currents are capable of reducing the substances into which these animals penetrate, and that a *Patella* attached to shale, or any other rock, is working its way into it. What are the currents effecting all the time on the surface around the shell—those currents being ten thousand times more powerful than the minute, microscopic ones produced by the animal? Must not the action of the advancing and receding tides, augmented by the rolling of the waves to and fro, triturate the surface of the rock more rapidly than the comparatively feeble, ciliary currents of the gills and foot? Were the excavating powers, therefore, limited to these currents, should not the *Patella* stand upon an eminence rather than be half-buried in a hole? This argument also applies with equal force to *Pholas,* and still more strongly to *Teredo*; for surely it can never be maintained that the triturating effect of water on the planks of a vessel, sailing at the rate, occasionally, of ten knots an hour, is less than the almost imperceptible currents produced by the *Teredo,* which will penetrate several inches into the timber during a voyage from India.

I fortunately possess three or four specimens exhibiting the bores of *Patella,* which perhaps may be considered sufficient to prove that the animal works mechanically, and in a way that currents of water could scarcely act. The first of these bores is that of a small *Patella*: it is sunk only a little way into the surface of a gigantic species of the same genus from the coast of America, and exhibits minute striæ or scratches radiating from the centre to the circumference. I have seen another specimen of this gigantic *Patella,* in the collection of Mr. Fryer, which is marked with several similar impressions, one of which is scratched in the same manner, but more distinctly. In this specimen the whole surface of the impression is covered with lines radiating from the extreme circumference to a spot near the centre. The lines or scratches are in groups, and so small as to require a powerful lens to show them. At first I thought it possible that these lines might, in some way, be connected with the structure of the shell, though it was impossible to explain how this could be. Since then I have procured from the coast, in the neighbourhood of the Tyne, specimens of the bores of the common *Patella* in shale and limestone very distinctly marked with the same radiating striæ or scratches; thus proving satisfactorily that the radiating lines in the former instances are not structural, and that the foot and mantle of the animal possess the power of reducing those substances mechanically. But certainly not by ciliary currents, unless they be supposed capable of producing a scratched surface; and if so, how are the currents in the cases cited to pass away, meeting as they must under the centre of the foot*?

Having stated the facts, and having gone through the reasons that induce me to consider the three generally received theories insufficient to account for the operations of the stone- and wood-boring mollusks, I shall now proceed to explain my own views on the subject.

It has been already stated that I have expressed an opinion that the anterior portion of the animal is the excavating instrument. This in *Teredo* and *Pholas* is composed of the foot and the edges of the mantle, which, together, entirely fill up the frontal gape of the shell. In *Saxicava* and *Gastrochæna* it is formed wholly of the edges of the mantle, which are united and thickened. The foot and mantle of *Teredo* protrude before the valves: the former is circular and convex in front, and there is little doubt, from the resemblance it bears to the same part in *Pholas*, that it adheres to the bottom of the burrow, with which in form it precisely agrees. Sir Everard Home calls this the "proboscis," which, he says, "in the living animal had a *vermicular motion*: the extremity was covered by a cuticle not unlike the cornea of the eye." Sir Everard also remarks, "that as this proboscis has no orifice, there is reason to believe that it adheres to the wood, acting as a centre-bit, while the animal is at work with the shell." Not having seen *Teredo* alive, I cannot speak from my own knowledge to the exact form of these parts; but from the examination of specimens in spirits I have no doubt of the accuracy of this description, which proves that the foot or "proboscis" corresponds exactly in form to the bottom of the burrow. The comparison of this part to the "cornea of the eye"

* In the 'History of British Mollusca,' it is stated that in Mr. Cuming's collection there is a specimen of *Pholas* which has made its excavation in wax; a circumstance scarcely favourable to the opinion advanced by the authors of that work. Currents of water could have very little effect on a substance of this nature, and it would be very liable to clog the rasping surface of the valves so as to retard operations, if not to stay them entirely.

is most conclusive, for a better idea could not be given of the peculiar concavity of the bottom of the burrow than by an allusion to this object.

The foot of *Pholas crispata* is like that of *Teredo*: it projects in front of the valves, is very large and convex in front, agreeing also in shape with the bottom of the burrow, to which it closely and constantly adheres. The free borders of the mantle surround this organ, and together with it almost fill up the bottom of the excavation, the concavity of which so exactly corresponds to the convexity of those parts that the one might be supposed to be moulded on the other. *P. candida* and *P. parva* have the foot and anterior portion of the animal formed in the like manner, being only specifically modified; and, judging from analogy, there can be no doubt that all the individuals of this group are constructed after the same type. *P. papyracea* and *P. striata,* from being closed in front when mature, might be thought to have the animal differently formed. But we have the authority of Mr. G. B. Sowerby for asserting that *P. laminata* is the young of the one, and *P. minuta* of the other. If this be the case (and having carefully examined specimens of them all, I am inclined to the same opinion), the animal of these two species when young will undoubtedly resemble that of *P. crispata,* and the excavations must be made whilst in that state. We have already seen that the burrows of all the boring bivalves are formed during the growth of the animal. And in these two species after the burrows are completed the anterior gape of the shell is filled up, and probably the large foot greatly reduced.

Thus then we see that in *Teredo* and *Pholas* the anterior portion of the animal corresponds in form to that of the bottom of the excavation. How is this in *Saxicava rugosa*? Precisely the same. The parts however are modified.

The animal of this species, and of that of *Gastrochæna Pholadia,* are alike: they are both closely enveloped in the mantle, having only siphonal orifices, and a small perforation about one-third of the length of the shell from the anterior end for the passage of the byssus and a small slender foot, which is occasionally protruded. The mantle in front is much thickened, and forms a sort of cushion-like swelling of an elliptical form, extending some way backwards, and which at the will of the animal can be thrust out considerably in advance of the valves. The arch of the front of this cushion corresponds to the concavity of the bottom of the burrow. As before stated, this part of the animal has not the power of adhering to the substance to be eroded, but is held in contact with it by the attachment of the byssus; and, howsoever the excavation may be effected, there can be no doubt that this thickened portion of the mantle is the instrument.

Burrows frequently occur with a depression at the bottom exactly agreeing in form and size with this part of the animal, and it very commonly happens that there is an elevated point in the depressed part corresponding with the greatest accuracy to the position of the byssus. Indeed, I have seen the byssus on several occasions adhering to the projection. It seems impossible to have a more convincing proof than this, that the anterior portion of the animal is the excavating instrument.

The animals of all the species that confine their operations to calcareous bodies are most probably formed like those of *Saxicava* and *Gastrochæna*. *Petricola* is stated by Mr. G. B. Sowerby to have "the borders of the mantle thickened in front with a small hole for the foot." And Professor Owen, in his paper on *Clavagella,* published in the first volume of the 'Zoological Transactions,' describes that genus as having the mantle closed and thickened in front with a small orifice for the foot. It is satisfactory to observe that this distinguished physiologist considers that the animal enlarges its habitation by this thickened portion of the mantle. I have not been able, anywhere, to find a sufficient description of the animal of *Lithodomus*; but from the remains of it in a small specimen which I found buried in an old shell, there can be little doubt that it also has the mantle closed in front.

From what has already been said respecting the holes of *Patella,* it is sufficiently evident that they also partake of the form of the animal.

The direction of the burrows of the *Acephala,* as well as their form, corroborates the opinion that the anterior part of the animal is the boring apparatus. I have examined a great number of the burrows of these animals, and find that the direction of the excavations is always inclined a little to one side: none of them are at right angles to the surface by which the animal enters. The bores of *Teredo* are so inclined at the commencement; but their course is soon altered, and is afterwards, apparently, determined at the will of the animal. The burrows of *Pholas* and *Saxicava* are generally continued their entire length in the original direction; they are, however, sometimes slightly twisted as well as inclined. This happens with *Saxicava* more frequently than with *Pholas,* and is occasioned by the animal having turned a little more to one side than usual. This obliquity of the burrow is unfavourable to the opinion of rotatory motion, and arises from the exposure of the animal towards the ventral margin of the shell. The cutting surface being therefore placed to one side, the excavations cannot be perpendicular unless complete rotation were to take place, which we shall afterwards see is unnecessary.

It now remains to be shown that the anterior parts of the animal are furnished with the means of removing the various substances into which the burrows are made. The means employed cannot be a solvent, unless we are prepared to suppose it capable of eroding argillaceous, calcareous, and siliceous bodies and also wood; and we have already seen that in the case of *Teredo* the wood is reduced to sawdust, and in no way affected by chemical action; likewise that the excavations of *Patella* occasionally exhibit a scratched surface. This latter fact would appear also to exclude the instrumentality of ciliary currents, as they can scarcely be deemed sufficient to produce such a surface. And since we have seen that *Saxicava* is unprovided with cilia on the boring instrument, few naturalists will be disposed to support the theory promulgated by Mr. Garner: all such, however, are compelled to allow that the mighty currents of the rolling tide are far less potent than the minute breathing currents of the mollusk; and that they, microscopic as they are, can in the course of a few months dig deep into hard shell and limestone,—nay, even into the hardest marble which has withstood the shock of the elements for ages. Some naturalists may still be inclined to urge that one species may work mechanically and another chemically. But is it not more philosophical to allow that animals so nearly allied as these—or at all events that all the boring *Acephala*—are more likely to effect a similar purpose by the same means, than that several should be adopted? Surely this is more consistent with the unity of the laws of nature, and that beautiful simplicity which is everywhere prevalent in her works*.

We shall now examine the anterior portions of the animal. The surface of the foot of *Teredo norvegica* when preserved in spirit is tough and coriaceous, and is entirely covered with little, irregular pimples. If a portion of it be placed in the compressor of the microscope, it is perceived to be crowded with minute, bril-

* Professor E. Forbes and Mr. Hanley, who, as before stated, advocate the mechanical action of the shell, aided by the currents produced by the animal, appear also to contemplate the probability of the assistance of an acid solvent; for they state in conclusion that "if there be any chemical action aiding, it must be due to the carbonic acid set free during the respiratory process." The advocacy of such a multiplicity of means to effect the same purpose cannot be avoided by those who believe that the *Pholades* work out their excavations by the rasping of their valves. *Saxicava* has a smooth shell, and is unprovided with cilia on the anterior portion of the animal; therefore the assistance of an acid solvent must be resorted to in this case. But in that of *Patella*, which penetrates shale and shaly sandstone as well as calcareous bodies, such a solvent cannot be supposed to act for the same reason that would preclude its use in the *Pholades*; and therefore in *Patella* the currents produced by the animal must be imagined to operate, as the shell here is out of the question. Thus all these three means are requisite to account for the phænomenon, if the theory proposed in the 'History of British Mollusca' be correct.

liant points; and on increasing the pressure, comparatively large imbedded, crystalline bodies are revealed (Pl. VIII. figs. 6 and 7). They are very numerous and of various sizes and shapes, chiefly five- and six-sided, but not by any means regularly so: they all agree in having one or more elevated points near the centre. It was these points, apparently, that were seen in the first instance shining on the surface. These bodies are highly refractive, and are for the most part pretty regularly distributed over the whole convex surface of the foot, but are occasionally congregated into masses. Similar crystalline bodies are likewise imbedded in the edges of the mantle surrounding the foot.

In *Pholas* the same appearance is presented both in the foot and in the surrounding edges of the mantle. When the anterior convex surface of the foot of *P. crispata*, for instance, is removed and examined with the aid of the compressor, it is found to be studded over with minute dark spots, each emitting a brilliant point of light from the centre. On using a higher magnifying power the whole surface is seen to be crowded with crystalline bodies, some dark-coloured, others perfectly transparent, and resembling in shape and character those of *Teredo*; but most commonly drawn together into little bundles, and very brilliant: they are sometimes also gathered into considerable masses. These bodies in some specimens are quite colourless; but when of a dark reddish brown, which is not uncommon, they have at first sight a glandular appearance, especially when the imbedding tissue is a little thickened about them, which frequently happens. The dark spots of a glandular aspect observed by Professor Owen in the outer dermoid layer of the mantle of *Clavagella* may probably prove to be similar crystalline bodies.

Saxicava rugosa has also the anterior portion of the animal abundantly provided with crystalline bodies like those already described (figs. 1 and 2); but they are for the most part larger and stouter, and are likewise frequently associated in groups. They are highly refractive, perfectly colourless and of a glassy purity; and are imbedded in a thinnish epidermis, which is firmly attached in the living state to the thickened portion of the mantle, but is easily pealed off when the animal has been some time in spirit. The thickened portion of the mantle of *Gastrochæna* is also furnished with similar crystalline bodies, but from the want of specimens I have not been able to examine them in this species so fully as is desirable.

The foot and mantle of *Patella vulgata* likewise exhibit these brilliant bodies; but in this species they are smaller and less robust than usual. In the species which has been mentioned as boring in the large *Patella* from the coast of America, they attain, however, a high degree of development. I fortunately obtained a desiccated animal of this borer adhering to the base of an excavation, and on placing the foot and edges of the mantle in the compressor, large, robust crystalline bodies (figs. 3, 4) were distinctly visible, arranged in irregular groups around the margin apparently in the mantle: similar bodies were also distributed over the foot, but without the slightest tendency to order. They are mostly five- and six-sided, are thick, and have an elevated point in the centre. When crushed between glass they are liable to fracture in a radiating manner (fig. 5), as if from the influence of the pressure on the central point.

It is difficult to say what these crystalline bodies are composed of, though there can be little doubt that they are modified epithelium scales, from which they differ chiefly in being very robust, highly refractive and brilliantly crystalline. The difference between these and ordinary epithelium scales will be at once recognized, if a little of the surface of the lower portion of the siphonal tube of *Pholas* be examined in the compressor. It appears also that, like the scales of epithelium, these bodies are constantly being shed. On testing the scourings taken from the bottom of the burrow of *Saxicava,* as before-mentioned, they were found to contain a vast number of these bodies exactly corresponding with those of the mantle; and on examining the sediment adhering to the shell of *Gastrochæna,* the residuum after the action of the acid had ceased was almost entirely composed of them. The reduced wood taken out of *Teredo* also contains brilliant crystalline bodies resembling those in the foot and mantle. Whether these bodies, however, are epithelium scales or not, we see in this deciduous character the means of keeping the rubbing surface in an efficient state. With pressure these bodies frequently break into sharp angular fragments. Acetic acid has no effect on them; and in *Saxicava* strong nitric acid produces no change even after several days' immersion. If allowed to remain sufficiently long in this acid the imbedding tissue is destroyed, and the crystalline bodies, not in any respect altered, are left as a sedimentary residuum. Those of *Pholas* and *Teredo,* however, appear to be ultimately acted on by this acid, though they resist its power for several hours, and are never totally destroyed by it. They become attenuated and brittle, but retain much of their brilliancy and sharp angular appearance; and even some of them, especially in *Pholas,* are scarcely at all altered after having been subjected to the action of this powerfully corrosive acid for many days. From these facts it perhaps may be inferred, that these crystalline bodies are either entirely composed of silex, or are a combination of it with animal matter. These experiments certainly do not prove this; but when their results are taken in connexion with the crystalline appearance of these bodies, and when we refer to the fact recently made known that the spines of the tongue of the Gasteropods are composed of silex, a high degree of probability is established in favour of this view; and if it be correct, the phænomena attending the boring of the mollusks are very easily explained*.

The foot and mantle of *Teredo, Pholas* and *Patella,* and the thickened portion of the mantle of *Saxicava, Gastrochæna* and their allies, appear, then, to be rubbing discs of extraordinary power, crowded as they are with these siliceous bodies, which penetrating the surface give to it much the character of rasping or glass-paper. And all that now remains to be proved is the existence of muscles to give to this formidable cutting surface the necessary rubbing motion.

These muscles are amply provided: the adhesive portion of the foot, as well as the mantle, of *Teredo* and *Pholas,* and also of *Patella,* are composed of interlaced muscles. The anterior thickened part of the mantle of *Saxicava* is also made up of muscular fibres running in all directions. And Professor Owen, in his account of *Clavagella,* states that "the muscular layer after forming the siphon and its retractors is confined to the anterior part of the mantle, where it swells into *a thick convex mass of interlaced and chiefly transverse muscles.*" Surely this powerful muscular apparatus has some important function to perform:—not to secrete a solvent, but to assist by its mechanical agency in the work of excavation.

We now see the boring instrument complete in all its parts; and a more efficient apparatus could not be devised. Supplied with this flinty armature, the soft fleshy foot of *Pholas* and *Teredo,* adhering to the substance to be reduced, and aided by the edges of the mantle, cuts with equal facility into wood, shale, chalk, and the various other bodies into which these mollusks burrow. *Patella* excavates in the same way. The mode is somewhat varied in *Gastrochæna* and *Saxicava*: they firmly attach themselves by the byssus to the rock, then bring into contact with it the armed and thickened portion of the mantle; thus enabling the interlaced muscles of which it is composed to work with as much effect as those in the broad adhesive foot and mantle of *Pholas* and *Teredo.*

In none of these species is much rotatory motion required. In

* In the 'History of British Mollusca' the existence of siliceous bodies in the foot and mantle of *Pholas* and *Teredo* is denied. Perhaps the authors of that work may have overlooked them on account of their resemblance to epithelium scales. Silex, however, can scarcely be considered essentially necessary; a much softer material on a living surface, and *perpetually being renewed,* may be supposed capable of rubbing down the various substances into which these animals burrow; certainly so far as the *Pholades* and *Teredines* are concerned.

Pholas and *Teredo* little more than the mere contraction of the cutting surface is sufficient; each portion of the foot and mantle, which together nearly fill up the bottom of the excavation, acting immediately on the substance with which it is in contact. The same thing takes place in *Patella*, which evidently does not rotate, for the burrows are elliptical like the animal, and fit with great accuracy the marginal indentures of the shell. But the cutting disc of *Saxicava* and *Gastrochæna* being narrower than the burrows, these species must, at intervals, move a little from side to side, anchoring themselves afresh by the byssus whenever they shift their position. In all, however, the same vermicular contraction of the parts observed by Sir Everard Home in the foot or "proboscis" of *Teredo* will be required to remove the substances into which these animals bore.

Thus this perplexing subject is simplified; and judging from analogy, there can be little doubt that all the boring mollusks excavate in the same manner: none by the rasping or cutting of their valves,—none by a solvent,—none by ciliary currents*. We should therefore be inclined to doubt that any of the *Acephala* bore, which are not provided with either the broad adhesive foot or with the thickened mantle united in front. *Venerupis perforans* may be, perhaps, cited as an exception to this rule; but it is doubtful whether it ever bores. On the coast of Northumberland, where there is abundance of soft shale and a great variety of rocks, it certainly never does so: but it frequently takes up its

* The stone-boring *Annelides* will probably be found to work out their excavations in a similar manner. The *Cliona celata* of Grant would also appear to make the chambers it inhabits in the shells of bivalves and in other substances by mechanical agency. This curious production was supposed by its describer to take up its abode in excavations made by marine worms; but after carefully examining the cavities occupied by the *Cliona*, there can be no doubt that they are the work of this creature, most probably aided by its siliceous spicula, which penetrating the surface of the animal give to every portion of it the character of rasping-paper. In this case such an apparatus, at first sight, might be thought inefficacious, as the sponges are not contractile; but the *Cliona* is an exception to this general law. Dr. Grant states that it is "distinctly irritable," and describes the papillæ as being highly contractile; and it is worthy of remark, that this, the only boring species, is the only one that possesses this power. Dr. Grant also states that it adheres so closely to the smooth parietes of the cavities that it cannot be removed without tearing—a fact corroborative of the theory now advanced, but not at all favourable to that of an acid solvent or of ciliary currents. Were either of these agents employed, it is not likely that laceration would attend the removal of the animal, as no very intimate connexion could exist between it and the walls of the bore. But from the nature of the apparatus, as just described, it is evident that the creature would be held in its place by the siliceous points on its surface, and thereby removal rendered difficult.

abode in the old burrows of *Pholas* and *Saxicava*; and it is probably owing to this habit that powers have been attributed to it which it does not possess. From a similar habit, *Kellia suborbicularis* has also been stated to excavate; and it is not unlikely that several other reputed borers have no better title to be so considered.

It may still be asked;—if the armature be of this formidable nature, how is it that *Saxicava* is entirely confined to calcareous substances? Why should it not likewise burrow in softer materials, such as wood and shale? This may be answered by another question—why do *Teredo* and *Pholas striata* always bore in wood? And why is not *Saxicava* itself found in shells of other mollusks, as is frequently the case with *Lithodomus*? for certainly an acid solvent could dissolve the calcareous covering of these animals as well as hard limestone.

Some impulsive instinct is most probably the guidance in these matters, leading each species to that substance best suited, in some way or other, to the œconomy of its life. This selection, without an apparent cause, is observed everywhere in the wide field of nature: we see it in the nests of birds, which in closely allied species are frequently built of different materials; and we see it in a striking manner in the habits of the burrowing bees. The carpenter-bees (*Xylocopæ*) are well known to excavate in wood; there is a species, however, of an allied genus, the *Anthophora retusa*, which "makes its nest not only in hard dry banks but also in the crevices of walls, *burrowing through the mortar*, and causing much damage by loosening the bricks." It cannot be from want of power that this species does not penetrate wood.

In *Saxicava* there is also a mechanical cause which may have something to do with the matter. It has been already stated that the rubbing instrument is held by the attachment of the byssus in contact with the substance to be excavated; and as the byssus is small, it is ill calculated to maintain its hold of soft friable rocks, such as shale, which, on the coast of Northumberland, is frequently exceedingly brittle; so much so that the *Algæ* seldom grow on it, and the *Patellæ* rarely trust themselves to its treacherous surface. *Clavagella*, however, appears to burrow in soft substances as well as in hard ones: this is easily accounted for by the fact, that the attachment of one of the valves to the side of the burrow renders the support of a byssus unnecessary; and having an extensive fulcrum, this species can therefore excavate in soft substances with as much facility as *Pholas*.

There is another phænomenon in the history of the mollusks which appears intimately connected with the subject just discussed—the power possessed by many of the Gasteropods of reducing the thickness of the columella, and of removing spines and other obstructions from it.

Mr. Gray, who has entered on this matter at some length in his paper (before quoted) in the 'Philosophical Transactions,' states that "this absorption of the outer part of the last whorl but one, and of the spines, is evidently effected by the edge of the mantle." And there can be little doubt that the other instances which that gentleman mentions of the "absorption" to a greater or less extent of the septa is likewise effected by the same organ. That this view is correct we have but to refer to the *mollusca* of our own coast. The shell of *Buccinum undatum* generally exhibits a groove on the columella extending the whole length of the mouth; and if a living specimen be examined, we perceive that the edge of the mantle perfectly corresponds to this groove. *Fusus antiquus* and *Purpura lapillus* also reduce the thickness of the columella, and in both it is very easy for any one to satisfy himself that the mantle is the instrument. In *Buccinum undatum* the cutting of the columella is occasionally very deep, especially when the part has been repaired and projecting a little; in which case it is frequently under-cut, and actually overhanging the mantle.

It is difficult to say what is meant by "absorption" in these cases: nothing like the absorption of hard, inorganic matters in the higher animals can be supposed to take place here; for no vascular connexion exists between the mantle and the columella. Mr. Gray says, "Possessing this power of absorbing their own shells and the shells of other *mollusca* and calcareous rocks, it is remarkable that these animals do not exert it for the purpose of removing extraneous obstacles which may oppose their progress in the formation of their shells." Were this indeed the fact, it would go far to support the opinion that vascular absorption, or something like it, really takes place. I possess, through the kindness of Mr. Richard Howse, two specimens which prove that these animals, however, do remove extraneous bodies from the columella. The one is a small individual of *Buccinum undatum* with a *Serpula* attached to the spire, and passing over the posterior part of the columella. This *Serpula* is completely cut through undoubtedly by the mantle, and left overhanging it for nearly a quarter of an inch. The other is a *Fusus antiquus*, which has adhering to the columella two barnacles (*Balanus communis*). These have the walls, that are next the mouth of the shell to which they are attached, cut through; proving beyond a doubt that the mantle has the power of removing extraneous matter that retards the growth of the animal. It is therefore pretty evident that these removals do not take place by vascular absorption; and it remains to be proved whether they are effected by a mere solvent or by mechanical means.

The arguments before urged against the use of a solvent by the boring *Acephala* are to a considerable extent applicable in this case. It is impossible to conceive how it could be applied without having its powers very much impaired by the diluting effect of the surrounding element. When the mantle commences its operations on the striated surface of *Buccinum undatum,* the elevated ridges or striæ are nearly obliterated before the grooves are at all affected: the surface is therefore rapidly levelled. Were a solvent used, the reverse of this might be expected to happen, for the fluid accumulating in the depressed lines would act there more vigorously than on the elevated parts, and the consequence would be the exaggeration of the grooves. Holes and cracks cut over are not enlarged, as every one conversant with etching is aware they should be were a solvent fluid used. As before remarked, extraneous obstructions of a calcareous nature can be removed: the sandy sheath however of *Terebella lumbricalis* resists the power of the mantle. When this animal retards the growth of the mollusk, it is covered over by the inner lip, and distortion frequently arises in consequence. The sand attached by this species of *Terebella* is composed almost entirely of rather large siliceous particles; and from what we know respecting the boring of the *Acephala,* it might be inferred that the sheath of this animal could not be removed. The question is not materially affected, on either side, by this fact, though if a solvent be the agent, it must have the power, one would think, of removing in the first instance the epidermis; and if so, there does not appear any good reason why the corroding fluid should not find its way to the horny sheath that holds together the siliceous particles, and reducing it liberate the sand. The improbability of the use of an acid solvent is increased by the fact that it must be supplied by the same organ that secretes the calcareous matter forming the inner lip: certainly this may be supposed to come from the mantle further back, and the solvent from the extreme edge of it; but this does not remove the difficulty, for the one would still be liable to interfere with the other.

The action of currents is apparently out of the question in this case, as the mantle is furnished with cilia only on the surface next the animal; on that next the shell I could detect none: it is supplied, however, with crystalline bodies similar to those before described in the foot and mantle of the boring mollusks. Then, shall we not conclude that it is by their agency that the columella is reduced, and that spines and other obstructions are removed from it? Analogy would lead to this conclusion, assuming that we have arrived at a correct view respecting the boring of the mollusks. In all the boring species I have endeavoured to show that the foot and mantle are the organs employed; and that in *Patella,* with which the analogy may be considered closest, the mantle is highly instrumental. In this species we have seen that it has the power of rubbing down shale, limestone and shell; and these substances are removed as the shell increases, apparently for the purpose of levelling the surface, and preparing it for the accommodation of the animal. The mantle of *Buccinum undatum* and of many other Gasteropods does—what? It clears away obstructions from the columella and reduces its thickness, that as the animal grows it may have sufficient room. They all, *Acephala* as well as *Gasteropoda,* rub down those hard substances only during growth, and all do so that they may find increased protection and accommodation: it is the same act in all, the same organ is employed in all; and we can scarcely doubt that in all it is furnished with the same means.

We might have gone more fully into this branch of the subject, but it appears unnecessary to do so; for if I have succeeded in substantiating my views in the former part of this communication, little need be said here; if not, all that I could now advance would be of little service, feeling strongly inclined to believe that one law regulates the whole of these phænomena.

The boring of the carnivorous Gasteropods, into bivalve and other shells, remains yet to be examined; but having already extended this paper to too great a length, this interesting portion of the subject cannot now be fully entered upon. In reference to it I shall at present make only one or two remarks before concluding.

A short time ago Mr. Richard Howse discovered *Purpura* boring on the Durham coast, and in company with that gentleman I have had several opportunities of taking this animal in the act of piercing the common *Mytilus,* which appears to be a favourite food. The holes are generally one-sixteenth of an inch in diameter, being just sufficient to admit the proboscis, which in one or two instances I have seen inserted in the bore. The tongue, which is covered with transverse rows of siliceous spines, is strap-formed and very long; it is much narrower than the bore; and the anterior spines are generally worn down, or have never been developed. The bores are for the most part circular, sometimes they are slightly oval, and frequently pass through the epidermis, which in *Mytilus* is strong and horny. When they do so the epidermis is never torn, but the edges are smooth and circular like the rest of the bore.

Putting these facts together, it is, perhaps, fair to conclude that the boring in this case is also mechanical, and that the tongue is the instrument, though it is difficult to understand how a narrow strap-formed apparatus is to work out a circular hole. But having this powerful siliceous organ at hand, certainly capable of penetrating calcareous substances, it would be unlike the direct and simple operations of nature were another one provided. It is more likely that some mode of application is effected by which the ordinary prehensile tongue of the Gasteropod is turned into a rasping or drilling instrument. The wearing down of the anterior spines appears favourable to this opinion.

EXPLANATION OF PLATE VIII.

Fig. 1. A portion of the epidermis from the anterior cushion-like swelling of the mantle of *Saxicava rugosa*, seen in the compressor, exhibiting large crystalline bodies.

— 2. Some of the crystalline bodies from the same after having been six hours in nitric acid.

— 3. The foot and mantle of a small foreign *Patella* found dried up in an excavation, showing the arrangement of the crystalline bodies.

— 4. A group of the same crystalline bodies more highly magnified.

— 5. Four of the same bodies exhibiting radiating fractures caused by the action of the compressor.

— 6. A portion of the convex surface of the foot of *Teredo norvegica*, as seen in the compressor, exhibiting crystalline bodies.

— 7. A group of the same bodies more highly magnified.

XXVI.—*Notes on the distribution of the Fossil Conchology of the Oolitic Formations in the vicinity of Minchinhampton, Gloucestershire.* By John Lycett, Esq.*

The following remarks have been written chiefly with a view to illustrate the contents of the author's cabinet, premising that the objects in question constitute materials fitted rather for private study than for public demonstration. The bones of gigantic Saurian reptiles, of fishes, the shells of great Cephalopods, are appreciated even by the uninstructed spectator. They speak to his senses of a creation distinct from that which he sees around him, and he is prepared to hear of further wonders when the voice of comparative anatomy tells him of their organization and consequent habits. None of these fall within the scope of my remarks; they are absent: we know that they existed contemporaneously with the deposition of these rocks and their included fossils: Stonesfield in this country, Pappenheim and Solenhofen in Germany assure us of this. Speaking with the caution which the subject demands, it may be asserted that the conditions of sea-bottom in our neighbourhood, though varying considerably during the time which was required for an accumulation of 400 feet in vertical thickness of solid rock, and the creation and ex-

* Read before the Cotteswold Naturalists' Club, August 8, 1848.

tinction of many forms of molluscous animals, at no time constituted the estuary of a great river. We search in vain for the relics of air-breathing animals and plants periodically carried down and spread over its floor. The only vegetable remains are fragments of wood which may have floated on the ocean wave to whatever quarter the winds and currents directed them.

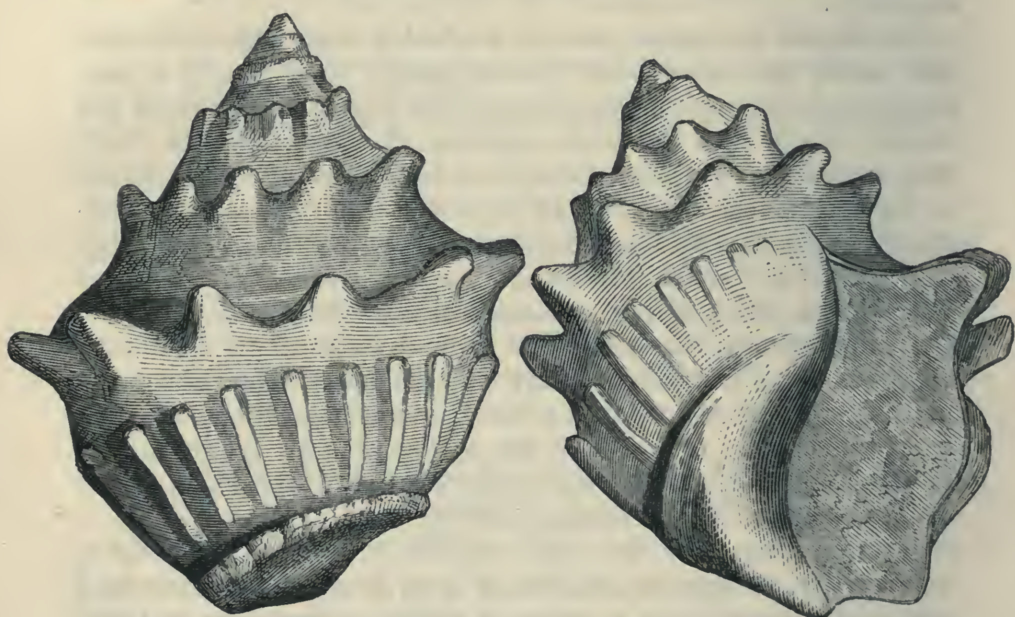
With the great Saurians the case was different; whether denizens of the land, of rivers, or of estuary waters, their remains were entombed in the fine mud which fluviatile waters deposit so copiously.

We should not expect, nor do we find, a large number of marine shells associated with such deposits; their paucity is perfectly compatible with what we know of brackish waters of the recent period, and the small number of marine species which they furnish. Precluded then from displaying this description of fossil treasures, we revert to the less striking remains of molluscous animals, and these from their number, their association, their separation into distinct groups and other circumstances repeated at different periods, acquire an interest distinct from that which would attach to them as mere examples of fossil conchology. To illustrate therefore this portion of the subject the present memoir is chiefly directed, interspersed with notices of such remarkable or characteristic forms as have hitherto been imperfectly described, or which impart to these assemblages their prominent and distinguishing features.

Commencing with the upper portion of the Great Oolite in our vicinity, we find several beds of hard limestone and bands of marly clay, containing a series of shells representing in diminished numbers the inhabitants of the lower and richer fossiliferous beds of the formation. Several which do not occur in the lower group I will notice; these are the little *Cardium Beaumonti* (Archiac), very abundant, *Pholadomya nana* (Phillips), *Chemnitzia*, new species, *Bulla Hildesiensis* (Rœmer), *Bulla suprajurensis* (Rœmer), *Cardium pes-bovis* (Archiac), *Cardilla grandis* (new species). The other forms which commonly occur are *Lucina lyrata* (Phillips), *Lucina rotundata* (Rœmer), *Ceromya semistriata* (new species), *Ceromya excentrica* (*Isocardia*, Rœmer). We have been fortunate enough to succeed in clearing the hinges of the two latter species, and have thus ascertained that they have nothing in common with *Isocardia*, but belong to the new genus *Ceromya* of Agassiz. *Isocardia concentrica* must likewise be placed in the same genus.

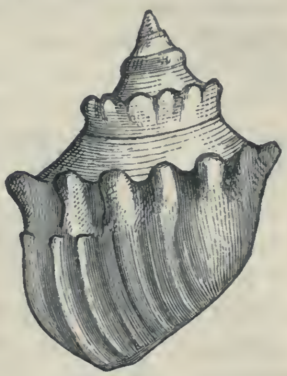
Quitting these beds and descending through sandstones nearly destitute of organic remains, we arrive at the shelly oolite locally termed *planking*, or upper beds of the Great Oolite building stone, a marine deposit distinguished by the great profusion of its fossil conchology and their good state of preservation. Here at one locality we find a large assemblage of a genus which seems to be characteristic of this formation and especially of this vicinity; I allude to the new genus *Purpuroidea* (see the figures), of which the generic characters are as follow:—

Shell turreted, ventricose, aperture large, apex of the spire pointed. Spire consisting of several whorls usually convex, and having about their middle part a circle of tubercles or blunt spines. Columella smooth, rounded, and curved inwards at its



Purpuroidea nodulata, middle size.

base. Notch wide, but not deep nor recurved. Outer lip thin, slightly sinuated, and forming an acute angle posteriorly at its junction with the body whorl. The casts of the interior are smooth, or exhibit but faint indications of the tubercles, and none of the ribs or striæ which distinguish the perfect shells. The axial umbilicus is usually very conspicuous and the basal notch not distinguishable. They would certainly be taken for *Naticæ* by persons not conversant with the outer form, and even appear to have been figured as such by Rœmer under the title of *Natica subnodosa* from the oolite of Hanover. One of the species has twice been imperfectly figured in English works; first in Young and Bird's 'Geology of the Yorkshire Coast' as *Murex nodulatus*; the figure is merely a rude sketch of a bad specimen, but characteristic; subsequently a figure representing little more than a cast was given in the 'Mineral Conchology' as *Murex tuberosus*. The varieties of form and markings which two of the species exhibit are worthy of notice: the most abundant shell, *P. rugosa*, when young and the size of a nut, has tubercles in lieu of spines; the transverse ribs are well-defined; but the longitudinal elevations which give the species a rugose aspect are absent, the basal notch is nearly obsolete, and the columella is nearly straight. The *P. nodulata* has still greater varieties; when full-grown it has two encircling rows of tubercles on the body-whorl, from the lower and smaller of which proceed oblique longitudinal ribs which terminate in a transverse elevated basal belt. The young shell is nearly smooth; the smaller circle of tubercles is scarcely distinguishable; the ribs are absent, as is likewise the basal belt. Occasionally in full-grown specimens the smaller circle of tubercles degenerates into an encircling rib. The spire is of various degrees of elevation, in fact scarcely any two specimens are exactly alike; a considerable number are therefore desirable for its full elucidation. The third species, *P. glabrata,* is rare; it equals the others in magnitude. It is seldom that we can trace the limits of a species over any particular area; here however we are enabled to do so with tolerable accuracy. These shells are grouped together in the blocks of stone by hundreds, occupying a vertical thickness of 5 or 6 feet, and spread over an area 50 yards wide and 100 long. It is to be regretted that this prolific space will ere long be entirely removed, and the *Purpuroidea* in its perfect state will probably be only a matter of tradition as far as this vicinity is concerned. These conditions have produced upon our mind the impression that here we perhaps behold the birth-place or original seat from whence the diffusion of the genus took place. Repeated observations have shown that specimens occur in every other quarry in the neighbourhood, but so rarely, that the total number noticed probably has not exceeded twenty in the course of the last six years. Higher in the series they are met with in several beds of compact homogeneous limestone, but much more sparingly than in the planking, and from the hard structure of the rock can only be separated in the form of the *Natica*-like casts.



P. nodulata, young.

The *Patellæ,* which occur abundantly in our shelly oolite, like their recent congeners, vary so considerably as sometimes to puzzle even persons who have been accustomed to their peculiarities. The most common species, *P. rugosa,* when obtained south of the vale of Brimscomb, fully deserves its name, but north of the vale it loses much of the rugŏse aspect caused by the lines of growth, the longitudinal striæ are faintly marked, and the shell is altogether extremely thin. In a very young state the form is a longer oval and much less elevated, the apex being slightly turned to the right side, constituting the *Patella ancilloides* of the 'Mineral Conchology,' which species should therefore be expunged. *Patella Aubentonensis* (Archiac) occasionally loses its striæ altogether, and this change is not confined to any particular size or form of shell. *Patella nana* in advanced age is spread out more horizontally towards its borders, and forms a concave conical and ovate shell. The fine encircling striæ then altogether disappear; the minute figure in the 'Mineral Conchology' refers to the shell in its young state.

The genus *Nerinea* is represented by upwards of fourteen species, of which five are abundant; they seem to occupy in the oolitic rocks the place of the *Cerithia* of the older tertiary strata, and are decidedly the predominating univalve of their period. Our most common species are destitute of the tubercles or striæ by which these shells are usually ornamented; four only of the species appear to have been figured or described. One fact in connexion with the extinct carnivorous trachelipods should be noticed. The recent genera of that class are furnished with a tubular boring apparatus, by means of which they drill round holes in the bivalves and prey upon their juices. As none of the oolitic bivalves have such perforations, we may conclude that the extinct carnivorous genera of that period were differently constituted.

Of the *Naticæ* we number fourteen species, seven of which are new; although the species are thus numerous, one only, *N. Michelini* (Archiac), is at all common.

The family of the winged shells, or *Strombidæ*, are represented by upwards of eleven species belonging to the same genus; the greater number of these likewise occur even to the base of the formation. We have separated them from the *Rostellarias* and *Pteroceras* under the generic term *Rostrotrema*; they are distinguished from the true *Rostellarias* by the absence of an upper or posterior siphon upon the spire, the outer lip not extending beyond the body-whorl or but slightly upon the penultimate, and there is no corresponding thickening upon the inner lip to form a channel. It is true that one or two recent species of *Rostellaria* have no posterior siphon upon the spire, but in such instances the siphon is present and coiled round upon the upper part of the wing. From *Strombus* it is sufficiently distinguished by the absence of the sinus on the outer lip. We venture to suggest that the *Strombidæ* require a re-arrangement, the digitations of the outer lip not being of sufficient importance to found upon them generic distinctions; they are of too variable a character, and in some instances depend very much upon the age of the specimen.

Another generic form, as yet found in no other part of England, is a conical turbinated univalve, called by me *Trochotoma*; five species occur, but only one is common. Its distinguishing generic feature is a transverse fissure upon the body-whorl, which approaches the outer lip, but does not reach it. This alone is sufficient to distinguish it from *Pleurotomaria*, from which also the base materially differs, its deep concavity resembling an umbilicus and giving to the aperture a semilunar figure.

The outer lip is thick, the whorls usually angular and concentrically striated. They occur throughout all the lower fossiliferous beds. Perhaps I may be excused for briefly alluding to the name given to this shell, although the matter is of a somewhat personal nature. In the autumn of 1841, finding that this form was entirely unknown, I forwarded a specimen to Prof. Sedgwick as a new genus, and mentioned that I proposed to call it *Trochotoma*: about the same time a gentleman who then collected largely from our Great Oolite and distributed its fossils widely always affixed to it the name which I had proposed to give it, so that the appellation became current wherever a collection of our fossils existed six years ago. Within two years afterwards Professor Ansted figured one of the species in his work on Geology under the same name. Knowing these facts, my surprise may be imagined, when lately turning to a new work on Natural History by Pictet, published at Geneva, I found that he had described this genus under a new name, saying that this is the *Trochotoma* of M. Deslongchamp, and referring to a paper by that gentleman on the Great Oolite of Normandy, published in the 7th volume of the 'Transactions' of the Linnæan Society of Normandy in 1842. In that memoir are figured and described five species, of which three are found in this vicinity. It would therefore appear that M. Deslongchamp must have read his paper to the Society in 1841, and nearly simultaneously with myself must have imagined the same new word as a designation for a certain new form. The paper in question is even now so little known in this country that I was compelled to resort to the British Museum to see a copy of it. Probably another coincidence exactly similar to this is not upon record.

It is proposed to restore the forgotten term *Cylindrites* used by Llwhyd as a generic name for a form which requires to be distinguished, and which appears to be very characteristic both of this rock and the Inferior Oolite. We possess six species, three of which have been figured, two as *Actæon* in the 'Mineral Conchology,' and one as *Conus* by Archiac; the generic characters are as follows:—Form cylindrical. Spire small, acute, sometimes not rising above the body-whorl but always exposed; whorls several, usually flat, sulcated at their junctions. Aperture elongated, narrow, almost linear. Columella with two folds at its base, which is slightly turned outwards at that part; base of the aperture entire, outer lip thin. All the species are distinct from those of the Inferior Oolite.

Before quitting this assemblage of shells, another form which has occasioned me much perplexity must be noticed. It is called by Rœmer *Placuna jurensis,* but is clearly distinct from that genus, of which it does not possess the cardinal teeth, nor has it the hole or appendage of *Anomia.* The following are the grounds upon which it is deemed proper to erect it into a distinct genus.

Generic Character.—Shell very thin, irregular, either convex or flat, posterior border rounded, anterior border more straight; apex little elevated, but always distinct and placed near to the middle of the anterior border. Fine longitudinal closely arranged waved striæ radiate from the apex on every side; the under surface is smooth with a large central impression.

These shells were frequently (perhaps always) attached to bivalves, more especially to *Trigoniæ,* not by the external surface but from the under side; the knobs and striæ proper to those shells causing the elevations upon the attached shell. From these circumstances it would appear that the soft parts of the parasite must have adhered to the *Trigonia* prior to the secretion of the thin shelly plate, and that the shelly matter was deposited during such adhesion. On the death of the parasite the thin plate separated, as there was no shelly adhesion between it and the *Trigonia,* and they are never found attached to the latter. With the scanty knowledge we possess of this form, it would be unwise to speculate upon its affinities unless with great reserve and circumspection. The mode in which the markings of the *Trigoniæ* are transferred to this shell renders it very difficult to imagine that it could have been a bivalve. We look as it were upon an impression at the back of the paper, the parts in relief having been stamped through it, but disguised by the finely striated surface at the back of the attached shell. It was sedentary, and if univalve may have belonged to those forms of the *Patelloidea* in which the shell is partially enveloped in the soft parts of the animal, examples of which are found in *Fissurella, Haliotis, Sigaretus* and *Stomatia.* We would however wish it to be understood that these hints are thrown out chiefly to engage the attention of others, as we are by no means satisfied with the result of our own observations.

The estuary waters which entombed the varied remains at Stonesfield spread out partially a thin stratum of their muddy deposit to this neighbourhood, without carrying with it any of the forms for which that locality is so famous. Our Stonesfield slate has a few marine shells, among which are *Ammonites coronatus*

(Orbigny), *A. Lalandeanus* (Orbigny), *Mya margaritifera* (Young), *Ceromya V. scripta* (*Cardita*, Buckman), *Cardium*, new species, *Anatina undulata* (*Sanguinolaria*, Phillips), *Mya dilata* (Phillips). As regards this neighbourhood, it may be stated as a general rule, that where the lower beds of Great Oolite are shelly, they repose immediately upon Fuller's earth; in the other condition the base is Stonesfield slate; probably the fine mud of the latter deposit was carried out to great depths almost beneath the region of shells. Our Fuller's earth is very imperfectly exposed, nor have any considerable number of species been obtained from it. The little *Ostrea acuminata* is found in great masses, which nearly compose the beds where it occurs. Not a single shell has been found peculiar to these beds.

The Inferior Oolite in the division of its beds does not differ materially from the description given by Mr. Buckman in his 'Geology of Cheltenham,' except towards the lower portion, which is strikingly dissimilar. It is not our intention to do more than allude to these conditions; a careful survey along the outer escarpment of the Cotteswolds would be required to enable us to understand the changes of mineral character, fossil contents, and perhaps thinning-out which certain beds must undergo in their short course between Painswick and Crickley Hill. Many doubts have been expressed by persons both in the metropolis and provinces as to the geological position of the rock from whence our Great Oolite fossils are derived; these doubts would seem to have arisen from a resemblance which portions of our rock and its fossils bear to a certain bed of the Inferior Oolite near Cheltenham.

Of the geological position of the rocks in our neighbourhood no person who has examined them can entertain any doubt; our sections, both natural and artificial, are numerous and of a decided character, affording what can rarely be seen elsewhere in one view, a complete escarpment from the Great Oolite to the Lias inclusive. The shells of the upper rag-stone agree closely with those from the Cheltenham sections. The cream-coloured marls and marly rock called "Fimbria bed," have however disclosed a remarkable suite of shells which must not be passed over in silence. The general aspect of these fossils, as contrasted with those of the upper and lower rag-stones, is striking. The association of genera strongly reminds us of the Great Oolite. The genus *Nerinea*, which is very rarely seen in the rag-stones, again reappears in vast profusion, to such an extent indeed that in some localities almost every fragment of marly rock discloses sections of this extinct form. Accompanying these are several species of small *Cerithia*, together with an equal variety of the genus *Chemnitzia*, comprising some of the most slender spiral univalves which it is possible to imagine. The *Rostrotremæ*, though rare, are likewise represented by five species. We seem in fact to have a repetition of the circumstances under which the mollusca of the Great Oolite lived and multiplied. In a former paper we alluded to an almost entire absence of the Cephalopoda which distinguishes our Great Oolite, and it would appear that this feature likewise extends to the same formation throughout France. Thus Archiac does not mention a single species in the district which he has illustrated, and Deslongchamp is equally silent in describing the Normandic fossils. The "Fimbria bed," in striking contrast to the other portions of the Inferior Oolite, is distinguished by a similar paucity of Cephalopoda; hitherto only a single specimen of Ammonite has been placed in our cabinet, and we have searched in vain for a Nautilus or Belemnite. There are several *Terebratulæ*, of which the *T. fimbria* is the most abundant; the varieties of figure and markings which this shell undergoes in its stages of growth become interesting when placed beside a similar series of the recent *T. Australis*, which it very nearly resembles in every circumstance. Of the fossil species but few will be found to have attained the characters of old age, and these latter are rarely equal in size to those which died on attaining middle life, a fact of which some striking examples may be cited in certain recent shells. As the *T. Australis*, unlike the Brachiopoda generally, is found in water only knee-deep near Sidney, we may be allowed to consider it probable that the *Terebratulæ* and other shells of the Fimbria bed were likewise denizens of a shallow sea; such a condition would assist in explaining the absence of Cephalopoda and the general resemblance to the association of Great Oolite shells. As a last resemblance a general dwarfing of species may be noticed, some examples of which will subsequently be given. This general resemblance however extends but in a very limited degree to specific identity: thus, of the seven *Nerineæ*, one only is common to both; the *Cerithia* are altogether different, as are likewise the *Chemnitzias* and *Cylindrites*. Our collection from the Fimbria bed contains—

59	Univalves and Radiaria, of which	22 are Great Oolite species.
72	Bivalves, of which	29 are Great Oolite species.
131		51

Thus only about 38 per cent. of the whole are common to both formations. On passing downward through the freestones these shells rapidly disappear, and on arriving at the lower rag-stones another and very dissimilar suite predominate; the profusion of *Nerineæ* has entirely vanished, and equally in vain might we look for a *Cerithium* or a *Rostrotrema*, and we very rarely meet with a

Chemnitzia; the bivalves are again of full dimensions, and the Cephalopoda reappear in full force and of large size, but being difficult to extract entire, are rarely seen in the cabinets of collectors. But to form an idea of their numbers, the lowest bed in the escarpment at Frocester Hill should be visited; it is a perfect storehouse of this class of remains. Nor is this abundance confined to one locality; wherever the brown ochrey beds are exposed in the escarpments of our valleys, or on the outer line of the Cotteswolds, a single square yard of rock exposed is usually sufficient to produce fragments of Ammonites and Belemnites; and it would appear that a similar profusion of those forms distinguishes the lower beds of Inferior Oolite throughout the whole of its course in Somerset and Dorset. That they should entirely cease between Painswick Hill and Crickley Hill, to be replaced by other and totally different beds of rock and fossil contents, is one of the most interesting geological problems which the Cotteswolds offer to the scientific inquirer. A very remarkable Brachiopod marks the base of the formation in our district; *Terebratula bidens* occurs in the lower rag-stone, and more especially in a few inches of marly rock, sometimes called Gingerbread rock, which immediately underlies it. *Terebratula acuta* and *T. tridens* accompany it much more sparingly; the latter possibly may be only a variety of the first: the separation of species among the Brachiopoda must be regarded as merely provisional until the state of our knowledge respecting them shall be more advanced. The brown sands beneath are entirely barren of organic relics, and gradually and insensibly merge into the Upper Lias.

The general diminutive appearance which the Great Oolite shells present when compared with those of the other oolitic rocks cannot fail to be noticed. In species which have a considerable vertical range this fact is rendered particularly striking: thus, but for a perfect identity of markings, *Trigonia costata* reduced to the size of a bean, and sometimes even of a pea, would scarcely be regarded as the representative of the large Inferior Oolite shell: higher in the Oolites it again attains its pristine dimensions. *Astarte excavata* too, without the aid of a large series for comparison, would not be recognised; the shell becomes small, depressed, and the costæ rendered almost obsolete. *Modiola plicata*, which reappears in the upper beds of Great Oolite, nearly loses its plicæ, and acquires a compressed angular form. The changes of size which *Lucina lyrata* undergoes is still more remarkable. In the lower rag-stone it is of full dimensions; in the Nerinea bed or Fimbria bed it is reduced to one-fourth its former bulk; in the upper rag-stone it is again large; in the shelly beds of the Great Oolite it is rare, but is again reduced to the dimensions of the Fimbria bed; lastly, in the upper beds of the Great Oolite it is again abundant and of its standard bulk.

Next as to the gregarious habits of certain species:—Bussage, a small hamlet north of the vale of Brimscomb, produces in its shelly Great Oolite a large assemblage of an undescribed species of *Terebratula* somewhat resembling *T. globata*, but very rarely having both valves in juxtaposition, and seldom found in any other locality. In the limestone beds of the upper fossiliferous series, one locality has produced a dense assemblage of a fine bivalve which seems to belong to the new genus *Cardilla* of Deshayes, although generally in these beds it is rare. The compact structure of the rock renders it nearly impossible to disengage them in a perfect state, but the fine striæ of the shell are well preserved, and the character of the species evident; its sudden advance in size when compared with the small fossil shell upon which the genus was founded is remarkable, and justifies the specific appellation of *grandis*.

The association of species at the locality in question is curious: the whiteness of the Cardilla limestone displays every testaceous fragment in strong relief, and enables us to discover that the *Cardilla* is the only bivalve, and that it is accompanied by a *Purpuroidea*, and more sparingly by three large *Naticæ*, all of which probably constituted checks upon its superabundance. *Monotis radiata* occurs by myriads immediately beneath the planking beds on Minchinhampton Common, and the gregarious habits of *Perna mytiloides* may often be shown in a small hand specimen of rock. *Cardium Beaumonti*, Archiac, is found only in the upper beds, where, in abundance, they rival the *Perna mytiloides* of the lower series. In spots where the rock becomes a barren sandstone far away from all detritus of shells, and probably deposited at greater depths, a cluster of *Pholadomya concentrica* or *P. Murchisoniæ* sometimes appears; nor are any shells of the genus *Pholadomya* ever found in the shelly beds of the Great Oolite; they are likewise absent in the Fimbria bed of the Inferior Oolite, and it may be safely predicted, that they never will be found in the shelly roe-stone of the vicinity of Cheltenham; these beds were evidently deposited in a shallow sea, and portions of them even possess a littoral character. The little knowledge we possess of the habits of the recent *Pholadomya candida* is in exact accordance with this fact. At one locality the upper beds have produced a dense colony of *Terebratula media* to the exclusion of all other shells. *Lucina lyrata, Pholadomya truncata, P. nana, Ceromya excentrica* and *Ceromya semistriata* are likewise never found isolated.

The changes of external characters produced by growth alone form another interesting subject for study, and have occasionally become a source of error and confusion. Two examples will sufficiently illustrate this. The large and elegant new species of *Lima* (*L. varians*) has a surface when young covered with beautifully large waved striæ; a good series will show the gradual disappearance of these until a mere remnant is seen on the anterior border; the figure becomes more gibbose and elongated, and finally is devoid of all markings, except the concentric lines of growth. It is found in the shelly Great Oolite and Fimbria bed of the Inferior Oolite. *Macrodon Hirsonensis* is another example. Phillips, in his 'Geology of Yorkshire,' gives two shells the name of *Cucullæa elongata*, one of which, t. 11. f. 43, is our species in its young state, with regular longitudinal striæ. A broken specimen with striæ more irregular, but still in its young state, is the *Cucullæa rudis* of the 'Mineral Conchology,' t. 447. Another variety of figure, more advanced in age, is the *Arca elongata* of Goldfuss, t. 123. f. 9. *Cucullæa Hirsonensis*, Archiac, t. 27. f. 5, is a half-grown specimen with the longitudinal striæ obliterated. The genus is described in Mr. Buckman's 'Geology of Cheltenham,' but the species there figured seems to be distinct from the one in question. Our species is abundant in the planking beds, but more rare in the Fimbria and Freestone beds of the Inferior Oolite. To pursue the subject further would involve descriptions of individual species useful only in a monograph devoted to the purpose. Here these remarks may fitly conclude with the expression of a hope that the large number of our Great Oolite shells new to science may ere long be given to the public*, and that the fossil fauna of the Cotteswolds generally may by the instrumentality of this Club acquire a "local habitation and a name." Probably no district in England contains an equal number of fossil treasures which have not as yet been transferred to the plate of the engraver.

XXVII.—*Notices of British Fungi.* By the Rev. M. J. Berkeley, M.A., F.L.S., and C. E. Broome, Esq.

[Continued from vol. xiii. p. 360.]

[With a Plate.]

*323. *Agaricus platyphyllus*, P. This species, which was noticed before, occurred on old stumps in Leigh Wood near Bristol, August 1848. The base of the stem was furnished with

* Perhaps by means of the Palæontographical Society.

strong branched rhizomorphoid mycelium, which did not exist in the specimens found on the ground at King's Cliffe, and which accorded perfectly with the plate of Bulliard.

324. *Ag. Helvelloides,* Bull. t. 601. fig. 3. This elegant agaric, which Fries considers doubtfully a state of *Ag. umbelliferus,* L., occurred at Navigation House, Monmouthshire, Oct. 27, 1847. It is far more delicate and graceful than any of the numerous forms of that species.

325. *Ag.* (*Omphalia*) *rufulus,* n. s. Pileo umbilicato rufo-gilvo pallescente subfarinaceo; stipite concolori nitente; lamellis decurrentibus crassiusculis furcatis incarnatis. On an exposed common amongst *Polytrichum aloides,* Hanham near Bristol, Dec. 7, 1847.

Pileus half an inch across, at first convex, soon expanded and umbilicate, subcarnose, reddish gray or buff, at length pale, minutely mealy; margin crenulate. Stem half an inch high, 1 line thick, flexuous, of the same colour as the pileus, smooth, shining, solid. Gills decurrent, rather thick, flesh-coloured, especially towards the margin, forked, rather distant; interstices veiny. Spores oblong, oblique.

A very pretty and distinct species with somewhat of the aspect of *Ag. laccatus,* but allied to *Ag. pyxidatus.*

326. *Ag.* (*Pleurotus*) *euosmos,* Huss. Odorus, pileis fasciculatis inæqualibus; stipitibus distinctis e lamellis longissime decurrentibus albidis costatis; sporis albo-purpuratis. Badham, Esc. Fung. t. 11 in part. On a decayed elm, Kent. Mrs. Hussey and Dr. Badham.

Pilei very much crowded, 2 inches or more across, deeply depressed, unequal, at first white, invested with a light blue varnish, at length of a light brown. Stems distinct above, connate below. Gills rather broad, running down to the bottom of the free portion of the stem. Spores oblong, narrow, oblique, white tinged with purple. The whole plant smells when first gathered strongly of tarragon.

Vittadini describes the spores in his *Agaricus ostreatus* as "bianco porporino," but his figure is so much like that of the true *Ag. ostreatus,* that it is possible he may have had two species in view. In *Ag. ostreatus* the spores have not the slightest tinge of purple.

327. *Ag. durus,* Fr. Ep. p. 162. *Ag. obturatus,* Krombholz, t. 28. fig. 14–22.

Brighton, Dr. Badham.

328. *Ag.* (*Pholiota*) *jecorinus,* n. s. Cæspitosus; pileis convexis glaberrimis viscido-pelliculosis lævibus demum caperatis subcarnosis, brunneis, demum expallentibus; stipitibus deorsum incrassatis fibrillosis brunneolis, lamellis adnato-decurrentibus

subdistantibus subrubello-umbrinis. About the roots of beech-trees, Rushton, Norths., Aug. 1848.

Fasciculate or gregarious. Pilei 1½–2 inches across, hemispherical, at length expanded, quite smooth and even, at first clothed with a viscid pellicle, at length slightly wrinkled, somewhat fleshy, dark brown, paler when dry. Stem 2½ inches high, ¼ of an inch thick, incrassated below, umber, dark brown at the base, fibrillose, stuffed, at length hollow. Ring near the top, persistent, mostly deflexed; stem above the ring paler, fibrillose. Gills umber with a rosy tinge, adnate, with a decurrent tooth, rather distant. Spores brownish.

Allied to *Ag. pudicus*, *Ag. cylindraceus* and *Ag. Ægerita*, but distinct in its very dark head, and umber adnato-decurrent gills. It approaches very near to Paulet's mulberry-tree Agaric, t. 144. It is certainly not described by Fries. The taste is like that of the common mushroom with a slight acidity.

329. *Ag.* (*Pholiota*) *mesodactylius*, n. s. Pileo conico-expanso obtuso pallide fulvo submembranaceo; margine striato; stipite gracili glabriusculo fistuloso albo; annulo centrali integerrimo; lamellis ascendentibus rotundato-affixis pallide fulvis. On the ground in a moist wooded dell, Woodborough, Notts.

Pileus 1½ inch broad, obtusely conical with the margin expanded, hygrophanous, pale tawny, slightly fleshy in the centre; margin striate. Stem flexuous, 2½ inches high, 2 lines thick, white, nearly smooth above and below the ring, sometimes showing a vinous stain where bruised, nearly equal, fistulose. Ring central, expanded, quite entire, deeply striate within. Gills moderately broad, slightly ventricose, ascending, affixed.

Allied to *A. Mycenoides*, from which it differs in its pure white stem, without the ferruginous hue of that species. The entire white striate ring is very remarkable.

Plate IX. fig. 1. *Agaricus mesodactylius* and section of the natural size.

*330. *Ag. flavidus*, Schæff. t. 35. Woods near Dundee, Mr. W. Gardiner, no. 46.

*331. *Ag. horizontalis*, Bull. t. 324.

This species, which belongs to the section *Naucoria*, occurs at Burghley Park near Stamford. Sowerby's plant is certainly different, and, as appears from his herbarium, merely a state of *Ag. corticola*.

332. *Hygrophorus russo-coriaceus*, Berk. and Miller MSS. Odorus, pileo visciduIo eburneo; stipite tenui glabro; lamellis paucis latis candidis, decurrentibus. In exposed pastures, Walkeringham, Notts, Oct. to Dec., Rev. T. K. Miller.

Pileus about ½ an inch in diameter, convex, fleshy, slightly viscid, ivory-white. Stem $\frac{3}{4}$–1 inch high, not a line thick, incrassated upwards, smooth, solid, pure white. Gills thick, broad, arched, decurrent, very few and distant, with a few shorter ones intermixed. The whole plant exhales a strong musky smell like that of Russian leather, or *Potentilla atrosanguinea,* which it sometimes retains for years.

The only species which approaches very near to this is *Ag. ptychophyllus,* Corda. It is at once known by its delightful odour.

333. *Russula emetica,* Fr. Ep. p. 357. Stapleton near Bristol, Aug. 1838.

The determination of the species of this genus is surrounded with many difficulties. This and the two following, gathered near Bristol, being clearly characterized and exactly described by Fries, we venture to give as certain contributions to the list of British Fungi. Other species may be added when strictly determined. The present is known by its very acrid taste and free gills, between which and the stem is a distinct channel as in the *Plutei.*

334. *R. integra,* Fr. Ep. p. 360. Leigh Wood near Bristol, Aug. 1848.

Distinguished by its mild taste, its at length sulcate and tuberculated margin, its white stem and its gills which gradually assume a pale dirty yellow hue.

335. *R. aurata,* Fr. *l. c.* Leigh Wood, Aug. 1848.

A most splendid species, distinguished by its golden yellow shining pileus and yellow margined gills. It is equal in beauty to *Ag. muscarius.*

336. *Cantharellus Brownii,* n. s. Ochraceo-albus; pileo tenui convexo subumbonato; stipite gracili, farcto; plicis subdistantibus angustissimis obtuse decurrentibus. Amongst grass (to the roots of which it was attached) in the park, Hitchin, Mr. Isaac Brown and Mr. W. Dawson, Oct. 1844.

Whole plant of a pale ochraceous cream-colour. Pileus orbicular, thin, convex, subumbonate, half an inch across, sometimes rather larger, obscurely silky. Stem slender, $1\frac{1}{2}$–2 inches high, scarce 1 line thick, nearly equal, subfurfuraceous, furnished with a little white fibrillose mycelium at the base, which sometimes forms a small earthy ball, rather tough, stuffed. Folds linear, very narrow, sometimes slightly forked, obtusely decurrent; interstices smooth; occasionally quite obsolete except towards the margin. Hymenium nearly white.

There is no described species allied to this except *Canth. aurantiacus,* which approaches to it by means of its white variety. It is a very neat and beautiful fungus, with very much the habit of *Ag. hemisphæricus,* and with the stem stuffed as in that species.

*337. *Lenzites sepiaria*, Fr. Ep. p. 407. On a scaffolding-pole, Oundle, Northamptonshire, 1847.

The hymenium is of a brilliant orange-brown when fresh.

338. *Boletus parasiticus*, Bull. t. 451. fig. 1. Parasitic on *Scleroderma vulgare*, Hanham near Bristol, Aug. 1845, C. E. Broome.

Pileus silky, dirty yellow as well as the incurved, rigid, slightly silky stem; flesh, of a pale reddish hue; tubes decurrent, labyrinthiform, reddish.

Fries appears never to have seen this species when fresh, which may account for one or two slight discrepancies. It is certainly not viscid in any stage of growth.

339. *Boletus chrysenteron*, Bull. t. 490. fig. 3; Fr. Ep. p. 415. In woody pastures: common.

This species was formerly confounded by Fries with *Bol. subtomentosus*. It is the species described in 'Eng. Flora,' vol. v. pt. 2. p. 150.

340. *Boletus Satanas*, Lenz. (2nd ed.), fig. 21; Fr. Ep. p. 418. On the ground under trees, in Rockingham Forest: not uncommon.

341. *Boletus purpureus*, Fr. Ep. p. 419. On the ground under trees, Rockingham Forest, June 1845.

342. *Boletus alutarius*, Fr. Ep. p. 425. Hayes, Kent, Mrs. Hussey.

*343. *Polyporus brumalis*, Fr. Ep. p. 430. On fallen sticks, Portbury near Bristol, May 1847.

This beautiful species is distinguished from *Pol. ciliatus*, with which it is often confounded, by its larger pores and different habit.

344. *Polyp. quercinus*, Fr. Ep. p. 441. *P. suberosus*, Kromb. t. 5. figs. 3, 5, t. 48. figs. 11, 13. On old oaks, Hayes, Kent, Mrs. Hussey; Apethorpe, Norths., Mr. Alfred Brodhurst Hill.

A very distinct species, having somewhat the form of *Fistulina hepatica*. It is of a beautiful yellow brown with rather shallow pores.

345. *Polyp. nidulans*, Fr. Ep. p. 455. On mountain ash, Sherwood Forest.

A resupinate form was gathered on oak at Edinburgh by Dr. Bauchop.

346. *Polyp. rutilans*, Fr. Ep. p. 455. On *Quercus sessiliflora*, banks of the Dee near Wynnstay, July 1848.

When fresh very soft, of a beautiful reddish gray, and with a powerful but pleasant odour like that of aniseed.

346^{b}. *Polyp. salicinus*, Fr. Ep. p. 467. On willows, Berkshire, F. J. Graham, Esq.; Apethorpe, Norths.

Polyp. salicinus, Grev., is now *Polyp. salignus*, Fr. *Polyporus* *undatus,* Eng. Fl., it should be observed, is not the true species of Persoon, of which we have lately seen an authentic specimen. It is probably a state of *Pol. conchatus.* The true plant seems, as far as I can judge from the dry specimen, to resemble *Pol. vitreus.*

347. *Polyp. cervinus,* Pers.! Myc. Eur. vol. ii. p. 87. On beech, Oswestry, Rev. T. Salwey; King's Cliffe.

Polyp. cervinus, Fr. and Schwein., appears to be a different species. The present is remarkable for its large pores and rigid dissepiments, especially when young, which would almost justify its being referred to *Trametes.* Persoon's plant is rather cinereous than fawn-coloured. This species is marked by Nees von Esenbeck in M. Desmazière's herbarium *Pol. connatus,* Fr., which is a totally different thing, and of which I have Swedish specimens.

348. *Polyp. cellaris,* Desm.! no. 72. Oswestry, Rev. T. Salwey.

This cannot be, as Fries supposes, a state of *P. igniarius.* It is much more nearly allied to *Pol. contiguus,* Fr., which is the same with *Pol. megaloporus,* P.

349. *Polyp. nitidus,* Fr. Ep. p. 483. *Boletus nitidus,* Pers. Obs. 2. t. 4. fig. 1. On wood near Bristol, Mr. H. O. Stephens.

350. *Polyp. bombycinus,* Fr. Ep. p. 483. On decayed wood, Portbury near Bristol, C. E. Broome. It has also been found near Bristol by Mr. H. O. Stephens. The specimens found by the latter gentleman however have smaller pores, though agreeing in colour and general aspect.

351. *Polyp. vitreus,* Fr. Ep. p. 485. West of England, C. E. Broome.

Distinguished by its distinct xylostromatoid substratum, which separates easily from the matrix.

352. *Polyp. obducens,* Pers. Myc. Eur. vol. ii. p. 104. On an old rotten stump, Failand near Bristol; also at Southwick, Norths.

This species forms thick strata consisting of several layers, the growth of as many years. Chevallier's *Polyp. Radula* is probably the same species.

353. *Polyp. aneirinus,* Fr. Ep. p. 487. On dead fallen twigs, Edinburgh, Dr. Bauchop.

Distinguished by its large pores, the hymenium of which has a peculiar smooth waxy aspect.

354. *Polyp. vaporarius,* Fr. Ep. p. 487. On dead wood: very common.

This species, or one most closely allied, occasionally occurs on the hymenium of *Lenzites betulina.*

355. *Polyp. terrestris,* Fr. Ep. p. 486. On rotten wood, Linlithgowshire, Dr. J. C. Bauchop.

356. *Polyp.* (*Resupinatus*) *Stephensii,* n. s. Albus orbicularis, demum confluens margine quandoque breviter reflexo tomentoso.

poris amplis subæqualibus angulatis; dissepimentis crassiusculis acie villosis. On privet, Leigh Wood near Bristol, Oct. 1847, Mr. H. O. Stephens; Wraxall, Som., C. E. Broome.

Forming scattered orbicular white or at length confluent resupinate patches about half an inch in diameter, which are sometimes slightly reflexed with the free surface tomentose. Pores rather large, $\frac{1}{20}$th of an inch broad, nearly equal, angular, sometimes subhexagonal; edge even, tomentose.

This species has the habit of a resupinate *Hexagonia*, and is very well marked. There is none with which it can be confounded. *P. Radula* appears to be the most nearly allied species.

357. *Merulius rufus*, Pers. Myc. Eur. t. 16. figs. 1, 2; Fr. Ep. p. 502. *Xylomyzon isoporum*, Pers. Myc. Eur. vol. ii. p. 33. t. 16. figs. 1, 2. On dead oak branches, Wraxall, Som., C. E. Broome.

Polyporus bathyporus, Rostkovius, appears to be the same species.

358. *Merulius Porinoides*, Fr.! Syst. Myc. vol. i. p. 329. *Xylomyzon paucirugum*, Pers. Myc. Eur. vol. ii. p. 33. t. 14. fig. 7. On the ground, Leigh Wood near Bristol, C. E. Broome.

359. *Porothelium Friesii*, Mont. Ann. d. Sc. Nat. 1836, vol. v. p. 339; Fr. Ep. p. 504. On pine wood, Wraxall, Som., C. E. Broome; Castle Semple, Klotzsch, sub nom. *Hydnum mucidum.*

360. *Hydnum zonatum*, Batsch, t. 40. fig. 204; Fr. Ep. p. 509. On the ground under large oak-trees in Mr. Brown's Wood, Glanmire near Cork, Mr. Denis Murray.

361. *Hydnum niveum*, Pers. Disp. Meth. t. 4. figs. 6, 7; Fr. Ep. p. 518. On decayed leaves, sticks, moss, &c., Leigh Wood, Bristol, Dec. 13, 1847, C. E. Broome.

362. *Radulum quercinum*, Fr.! Ep. 525. On beech, Bâch Hall, Chester, Mr. A. Brodhurst Hill.

An authentic specimen from Sweden is on *Rosa canina.*

363. *Kneiffia setigera*, Fr.! Ep. p. 529. On pine, Wraxall, Somersetshire, C. E. Broome.

364. *Thelephora biennis*, Fr. Ep. p. 540. *Auricularia Phylacteris*, Bull. t. 436. On the ground, running over grass, sticks, &c., Bowood, Wilts, C. E. Broome.

365. *Thelephora cæsia*, Fr. Ep. p. 541. On the ground in woods. Leigh Wood, Stapleton Grove, near Bristol, Aug. 1848.

The hymenium, studded with the quaternate spores, is a beautiful object under a low power of the compound microscope. The surface is sometimes quite smooth, sometimes distinctly papillose.

366. *Thelephora laxa*, Fr.! Ep. p. 543. On bark and lichens, King's Cliffe, 1841.

367. *Clavaria crocea*, Pers. Coryph. p. 189; Ic. et Descr. t. 9. fig. 6. On the ground, Wraxall, Som., C. E. Broome.

368. *Clavaria purpurea*, Müll. Fl. Dan. t. 837. fig. 2. Abundant in a grass-field at Tansor, Northamptonshire.

This was formerly referred to *Clav. rufa*, 'Fl. Dan.,' by some error, of which the origin is now inexplicable.

369. *Clavaria tenuipes*, n. s. Gregaria, pusilla, clavula inflata rugosa pallido-argillacea; stipite gracili flexuoso subdistincto. On bare heathy ground on the borders of Sherwood Forest, Nov. 15, 1837.

Not exceeding an inch in height. Head swollen, obovate, rugose, pale clay-coloured, about ½ an inch high, rarely confluent with the stem, which is quite smooth, flexuous and very slender.

Allied to *Clav. fragilis*, but distinguished by its constantly incrassated head and less distinct flexuous stem.

Plate IX. fig. 2. *Clavaria tenuipes* of the natural size.

370. *Clavaria argillacea*, Fr. Ep. p. 577. *a.* Leigh Wood near Bristol, C. E. Broome; New Brighton, Cheshire, on sandy pastures. *b.* Collyweston, Norths., on bare ground in woods.

Fries now unites *C. argillacea*, P., and *C. flavipes*, P., under one species, in which view we concur.

371. *Calocera glossoides*, Fr. Ep. p. 582. *Clavaria glossoides*, Pers. Comm. p. 68. On decayed oak, Leigh Wood near Bristol, C. E. Broome.

Composed of erect forked flocci. Spores oblong, oblique, somewhat incurved, attached by a short pedicel.

372. *Tremella torta*, Willd. Mag. für die Bot. vol. iv. p. 18. *Dacrymyces tortus*, Fr. Ep. p. 592. *Dacrymyces stillatus β*, Fr. Syst. Myc. vol. ii. p. 250. On decorticated oak branches: very common.

This does not agree in structure with *Dacrymyces*, but is a true *Tremella*.

373. *T. epigæa*, n. s. Effusa gelatinosa gyroso-plicata candida. On the ground, Leigh Wood, Aug. 1848.

Spreading over the naked soil, on which it forms a thin white stratum, the surface of which is gyroso-plicate, and dusted with the white spores; the inner substance is very soft and gelatinous. This is a true *Tremella* and very different from *Corticium viscosum*.

Plate IX. fig. 3. Section of hymenium highly magnified.

374. *Nematelia virescens*, Corda, Ic. iii. t. 6. fig. 90. *Dacrymyces virescens*, Fr. Syst. Myc. vol. ii. p. 229. Common on *Ulex europæa*, Norths., Somers., &c.; Sidlaw Hills, Forfarshire, Mr. G. Lawson.

This pretty little fungus does not agree in structure with the genus *Dacrymyces,* and is correctly placed in *Nematelia* by Corda, who rightly suspected it to be *Tremella virescens,* Schum.

375. *Ditiola nuda,* n. s. Stipite cylindrico brevi albo tomentoso; capitulo subpileato corrugato aurantiaco. On fir stumps, Apethorpe, Norths., Sept. 1835.

About 1 line high. Stem rather thick, cylindrical, white, tomentose; head subpileiform, corrugated, sometimes umbilicate, consisting of loosely packed threads, which above bear fascicles of fertile branches. Spores oblique, oblong, obtuse, slightly curved, attached by a short excentric pedicel, and containing about three nuclei.

This pretty species has the habit of *Ditiola radicata,* but it does not root into the wood, neither has it any veil. It is a *Nematelia,* with the nucleus elongated into a stem. It must not be confounded with forms of stipitate *Dacrymyces stellatus,* which produces its spores in moniliform branched threads.

Plate IX. fig. 4. *a. Ditiola nuda,* nat. size; *b.* hymenium highly magnified; *c.* single spore still more highly magnified.

376. *Hymenogaster muticus,* n. s. Globosus, juvenis candidissimus, demum fusco-tinctus rimosus; intus pallide luteo-fuscus; cellulis laxioribus, sporis obovato-oblongis obtusissimis. Stapleton Grove near Bristol, 1845, and Nov. 18, 1847.

About an inch in diameter, almost destitute of any absorbing base, globose, scarcely at all lobed. When young pure white, but changing with age, especially when rubbed, to brownish, and at length much cracked. Substance pale yellowish brown, rather firm and dry; cells loose, but smaller than in some of the allied species, clothed with reddish brown obovate oblong spores, which for the most part are quite obtuse, without the slightest trace of an apiculus, and contain two or three variously-sized oil-globules. Smell very slight.

Distinguished from all its more immediate allies by its peculiar spores. It resembles much in general appearance *H. olivaceus.* The spores of *H. lilacinus,* Tul., are sometimes similarly shaped, but not typically, a point which requires strict attention in this genus.

377. *Hysterangium Thwaitesii,* n. s. Subglobosus albus tactu rufescens; peridio membranaceo; sporis oblongis apiculatis. Leigh Wood, Aug. 2, 1848. A single specimen occurred in the previous year on Aug. 22.

Mycelium white, fibrillose, not much disposed to form membranous expansions, spreading for some distance. Sporangium globose or slightly irregular, white, slightly silky, when rubbed or exposed to the air assuming a rufous tinge. Peridium membranous, not so thick as in *H. nephriticum*, though as in that species it sometimes separates when dry; rufous when divided. Cells brownish olive. Spores oblong, apiculate, differently shaped from those of the other species, and comparable only with those of *H. membranaceum*, Corda, of which at present nothing more is known than from an unpublished plate.

*378. *Geaster rufescens*, P.

An authentic specimen from Persoon is identical with *G. fimbriatus*, Fr., and to this belong some of the synonyms in 'Eng. Fl.,' especially that of Sowerby. *Geaster rufescens*, Fr., is quite a different thing, specimens of a small form of which were abundant at Thringstone, Leicestershire, a few years since, and a single specimen has occurred at Cliffe. The figures of Schmiedel are indifferent representations of *G. fimbriatus*.

379. *Geaster mammosus*, Chev.

An authentic specimen of Sow. t. 401 proves to be this species. We hope then that the British species, as far as they have at present been discovered, are now correctly referred to their synonyms.

XXVIII.—*On the Insects of Jamaica.* By Philip Henry Gosse.

[Continued from p. 181.]

35. *Victorina Steneles.* This fine species is found throughout the year, but is common only during the summer months. It haunts the bushes and herbage, at the edges of woods, the sides of roads and mountain-paths, beating about with an irregular motion, not often alighting. When alarmed, its flight is strong and rapid, but not high. Most of the specimens that one sees are more or less damaged by beating. It is widely distributed over mountain and lowland; in the bridle-paths of the Cotta Wood, near Content, it is, I think, more numerous than elsewhere.

In October, a large spinous caterpillar, black with red spots, furnished with two longer clubbed spines near the head, was brought me, which produced a short, thick chrysalis, of a beautiful pale green hue. From this in a very few days emerged the present butterfly. As the larva was ready for its change when I obtained it, I do not know its food.

36. *Marpesia Eleucha.* This occurred sparingly during the summer, both in the lowlands and on the Hampstead Road. It affects shrubs and small trees, at a height of six or eight feet from the ground, rather than herbage, fluttering over them with rapid vibration of the wings; it is however easily alarmed, and not readily approached.

37. *Heterochroa Iphicla* (var. ?). In elevated situations this butterfly is rather common, and it extends down to the level of the lower hills. At the brow of Bluefields Mountain it may be met with at all seasons, playing around the summits of tall blossoming shrubs. Its motions are sudden and rapid; it frequently alights and sits on a flower or leaf, with its wings spread to the sun, or alternately opens and closes them quickly in the manner of the *Vanessæ*: shy and vigilant, an approach puts it instantly on the wing, when it darts swiftly out of reach among the bushes, but soon returning to the same spot again. In this butterfly, as well as several others which seem to be specifically identical with Brazilian specimens, there is a peculiarity of form in West Indian individuals by which they may be at once distinguished. It consists in a tendency to increased development of the tailed processes of the posterior wings. Though this may not be observable in a comparison of a single specimen from each locality, it becomes conspicuous when a large collection comes under the eye.

38. *Chlorippe Laura*. A male and a female of this species occurred, both on the Hampstead Road, in June. Their manners were much the same as those of the preceding.

39. *Timetes Chiron* (*P. Marius*, Cram.). In the lowlands, especially at Sabito, this species is not uncommon during summer, appearing about the end of April: in mountain localities it is rather rare. It affects road-sides, and open grassy glades in woods; in the former dancing along the road at a small elevation with a zigzag flight, in the latter occasionally alighting on the turf. When one is seen, others are usually not far off; but the species is not gregarious. It is rather difficult of capture, being swift when alarmed.

40. *Gynæcia Dirce*. Contrary to the habits of most butterflies, this species avoids the sun. Dark and sombre woods, where there is little underwood, but where the meeting and interlacing branches overhead admit only a subdued light, are its favourite haunts. A grove of rose-apple trees (*Eugenia jambos*) by the side of the Hampstead Road, and a gloomy corner of the zigzag Bamboo Walk on Grand-Vale Mountain, are situations where it may be seen in some numbers on any day in summer. I have also seen it rarely in the high woods of Auld Ayr, behind Bluefields. When alarmed it flies rather swiftly, with an irregular motion, for a few yards only, suddenly and unexpectedly alighting on the trunk of a tree, erecting its closed wings in the same moment. The action is exceedingly like that of the *Catocalæ*, and as in the case of those moths, the sudden cessation of flight often causes the unpractised eye to lose sight of the object: in flight the contrast of the broad pale yellow bands on the black wings renders it conspicuous, but the variegated under surface,

so exquisitely beautiful when examined in detail, has so much the appearance of the gray bark of a tree as to be undistinguishable, even though the eye has been following it up to that moment. The insect seems to be aware of this power of concealment, and to trust to it; for after having thus alighted it will allow of a close approach without again flying, provided the attention of the observer be not very obviously directed to the spot.

41. *Paphia troglodyta.* I believe this species occurred but on a single occasion; one morning early in May, three specimens were captured by my servant at Sabito. I know nothing of its habits.

42. *Paphia Portia* (*P. Astyanax,* Cram.). This is one of the species which are found in considerable abundance all through the year. It chiefly affects the lowlands, though I have occasionally taken it at the elevation of Bluefields Mountain. The road at Sabito and at Belmont, and the immediate vicinity of Alligator Pond, in all of which the soil is a heavy sand close to the sea-beach, are the situations where I have found it most numerous. To take it requires a net with a long staff, for it flies rather high, playing over the tops of the trees, but frequently alighting on the broad leaf of a sea-grape (*Coccoloba*) at the height of fifteen or twenty feet from the ground. As if confident in this security, it will frequently allow the net to be placed almost against it before it will move. Two sometimes play together in the air, rising to a great elevation, with swift tortuous evolutions; then, descending, each will suddenly alight on a leaf, turning in the instant so as to bring the head downwards,—an invariable rule,—and closing the wings at the same moment, when it will rest awhile motionless. In recent specimens there is a rich violet opalescence, which plays over the scarlet surface of the wings in some lights, and which is very beautiful.

43. *Aganisthos Orion.* At Sabito Bottom this imposing butterfly is rather common, and so it is some two or three miles farther on, upon the same road, beyond the Water-wheel. These spots have in common the close proximity of the sea-beach on the one hand, and on the other a dense impenetrable morass, covered with trees and bushes. Over the tops of the tallest trees of the morass, *Orion* is frequently seen playing with another of his species, occasionally coming down to alight on the topmost twig, or on some projecting leaf of a tree, frequently one that overhangs the road; it always rests head downward, in the manner of *Portia*; it is very vigilant, never descends within many yards of the ground, and will not allow of an intruder's approach; when it flies, it will often, after taking a wide circuit, return to

the same twig or leaf it had left. Its flight is rapid and commanding, effected by a succession of great, irregular *bounds,* if I may use such a term, with a leisurely flapping of the large wings; but sometimes it sails along with very little flapping. Its appearance in the air, from its size and dark colour, is striking.

44. *Charaxes Cadmus.* With much resemblance to the preceding species in form and coloration, *Cadmus* resembles it still more in general habits. It frequents also the same localities, but less exclusively; for besides Sabito and the Cave, where it is most common and constant, it occurs also in summer on the Hampstead Road, and in many lanes and glades in the hill-side woods. It is a butterfly of lofty flight, wary and swift, and hence is difficult of capture; yet sometimes, when sitting on a leaf, it manifests an unusual fearlessness. Its habit is to fly rapidly round and round a considerable area over the trees, occasionally resting on the lofty leaves and twigs: if another of the same species appears, an encounter takes place, whether hostile or amatory I know not, during which they whirl round each other with amazing rapidity; in these tussles they often descend near the ground, but on separation each returns to its usual elevation. The mode of resting suddenly from flight, without any hovering, even for a moment, over the spot, the immediate closure of the wings and the position, the head always being downward, with many other details of habit, are common to *Portia, Orion* and *Cadmus.*

45. *Libythea* (sp. nov.? near *Motya*). All I can say of this is that it was taken by my servant at Alligator Pond, a few yards from the sea-side, on an afternoon near the end of June.

46. *Calisto Zangis.* We rarely see this butterfly in the open fields or roads, but within the sombre shade of the woods it is almost everywhere to be met with, from the forest which comes down to the sea-side at Sabito to the summit of Bluefields Peak; and it is no less numerous than widely spread. Its habits are much the same as those of our own sylvan *Hipparchiæ*; it proceeds with an irregular dancing jerking motion, a few inches above the ground; commonly pursuing the same general direction, never hovering or flitting to and fro, rarely turning upon its course, and rarely alighting. Its flight is slow and feeble, and hence it is captured with the utmost facility. The large eye-like spot in the centre of the anterior wing in the male gives to this sex an aspect very diverse from that of the female. It is abundant throughout the whole year.

47. *Thecla Pan.* The Hampstead Road is the chief locality in which I have seen this species. There, in June, it is very common, frisking about in the morning sun, over such trees as are in blossom, in large parties, often alighting, and rubbing the

closed wings against each other, in the manner common to the genus.

48. *Thecla* (sp. nov. near *Pan*, No. 2632, Br. Mus.). About the end of March this little sombre species occurs; playing about the flowering plants and fruit-trees of the pastures, especially in the lowlands. In Bluefields pasture I have observed it affect the bushes of *Cleome pentaphylla*, whose elegant long-stamened blossoms probably attract it, though it does not rest much on them, but pursues its game of aërial play with its fellows in incessant and unwearied pertinacity; half-a-dozen or more whirling about each other in the air with a rapidity of contortion that the eye of the observer vainly attempts to follow. Often two or three will begin to play around an orange-tree, and in a few seconds, others which we had not seen before, coming from no one knows where, suddenly join in the gambols, and thus the little group increases to eight or ten, which after a while separate and disperse as invisibly as they came. Their small size and great rapidity of motion doubtless help to produce this effect. They delight in the full beams of the burning sun; the hottest part of the day is the season of their greatest activity; and even the shadow of a passing cloud will spoil their play.

49. *Thecla* (sp. nov., No. 2635, Br. Mus.).

50. *Thecla Acis*. A single specimen.

51. *Thecla* (sp. nov. near *Hugo*). A single specimen occurred, but I have no note of the time or place of its capture.

52. *Thecla* (sp. nov., No. 2659, Br. Mus.). A very lovely little species of a splendid silvery blue above, the apex of the wings broadly black; the under surface bluish white with many faint lines. It occurred two or three times only in the month of June on the Hampstead Road; each one was solitary, flitting among trees or resting on leaves at a considerable elevation, at the edge of the dark forest, itself out of the reach of the sun's rays.

53. *Thecla* (sp. nov. near *Herodotus*, No. 2718, Br. Mus.). Somewhat like the preceding above, but larger and much less brilliant: the under surface is of a lively yellowish green, the posterior wings brown at the margin, with a white edge. This species was still rarer than the former, but frequented the same situation.

54. *Thecla* (sp. nov.). Above with a general resemblance to the former two, the size agreeing with the last; the blue is very rich, approaching a purple tint. The inferior surface has somewhat the same character as in *Pan*. It is very rare; I met with it but once or twice on the Hampstead Road in June.

55. *Polyommatus Cassius*. This minute and delicate little "Blue" is exceedingly abundant in the pastures of the lowlands and the guinea-grass pieces of the hill-sides. In company with

the smaller *Teriades* and *Hesperiæ* it flits over the grass in thousands; frequently it engages in play with others of its species, with the hilarity of the little *Theclæ*, but in a less degree. It rarely rises to a greater height than a foot or eighteen inches above the turf, and though its motions are swift and sprightly yet it is very easily captured. It is active through all the seasons of the year.

[To be continued.]

XXIX.—*Description of a new genus of British Marine Zoophytes belonging to the family* Eucratiadæ. By John Coppin, Esq., M.A.

[With a Plate.]

Nov. Gen. Salpingia.

(Derivation from σάλπιγξ, *a trumpet.*)

Char. Cells elongated, sessile upon a branched stem; apertures lateral, broader above than below, produced; base of cells surrounded by one or more spines and trumpet-shaped processes.

Salpingia Hassallii.

Char. Polypidom calcareous, branched, confervoid, jointed, punctated; cells in a single series, distant, elongated, sessile, upon a branched stem; apertures lateral, produced, narrow below, broad and straight above; stem very slender, dichotomously branched, dilating upwards to the base of each polype-cell; spines and trumpet-shaped processes springing usually out of the angle formed between the stem and the cells, and from the dilated portion of the stem on which the cell itself is seated.

Hab. Parasitical on small filamentous Fuci, together with the *Eucratea chelata.* Brighton: rare. June 1848.—Pl. X. fig. 3.

This is a very elegant production, certainly both generically and specifically distinct from any hitherto-described zoophyte, but displaying an evident relation to the genus *Eucratea*, which has been made the type of a distinct family, *Eucratiadæ*.

The appearance of this zoophyte under the microscope is very beautiful; the long and slender footstalks surmounted by the uniserial cells, with their curious apertures, the singular-looking but not inelegant trumpet-shaped processes, the entire polypidom being at the same time regularly and delicately frosted or punctated, all conspire to render this an exceedingly graceful microscopic object.

An attentive examination of the construction of the polypidom of this species, and a consideration of the position of the several joints with which it is provided, render it extremely probable that the trumpet-shaped processes are the dilated footstalks upon which the cells themselves are ultimately to be developed.

The position of the several joints is not always exactly the same; one however is usually found at the commencement of the long footstalk, another near its termination and at the base of the trumpet-shaped process, a third between the cell and this process, and a fourth midway on the cell itself, which sometimes exhibits a constriction in the situation of the joint or line of division.

Occasionally also the spines, which would appear to be themselves trumpet-shaped processes in progress of development, are jointed.

The several branches forming the skeleton of the polypidom generally spring from the important trumpet-shaped processes, but occasionally also from the back of the polype-cells themselves.

This zoophyte is best examined with object-glasses of 1 and ½ an inch foci, and will well repay a careful examination.

22 Old Square, Lincoln's Inn, July 19th, 1848.

XXX.—*Algæ Orientales:—Descriptions of new Species belonging to the genus* Sargassum. By R. K. Greville, LL.D. &c.*

[Continued from p. 206.]

[With a Plate.]

Many of the species which I now propose to describe from time to time were communicated to me some years ago by my excellent friend Dr. Robert Wight, Surgeon on the Madras Establishment; a gentleman well-known by his valuable 'Illustrations of Indian Botany,' and for his untiring investigations into the vegetable productions of our Indian possessions. These Algæ were to have been published in the 'Prodromus Floræ Peninsulæ Indiæ Orientalis,' a work undertaken by him in conjunction with Dr. Walker-Arnott, and calculated to add largely to the well-founded reputation of both parties. The second volume, however, having been unfortunately suspended, I have been induced in the mean time to give them to the botanical world in the present form, through the medium of the Botanical Society.

Wightianæ.

4. *Sargassum echinocarpum* (nob.); caule cylindraceo, ramosissimo; foliis oblongo-lanceolatis, dentatis, uninerviis; vesiculis plus minusve ovalibus, petiolatis, petiolis latioribus, foliaceis; recep-

* Read before the Botanical Society of Edinburgh.

taculis axillaribus, racemosis, planis, lineari-cuneatis, acute et grosse denticulatis.

Wight in herb. no. 18.

Hab. in mari Indico, ubi detexit Wight.

Root unknown. *Plant* of a bushy habit, about two feet long. *Stem* cylindraceous, about as thick as a crow-quill, giving off branches 6–8 inches long at intervals of less than an inch apart; these branches are clothed with a second series 1–2 inches in length, on which the short fruit-bearing ramuli are thickly set. *Leaves* cartilaginous, fully an inch long, shortly petiolate, oblong-lanceolate, very irregularly repando-dentate, obtuse, the nerve extending almost to the apex, punctate, the pore visible to the naked eye. *Vesicles* between oval and spherical, about the size of hemp-seed, very numerous, intermixed with the receptacles, on broad foliaceous stalks, often winged and apiculate, frequently developed in the leaves themselves. *Receptacles* axillary, varying in length from little more than 1, to 2 or even 3 lines, racemose, more or less linear, flat, so largely and sharply toothed as to be sometimes almost pinnatifid. *Colour* a rich dark reddish brown. *Substance* cartilaginous.

In habit this species is allied to *S. vulgare*, but differs entirely in the fructification and other leading characters. The sportive disposition of the vesicle is very remarkable, showing every transition from the leaf to that organ. On one occasion I observed two vesicles imbedded in the same leaf, as represented at fig. 3. The leaves occasionally assume a broadly linear character, and if I am correct in referring one imperfect specimen in my possession to this species, they become sometimes more elongated and at the same time less toothed.

Campbellianæ.

5. *Sargassum Campbellianum* (nob.); caule filiformi; foliis membranaceis, linearibus, dentato-serratis, obtusis, uninerviis; vesiculis paucis, sphæricis, breviter petiolatis; receptaculis racemosis, elliptico-cylindraceis ad apicem denticulatis.

Hab. in mari Indico. Specimina communicavit J. Campbell.

Root unknown. Entire plant probably three feet long or more, of a very slender and graceful habit. *Stem* filiform, cylindrical, elongated, in my imperfect specimens nearly two feet in length, producing horizontal branches at remote intervals 6–9 inches long or more, which bear numerous ramuli 1–3 inches long; these ramuli are clothed with leaves and receptacles at intervals of often not more than the eighth of an inch. *Leaves* petiolate (those on the primary branches $1\frac{1}{2}$ inch, those on the ramuli less than an inch long), linear or nearly linear-lanceolate, irregularly dentato-serrate, either acute or quite obtuse at the apex, thin, membranaceous and translucent, the nerve slender, disappearing beneath the apex; pores not visible to the naked eye, scattered over a space nearer to the nerve than to the margin, which latter is destitute of them. Petioles short, with often a single sharp tooth at the base of the leaf. *Vesicles* solitary, subspherical, on short compressed stalks, generally situated at the base of the ramuli, but not unfrequently produced on the racemes also, scarcely so large as hemp-seed. *Receptacles* axillary, linear-oblong or fusiform, either undivided or forming lax racemes 2–3 lines long or more. They are generally entire at the lower part, but sharply toothed towards the apex. *Colour* a dull, very pale olivaceous green. *Substance* extremely thin, delicate and membranaceous.

This is a very interesting species, not contained in Dr. Wight's collections, but kindly communicated to me at his special request by its discoverer, James Campbell, Esq. of Madras. It is conspicuous by its very slender and delicate habit and pale olivaceous yellow colour. The receptacles are sometimes solitary, sometimes once-divided, but more generally form little clusters or racemes, the parts of which are much disposed to pass into foliaceous expansions. I have indeed seen receptacles on one raceme passing in a proliferous manner into both vesicles and minute leaves.

Vachellianæ.

6. *Sargassum debile* (nob.); caule elongato, subcompresso, ramis laxis, longissimis, simpliciusculis; foliis membranaceis, lineari-oblongis, obtusis, dentatis, uninerviis; vesiculis sphæricis axillaribus.

Hab. in mari Chinensi prope Macao; Vachell.

Root unknown. Specimen in my possession 34 inches long, and the character of the lower leaves indicates that they grew near the base; so that the whole plant may be from 3 to 4 feet long. Habit extremely slender and weak. *Stem* somewhat compressed, scarcely thicker than a sparrow's quill, giving off at irregular intervals, for some inches above the base, a few filiform branches 2–3 feet long, of nearly the same thickness throughout, sometimes more or less subdivided, but frequently simple, and along their whole length bearing leaves and vesicles at intervals of from half to three-quarters of an inch. *Leaves* thin, membranaceous, translucent, linear-oblong, obtuse, waved at the margin, sparingly and irregularly toothed, attenuated below into the stipes, the nerve conspicuous, very slender, disappearing below the apex; pores minute, but visible to the naked eye. *Vesicles* axillary, stalked, spherical, rather larger than the seeds of *Lathyrus odoratus*, the stalks scarcely a line long, filiform. *Substance* membranaceous and somewhat flaccid. *Colour* pale yellow-olivaceous green.

The only specimen which I have seen is not in fructification, but is otherwise in a very perfect and satisfactory state. In general appearance, especially when placed in water, it might be compared to some kinds of *Potamogeton*, and probably vegetates in quiet and shallow bays. The vesicles, as may be seen in the plate, form an axillary raceme, and no doubt indicate the position of the fructification, which, in more advanced individuals, would be probably found towards the extremity of the branches. In my specimen I observe no trace of it, although the vesicles are present on every part.

EXPLANATION OF PLATE V.

Sargassum echinocarpum.

Fig. 1. Portion of a branch.
— 2. Leaf with a vesicle at its apex.
— 3. Leaves producing vesicles.
— 4. Vesicle with foliaceous expansion of the stalk.
— 5. Vesicle in its simplest form.
— 6. Receptacles, with a leaf passing into a vesicle.
— 7. Portion of a raceme. 5—7 magnified.

Sargassum Campbellianum.

Fig. 1. One of the smaller branches.
— 2. A leaf with raceme of fructification.
— 3. Vesicle.
— 4. Receptacles passing into leaves and vesicles. 2—4 magnified.

Sargassum debile.

Fig. 1. Portion of a branch.
— 2. Leaf and vesicles; the last magnified.

XXXI.—*Reply to* Sir Philip Egerton's *Letter on the* Placodermi. By Frederick M'Coy, M.G.S. & N.H.S.D. &c.

To the Editors of the Annals of Natural History.

Gentlemen,

I regret to have to trouble you with a few lines in reply to the above article in your last Number. The opinion I entertained of the value of your space and the reader's time induced me to condense the gradually acquired experience of years into a very brief paragraph, proposing the family *Placodermi* for certain Ganoid fish, in my paper in the 'Annals' of July last. This brevity has I fear caused me to have been misunderstood by Sir P. Egerton, who has reprinted the paragraph in his letter, adding, that "Not having seen the specimens which have induced Mr. M'Coy to propose this new classification, I am unable to form any opinion as to whether he is justified or not in making the change." I can scarcely imagine any one reading the paragraph in question could think I proposed this change from the characters merely of the few new Carboniferous species I was then describing; on the contrary, it was the result of a careful study of *the Scotch and Russian Old Red Sandstone fishes,* and having of course first made myself master of the writings of Agassiz, Eichwald, &c. on the subject: all the genera I mentioned in that paragraph were previously published Devonian forms, and I should have imagined were well known to Sir Philip Egerton, who I regret did *not* give his opinion on the subject, as it would have been of great value, and rendered more clear the object of his letter. The next passage I confess pained me excessively, as it seemed to impute to me the absurd unworthiness of taking advantage of Agassiz being absent a nine days' journey to make this change in a part of his classification, and to bring a charge against him of separating genera which were closely allied and placing them in different families with which they had no obvious affinity. The fact is, at the time I wrote I had nothing in my mind but the expression of what I conceived to be the natural affinities of the genera, after a laborious examination of the whole subject; I believed that if Agassiz had reinvestigated the matter he would have concurred in what I had done; and even Sir P. Egerton, whose knowledge of the *Cephalaspids* is at least I believe as great as that of any one living, does not dispute it. The passage is, "I cannot however allow a charge to be brought against my friend Professor Agassiz, in his absence, of having grouped together genera under the title *Cephalaspides, having no obvious affinity* with the genus *Cephalaspis,* and having *widely separated* genera *so obviously and closely allied to some of them, that they cannot be separated either by general appearance or any points of structure,* without claiming that in justice to Agassiz, his opinions on this subject may be accorded in your pages the same publicity which Mr. M'Coy's observations have already received. The following passages must surely have escaped Mr. M'Coy's memory when he claims to have discovered affinities (supposed to have been overlooked or disregarded by Agassiz) of sufficient value to justify a re-classification of the Palæozoic Ganoids."—I never "claimed" to have discovered affinities overlooked by Agassiz; and so far from forgetting his published opinions, they added considerably to the certainty which I felt of the correctness of the view I have put forward.

The extracts alluded to in the above quotation which Sir P. Egerton has given from Agassiz' Monograph do not invalidate my position, but on the contrary show that Agassiz perceived himself the affinities on which *I* have acted though *he* did not;

and I am quite uncertain whether they are quoted against my view or in support of it. It reminds one of Cuvier, who, when he first saw some *Palæonisci* from the Copper slate, said, they should be arranged *either* with the sturgeons among the *Chondropterygii, or* with the bony pike among the *Clupeæ,* and yet he missed the almost inevitable conclusion which any one might have drawn from his own evidence, it being reserved for his successor in those inquiries to make the most important improvement in his classification of fish by removing the sturgeons from the remainder of the *Chondropterygii,* with which they had no obvious affinity, and the bony pike from the *Clupeæ,* which group their presence equally disturbed, and uniting them with the aforesaid *Palæonisci* and the like fossil types to form the distinct order of Ganoids.

The facts of the present case are these:—Mr. Lyell long ago discovered the peculiar fish which Agassiz called *Cephalaspis* and made the type of his family *Cephalaspides*; it has the head covered by a single bony shield, the body covered with rhomboidal scales of the ordinary Ganoid construction, and has a large heterocercal tail and caudal fin, such as we so commonly see in the Ganoids of the old rocks: in his last book, Agassiz adds to this family the genera *Pterichthys, Pamphractus, Polyphractus* and *Coccosteus,* all of which agree among themselves, *and differ from Cephalaspis,* in, 1st, having the head covered with several distinct plates instead of one single shield, as in it; 2nd, in not having the body covered with small rhomboidal scales, as in it, but cased in a few large tuberculated bony plates; and finally, instead of the large heterocercal tail and distinct caudal fin of that genus, having a straight simply pointed tail destitute of caudal fin. In the same work (Monog. of the Old Red Fish) we find a new definition of the family of Cœlacanth fishes, distinguishing them from the Sauroids by the sole characteristic of their body being covered with *rounded, imbricating scales*; and yet strangely enough here we find placed the genera *Asterolepis, Bothriolepis* and *Psammosteus,* the only certainly known parts of which are great, irregular, tuberculated bony plates, agreeing most nearly with *Coccosteus,* differing principally in their greater size; and I find it impossible, either from the examination of the fishes themselves or the writings of authors, to trace their connection with the obvious types of the family, *Holoptychius, Phyllolepis* and *Glyptolepis,* which strictly agree with the definition. By withdrawing the discordant elements of those two families, the *Cephalaspides* and *Cœlacanthi,* I have left them distinctly and well defined, and by uniting those disjoined members (whose affinity Sir P. Egerton's extracts show to have been recognized by Agassiz) I have formed what seems to me an equally definite, natural and peculiar family, to which I gave the name of *Placodermi*; and if any palæontologist can give any reasons against this course, I for one should feel grateful for the information.

I have the honour to remain, Gentlemen,
Your most obedient servant,
FREDERICK M'COY.

17 Osborne Terrace, Cambridge.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Nov. 23, 1847.—Wm. Yarrell, Esq., Vice-President, in the Chair.

The following papers were read:—

1. DESCRIPTIONS OF SOME NEW SPECIES OF AUSTRALIAN BIRDS. BY JOHN GOULD, ESQ., F.R.S., F.Z.S. ETC.

MELITHREPTUS CHLOROPSIS.

Upper surface greenish olive; head and chin black; crescent-shaped mark at the occiput, and under surface, white; wings and tail brown, margined with greenish olive; apical half of the external webs of the primaries narrowly edged with white; irides dull red; bill blackish brown; naked space above the eye greenish white in some, in others pale wine-yellow; tarsi and outer part of the feet light greenish olive; inside of feet bright yellow.

Total length $5\frac{1}{4}$ inches; bill $\frac{11}{16}$; wing $3\frac{1}{4}$; tail $2\frac{5}{8}$; tarsi $\frac{3}{4}$.

Hab. Western Australia.

Remark.—Allied to *M. lunulatus*, from which it differs in being of a larger size, and in having the bare space over the eye pale green instead of red.

MELITHREPTUS ALBOGULARIS.

Upper surface greenish wax-yellow; head black; crescent-shaped mark at the occiput, chin, and all the under surface, white; wings and tail brown, margined with greenish wax-yellow; irides dull red; bill brownish black; legs and feet greenish grey, with a tinge of blue on the front of the tarsi.

Total length $4\frac{5}{8}$ inches; bill $\frac{5}{8}$; wing $2\frac{7}{8}$; tail $2\frac{1}{4}$; tarsi $\frac{11}{16}$.

Hab. Northern and Eastern Australia.

Remark.—Rather smaller than *M. lunulatus*, from which it differs in the brighter colouring of the back and in the total absence of any black on the chin.

GRUS AUSTRALASIANUS.

The general plumage deep silvery grey; the feathers of the back dark brownish grey, with silvery grey edges; lesser wing-coverts dark brown; primaries black; crown of the head and bill olive-green, the bill becoming lighter towards the tip; irides fine orange-yellow; raised fleshy papillæ surrounding the ears and the back of the head fine coral-red, passing into an orange tint above and below the eye, and becoming less brilliant on the sides of the face, which, together with the gular pouch, is covered with fine black hairs, so closely set on the latter as almost to conceal the red colouring of the skin; upper part of the pouch and the bare skin beneath the lower mandible olive-green; in old males the gular pouch is very pendulous, and forms a conspicuous appendage; legs and feet purplish black.

Total length 48 inches; bill $6\frac{1}{4}$; wing 24; tail $9\frac{1}{2}$; tarsi $10\frac{1}{2}$.

Hab. Australia generally.

Remark.—A very noble species, which has hitherto been confounded with the *Grus Antigone* of India, to which it is nearly allied, but from which it differs in being somewhat smaller in size and in the black colouring of the legs.

Myïagra concinna.

The male has the whole of the upper surface, wings, tail, and breast, lead-colour, glossed with green on the head, neck and breast, and becoming gradually paler towards the extremity of the body and on the wings and tail; primaries slaty black; secondaries faintly margined with white; under surface of the wing, abdomen and under tail-coverts white; bill leaden blue, except at the extreme tip, which is black; irides brown; feet blackish grey.

The female has the head and back lead-colour, without the greenish gloss; wings and tail brown, fringed with bluish grey, particularly the secondaries; throat and breast rich rusty red; abdomen and under tail-coverts white, which colour does not gradually blend with the rusty red of the breast, as in the female of *Myïagra plumbea*; upper mandible black; under mandible pale blue, except at the tip, which is black.

Total length $5\frac{1}{4}$ inches; bill $\frac{1}{2}$; wing 3; tail $2\frac{3}{4}$; tarsi $\frac{5}{8}$.

Hab. North-western Australia.

Remark.—Closely allied to *M. plumbea* and *M. nitida.*

Herodias plumiferus.

The entire plumage pure white; bill and orbits yellow.

Total length 24 inches; bill 4; wing 11; tail $4\frac{1}{2}$; tarsi $4\frac{1}{4}$.

Hab. New South Wales.

Remark.—This species is distinguished by the greater development of the plumes depending from the chest, and by their structure assimilating very closely to those of the back.

Herodias pannosus.

The entire plumage bluish or slaty black, with the exception of the chin, which is pure white.

Total length 24 inches; bill $4\frac{1}{4}$; wing $10\frac{1}{2}$; tail 4; tarsi $4\frac{1}{4}$.

Hab. Port Stephens, New South Wales.

Remark.—The deep leaden blue colouring of this species renders it a very conspicuous bird.

Ardetta stagnatilis.

Crown of the head, occipital crest and a small tuft beneath each eye black; neck and all the under surface grey, with a vinous tinge, which becomes much deeper on the abdomen and under tail-coverts; lengthened feathers of the back bluish grey, with lighter shafts; wing-coverts dark slate-grey, narrowly margined with buff and white; remainder of the wings and tail dark grey; irides light yellow; orbits and eyelash gamboge-yellow; upper mandible and cutting edge of the lower mandible very dark reddish brown; remainder of the lower mandible oil-green; tibiæ and hinder part of the tarsi bright yellow; remainder of the legs and feet yellowish brown.

Total length 14 inches; bill $3\frac{1}{2}$; wing $7\frac{1}{2}$; tail $2\frac{3}{4}$; tarsi $2\frac{1}{4}$.

The young differ in having all the upper surface brown, with a triangular spot of white at the tip of all the wing-feathers, and the throat broadly and conspicuously striated with brown on a white ground.

Hab. Port Essington.

Actitis empusa.

All the upper surface pale glossy or bronzy brown, each feather crossed with irregular bars of dark brown, bounded on either side by a narrow line of paler brown; wings dark brown; base and tips of the secondaries white; primaries very slightly tipped with white; central tail-feathers pale glossy or bronzy brown, with a row of irregular-shaped spots of dark brown along the margins; lateral feathers white, crossed by irregular blended bars of dark and pale brown; under surface white, with the exception of the sides of the chest, which are pale brown, and the shafts of the feathers of the front of the neck, which are also pale brown.

Total length $6\frac{1}{4}$ inches; bill $1\frac{1}{8}$; wing $4\frac{1}{8}$; tail $2\frac{1}{4}$; tarsi 1.

Hab. Port Essington.

Remark.—Closely allied to, but smaller than, *Actitis hypoleucus*.

Sterna gracilis.

Crown of the head and back of the neck rich deep black; all the upper surface, wings and tail silvery grey; sides of the neck and all the under surface white, with a blush of rose-colour on the breast and centre of the abdomen; shafts of the primaries white, their outer webs slaty black, and a narrow stripe of dark slate-colour along the inner web close to the stem; irides brownish red; bill red; feet orange-red, nails black.

Total length $12\frac{1}{2}$ inches; bill 2; wing $8\frac{1}{2}$; tail 6; tarsi $\frac{3}{4}$.

Hab. The Houtmann's Abrolhos, off the western coast of Australia.

Remark.—A very elegant species, closely allied to *Sterna Dougallii* of the British Islands.

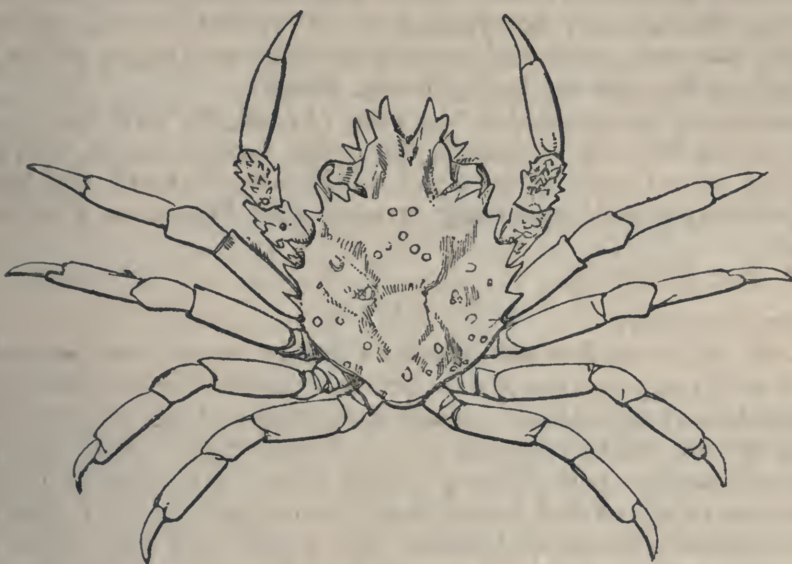
2. Short Descriptions of new or little-known Decapod Crustacea. By Adam White, F.L.S., Assistant in the Zool. Dep. British Museum.

Family Maiadæ.

Schizophrys, White.

Carapace oval, depressed, somewhat attenuated behind; beak deeply cloven; upper orbit deeply cloven, with a strong tooth in the middle of the cleft; under orbit with an elongated appendage on the inside, with two teeth at the end.

Tail of male with seven joints, the sides nearly parallel. Fore-legs shortest. Fingers without teeth.



Schizophrys serratus (twice the natural size).

Schizophrys serratus, White, List of Specimens of Crustacea in the Collection of the British Museum, p. 9.

Two basal joints of fore-legs with numerous pointed tubercles; sides of carapace with six strongish teeth, including outer tooth of orbit. The two strong teeth of the front with a tooth each on the outside.

Hab. Isle of France (male). Coll. Brit. Museum.

Schizophrys spiniger, White, l. c. 9.

Basal joints of fore-legs smooth; sides of carapace with eight teeth on each, the second and third from the orbit united at the base; behind, in the middle and close to each other, are two small teeth. Carapace above with numerous minute tubercles, amongst which are nineteen of larger size, arranged mostly transversely. The carapace is yellow, tinged here and there.

Hab. Philippine Islands (Siquejor and Isle of Rohol). Coll. Brit. Museum. From Mr. Cuming's collection.

Huenia frontalis, White, l. c. 10.

Carapace with the front very wide and semicircular in front; sides of carapace behind eyes narrower than a line measured across; a slight sinus in the side behind. Legs flat and foliaceous.

Locality unknown. Coll. Brit. Museum.

Huenia Dehaanii, White, l. c. 10.

Carapace elongated, depressed; beak compressed; sides hairy, with a tooth at base directed forwards; carapace behind eyes with the sides nearly parallel, the end straight; sides with two wide, bluntish, somewhat falcated appendages directed backwards, separated by a roundish sinuation.

Hab. Philippine Islands. Coll. Brit. Museum. From Mr. Cuming's collection.

Menœthius porcellus, White, l. c.

Upper part of carapace very irregular all over; the front, with three teeth arising from the same, plain; the middle one very much elongated and bent down at the end; the side margin with several largish crenations; base of fore-legs with two or three tubercles on the outside.

Blastia monoceros, Leach MSS.

Hab. Isle of France (male and female).

Family Canceridæ.

Genus Actæa, De Haan.

Actæa nodulosa, White, l. c. 15.

Carapace and legs above thickly covered with rounded tubercles, largest on fore-legs and on fore-margins; a tubercle on the under orbit; the carapace in the middle longitudinally impressed; the posterior edge is straight and furnished with two transverse lines of small tubercles; claws, both upper and under, with longitudinal keels, horn-coloured.

Hab. Isle of France. Coll. Brit. Museum.

Actæa carcharias, White, l. c. 15.

Carapace and legs above covered very closely with sharp rough tubercles; on the front the tubercles are much smaller, the upper surface divided into different divisions by transverse and longitudinal lines; upper edge of legs serrated.

Hab. Australia (Swan River).

This species is nearly allied to *Actæa calculosa* (*Cancer calculosus*, Edw. Crust. i. 378).

Atergatis, De Haan.

Atergatis sinuatifrons, White, l. c. 14.

Carapace with the marginal limb very entire and rather thick, of a uniform brownish red. Front with three lobes, each notched in the middle. Fingers of fore-legs with tufts of hair, black, extreme tip white. Width of carapace four inches.

Hab. Mauritius. Coll. British Museum. Presented by Lady Frances Cole.

Atergatis subdivisus, White, l. c. 14.

Carapace with the marginal limb divided by four very indistinct lobes; greater part of top of carapace deep red, with yellowish spots; behind paler. Fingers black, base of moveable finger yellow. Front of carapace with two straightish lobes, sinuated close to the eye. Width of carapace three inches eight lines.

Hab. Philippine Islands. From Mr. Cuming's collection.

Near *A. marginatus*.

Atergatis asperimanus, White, l. c. 14.

Carapace with its latero-anterior sides with a cutting edge, part of carapace behind this punctate; the rest of upper surface almost quite smooth, with three or four impressed lines in front. Hands rugose, especially above; fingers both moveable and fixed, deeply channeled. Pale yellowish red; feet darker; fingers of fore-legs pale horn-coloured.

Hab. Philippine Islands. Coll. Brit. Museum. From Mr. Cuming's collection.

Atergatis lateralis, White, l. c. 15.

Carapace with each of the sides having three projecting teeth; hands with a crest above and below; fingers short, pale brown; hands roughish on the outside.

Hab. Unknown. In collection of Brit. Museum.

Xantho, Auct.

Xantho depressus, White, l. c. p. 17.

Carapace much-depressed, very flat, in front tuberculated; many of the tubercles sharp-pointed. Front deeply notched in the middle; sides with three teeth. Hands on the outside tuberculated, three last joints of legs slightly tuberculated and with a few hairs.

Hab. Philippine Islands (Isle of Corregidor). From Mr. Cuming's collection.

This is quite a magazine genus in the family *Canceridæ*; it requires subdivision greatly.

Xantho denticulatus, White, l. c.

Carapace with the latero-anterior edge long, and arched with eight sharp teeth on each side, largest behind. Front of carapace between the orbits separated into four parts by five longitudinal lines; two transverse lines about the middle. Hands on the outside smooth, above with a bluntish edge, punctured on each side.

Hab. West Indies. Brit. Museum. From Mr. Scrivener's collection.

Xantho cultrimanus, White, l. c. 17.

Carapace slightly convex above; front notched; sides with four teeth; front part and sides with very slight tubercles; carapace behind the eyes with impressed lines, which meet in the middle. Hands with four longitudinal impressed lines on the outside, which is covered with small roughish tubercles. Carapace and legs pale yellowish, varied with red.

Hab. Philippine Islands. Coll. Brit. Museum. Mr. Cuming's collection.

Xantho lamelligera, White, l. c. 17.

Carapace rather convex above, with four teeth on each side; upper part on sides slightly tubercular. Hands rough on the outside; edge of wrist above with a toothed margin; edge of hands, both above and below, with a lamellar edge. Hind-legs on the upper edge lamellar.

Hab. Isle of France. Coll. Brit. Museum.

CHLORODIUS, Auct.

CHLORODIUS HIRTIPES, White, l. c. 18.

Carapace smooth; front very broad, scarcely notched in the middle; the sides with four blunt teeth. Fore-legs long; third joint very thick; upper edge at base with one thick tooth; hind-legs with many brownish hairs.

Hab. Philippine Islands. Coll. Brit. Museum. From Mr. Cuming's collection.

CHLORODIUS FRAGIFER, White, l. c. 18.

Carapace covered with roundish berry-like tubercles, arranged in groups and separated by definite impressed lines. Pedicel of eye with two spines close to the eye; legs covered with rice-like tubercles. White, a broad pinkish longitudinal line down the middle in front; five pink marks on hind part of carapace.

Hab. Philippine Islands (Rohol). Coll. Brit. Museum. From Mr. Cuming's collection.

CHLORODIUS PILUMNOIDES, White, l. c. 18.

Carapace and legs covered with brown hairs; carapace somewhat depressed, sides with three teeth covered with spines; fore-part of carapace with several bosses, and rough with spiny tubercles; on hind-part of carapace are four transverse raised lines, the innermost the shortest. Hands large, upper edge serrated, outside and top with largish tubercles. Fingers on the outside and top channeled; several tubercles at the base of the moveable finger; fingers black, hollowed ends white. Hind-legs serrated above, second and third joints with three rows of serratures.

Hab. Singapore. Philippine Islands (Rohol). Coll. Brit. Museum. From Mr. Cuming's collection.

PANOPEUS, Edwards.

PANOPEUS DENTATUS, White, l. c. 18.

Carapace having the sides furnished with five lobes, the first three blunt and wide, the last two sharp and narrow; front with four lobes, the two middle largest; fore-part of carapace above, round the edge, depressed and irregularly tuberculated, most of the tubercles very small. Hands very unequal in size, the right largest fingers thick, the left small, the fingers much elongated. Upper part red, with many irregular yellow marks.

Hab. Philippine Islands (Masbata). Coll. Brit. Museum. From Mr. Cuming's collection.

OZIUS, Edwards.

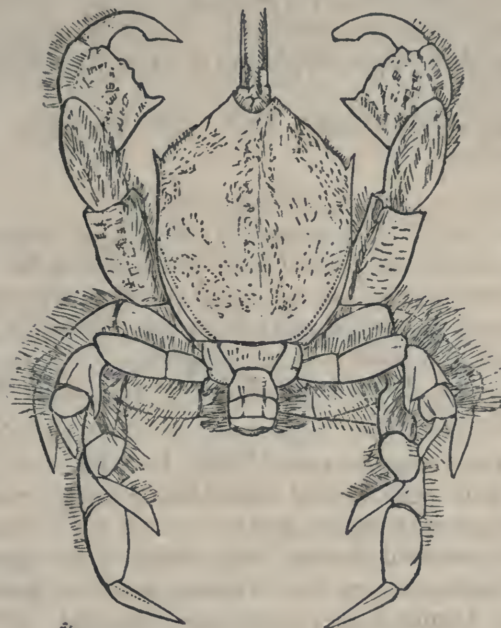
OZIUS? SUBVERRUCOSUS, White, l. c. 19.

Carapace with latero-anterior side short, with three deep incisions forming four lobes, the two middle truncated; carapace above irregular, the edges and under-side thickly covered with small warts. Front formed of two truncated widish lobes, separated by a very slight notch; a deepish notch between the front and the orbit, and a sinus between the outer orbital angle and the first lobe of the side.

Hab. —— ?

Family Hippidæ.

Cosmonotus, Adams and White.



Cosmonotus Grayii, Adams and White, List of Crustacea, p. 129.

Carapace oval (about an inch in length and half an inch wide), very much compressed laterally, especially in front, with a distinct prominent keel extending down the middle line, very strongly marked in front, but fainter posteriorly; the surface covered with numerous minute depressed punctures.

Front with two very small spines on each side of a deep angular notch, in which are placed the eyes.

Chelæ trigonal, the inferior part plane, the exterior convex, with transverse, interrupted, engraved or depressed lines, the upper angle covered with long thick hairs; the inner surface concave. Carpus incurved, subcompressed, convex externally, but less convex internally, and ending above and in front in a blunt spine; hand compressed, elevated, with the upper edge arched, but not so sharp as in *Notopus*; the sides convex and covered with asperities or minutely denticulated ridges, interrupted and transverse; finger uncinate, very short, incurved; thumb narrow, compressed, elongated, with a sharp apex and a strong tooth near the distal extremity.

Feet short and weak, as in *Notopus*; the first tibia bicarinated; the tarsus subquadrate, anteriorly bicarinate, with a scalpel-shaped claw; the second tibia one-keeled, with the tarsus oblong, and a sharp elongated trigonal claw; the third tibia subtriangular; tarsus short, flattened, subtrigonal, with a falcate claw; fifth tibia triangular, very short, flattened; tarsus transverse-ovate, with a small narrow claw.

Abdomen of the male seven-jointed, the joints from the first to the sixth nearly of the same width as in *Notopus*, and the last joint trigonal.

Cosmonotus differs from *Notopus*, De Haan, by wanting the post-frontal, elevated, denticulated ridge; by the dorsal keel ending abruptly in front, instead of terminating in a central frontal spine; in the front being notched with a single small spine on each side; in the thorax being much compressed, more especially in front, and in the produced and angular shape, while in *Notopus* it is almost straight across in front; and in the sides being entire, with a short sharp spine at the antero-latero angle.

The cut represents this species of twice the natural size, and is named in compliment to J. E. Gray, Esq., F.R.S., Keeper of the Zoological Department in the British Museum.

December 12.—W. Spence, Esq., F.R.S., in the Chair.

The following paper was read:—

DESCRIPTIONS OF NINETEEN NEW SPECIES OF HELICEA, FROM THE COLLECTION OF H. CUMING, ESQ. BY DR. L. PFEIFFER.

1. HELIX KURRI, Pfr. *Hel. testâ mediocriter umbilicatâ, depressâ, tenui, punctis distantibus sub lente scabriusculâ, diaphanâ, corneo-albidâ, fasciâ* 1 *angustâ rufâ, alterâ obsoletâ infra peripheriam ornatâ; spirâ planâ; anfractibus* $4\frac{1}{3}$, *primis convexiusculis, ultimo sensim descendente, utrinque subplano, anticè subconstricto; aperturâ obliquâ, subtriangulari-lunari; peristomate simplice, tenui, marginibus conniventibus, supero latè expanso, basali reflexo, columellari brevi, triangulatim dilatato.*

Diam. 25, alt. 10 mill.

Locality unknown.

2. HELIX GARDENERI, Pfr. *Hel. testâ subperforatâ, turbinatâ, solidâ, striis longitudinalibus et spiralibus distantioribus decussatâ, nitidâ, castaneâ; spirâ elevatâ, acutiusculâ; anfractibus* $6\frac{1}{2}$ *convexiusculis, ultimo majore, sublævigato, ad peripheriam cingulo albo ornato; aperturâ obliquè lunari, intus albâ; peristomate simplice, recto, margine columellari subincrassato, supernè subdilatato, perforationem ferè claudente.*

Diam. 22, alt. 15 mill.

Found on leaves of trees in the forests of Ceylon, 8000 feet above the level of the sea (Dr. Gardener).

3. STREPTAXIS FUNCKI, Pfr. *Str. testâ subobtectè umbilicatâ, de-*

presso-ovatâ, tenuiusculâ, supernè confertim plicatâ, basi lævigatâ, sub epidermide tenui, corneo-albidâ; spirâ regulariter parùm elatâ, apice obtusiusculâ; anfractibus $6\frac{1}{2}$ *vix convexiusculis, ultimo deorsum deviante, prope suturam striatulo, basi convexo, juxta umbilicum mediocrem compresso; aperturâ obliquâ, subtriangulari; peristomate breviter expanso, margine basali leviter arcuato, columellari in laminam triangularem, fornicatim supra umbilicum reflexam, dilatato.*

Diam. $27\frac{1}{2}$, alt. 16 mill.

From Merida, New Granada (Funck).

4. Bulimus quadricolor, Pfr. *Bul. testâ imperforatâ, succiniformi, tenui, striatulâ, luteâ, strigis obliquis fulguratis confertis castaneis, nonnullisque latioribus stramineis, antrorsum serratis, infra medium evanescentibus pictâ; spirâ conicâ, obtusiusculâ; anfractibus 4 subplanis, ultimo parùm convexo, 2—3 longitudinis subæquante; columellâ filari; peristomate undique brevissimè expanso, roseo, marginibus callo tenuissimo junctis.*

Long. $30\frac{1}{2}$, diam. 14 mill.

From Chachopo, province of Merida, New Granada (Funck).

5. Bulimus Lovéni, Pfr. *Bul. testâ imperforatâ, ovatâ, tenui, longitudinaliter plicatâ, fusco-luteâ, strigis castaneis fulguratis elegantissimè pictâ; spirâ conicâ, obtusâ, apice subimpressâ; anfractibus* $4\frac{1}{2}$ *vix convexiusculis, supremis castaneis, penultimo inter plicas subtilissimè transversim striato, ultimo subtiliter malleato, 4—7 longitudinis æquante; columellâ castaneâ, supernè leviter plicatâ; aperturâ oblongo-ovali, subconcolore; peristomate nigro-castaneo, undique expanso et reflexo, margine columellari supernè dilatato, appresso.*

Long. 42, diam. 20 mill.

From the Colonia of Tovar, Venezuela (Mr. D. Dyson).

6. Bulimus Lamarckianus, Pfr. *Bul. testâ subperforatâ, ovatâ, solidâ, striatâ et undique distinctè granulatâ, saturatè fuscâ, punctis nigricantibus conspersâ; spirâ brevi, obtusiusculâ; anfractibus 5 parùm convexis, ultimo ventrosiore, 3—5 longitudinis subæquante; columellâ obliquè leviter plicatâ; aperturâ oblongo-ovali, intus lividâ; peristomate subincrassato, expanso-reflexo, marginibus callo tenui junctis, columellari supernè dilatato, perforationem ferè occultante.*

Long. 62, diam. 32 mill.

From the Andes of New Granada, 8000 feet high (Funck).

7. Bulimus Blainvilleanus, Pfr. *Bul. testâ subperforatâ, solidâ, ventroso-ovatâ, longitudinaliter confertim plicatâ, sub epidermide olivaceâ castaneâ, strigis sparsis nigricantibus fulguratis variegatâ; spirâ brevi, conicâ, acutiusculâ; anfractibus* $4\frac{1}{2}$, *supremis planis, penultimo convexiusculo, ultimo ventroso, 3—5 longitudinis subæquante, perobliquè descendente; columellâ mediocriter plicatâ, paulò recedente; aperturâ oblongo-semiovali, intus nigricante, nitidâ; peristomate nigro, incrassato, latè expanso, marginibus callo tenuissimo junctis, columellari dilatato, plano, subappresso.*

Long. 50, diam. 25 mill.

From Zaji, province of Merida, New Granada (Funck).

8. BULIMUS PLECTOSTYLUS, Pfr. *Bul. testâ subperforatâ, ovato-conicâ, solidâ, regulariter et distinctè granulatâ, saturatè castaneâ, flammis brevibus albis infra suturam ornatâ; spirâ conicâ, obtusiusculâ; anfractibus 5 vix convexiusculis, superioribus plicato-striatis, ultimo tumido, anticè perobliquè descendente, 4—7 longitudinis subæquante; columellâ supernè plicâ validâ, subobliquâ, munitâ; aperturâ obversè auriformi, intus sordidè lilaceâ, nitidâ; peristomate undique expanso et reflexo, livido-fusco.*

Long. 35, diam. 17 mill.

From Chachopo, province of Merida, New Granada (Funck).

9. BULIMUS VERANYI, Pfr. *Bul. testâ subperforatâ, ovatâ, solidiusculâ, minutissimè granulatâ, fulvâ, punctis castaneis conspersâ et strigis luteis vel albis fulguratis distantibus ornatâ; spirâ conicâ, obtusiusculâ; anfractibus $4\frac{1}{2}$ convexiusculis, ultimo 3—5 longitudinis æquante; columellâ supernè subplicatâ, leviter arcuatâ; aperturâ oblongo-ovali, intus margaritaceâ; peristomate albo, undique mediocriter expanso.*

Long. 33, diam. 15 mill.

From Chachopo, province of Merida, New Granada (Funck).

10. BULIMUS PERDIX, Pfr. *Bul. testâ perforatâ, ovato-oblongâ, solidâ, confertim striatâ, albidâ, flammis, maculis et punctis nigricantibus pictâ; spirâ conicâ, apice obtusiusculâ; suturâ marginatâ; anfractibus $5\frac{1}{2}$ vix convexis, ultimo spiram subæquante, basi juxta perforationem angustam vix compresso; columellâ supernè obliquè plicatâ, leviter arcuatâ; aperturâ oblongâ, intus concolore; peristomate undique expanso, margine columellari subfornicato.*

Long. 36, diam. 15 mill.

From Agua de Obispo, New Granada (Funck).

11. BULIMUS QUITENSIS, Pfr. *Bul. testâ umbilicatâ, ovato-conicâ, solidulâ, ruguloso-striatâ, pallidè fuscescente, strigis variis fuscis et castaneis variegatâ; spirâ conicâ, acutâ; anfractibus 7 planiusculis, ultimo convexo, spiram vix superante, basi juxta umbilicum angustum, apertum compresso, nigricante; columellâ rectâ, verticali, nigricante; aperturâ oblongâ, ad basin columellæ subangulatâ, intus nigricanti-limbatâ; peristomate simplice, recto, marginibus subparallelis, dextro supernè repando, columellari dilatato, patente.*

Long. 26, diam. 12 mill.

From Quito (De Lattre).

12. BULIMUS IRREGULARIS, Pfr. *Bul. testâ umbilicatâ, ovato-oblongâ, solidulâ, plicis confertis, longitudinalibus rugosâ, carneâ, fusculo substrigatim variegatâ; spirâ conicâ, acutiusculâ, apice rufâ; anfractibus 6 vix convexiusculis, ultimo spirâ vix breviore, circa umbilicum angustum, non pervium subangulato-compresso; columellâ leviter arcuatâ; aperturâ ellipticâ, basi subangulatâ; peristomate simplice, recto, margine columellari e basi reflexo, supernè dilatato.*

Long. 19, diam. 9 mill.

From Quito, Equador (De Lattre).

1 . Bulimus meridionalis, Pfr. *Bul. testá perforatá, ovato-conicá, striatulá, diaphaná, albidá, fasciá* 1 *aurantio-fuscá cingulatá; spirá regulariter conicá, acutiusculá; anfractibus* 7 *convexiusculis, ultimo spirá breviore, subrotundato; columellá leviter arcuatá; aperturá obliquá, truncato-ovali, intus concolore; peristomate simplice, breviter expanso, margine columellari supernè fornicato-reflexo.*

Long. 15, diam. 8 mill.

From South Africa.

14. Bulimus pellucidus, Pfr. *Bul. testá subperforatá, turritá, tenuissimá, striatulá, nitidá, pellucidá, lutescenti-corneá; spirá elongatá, apice obtusá; anfractibus* 7 *convexiusculis, ultimo* 1—3 *longitudinis æquante; columellá subtortá; aperturá subquadrangulari-ovali; peristomate simplice, acuto, margine columellari breviter revoluto.*

Long. $11\frac{1}{2}$, diam. 4 mill. (spec. max.).

From Merida, New Granada (Funck).

15. Bulimus granadensis, Pfr. *Bul. testá angustè perforatá, fusiformi-ovatá, tenui, irregulariter striatá, albidá, strigis vitellinis et maculis longitudinalibus nigricantibus seriatis ornatá; spirá conicá, acutiusculá; anfractibus* 6 *vix convexiusculis, ultimo spiram æquante; columellá rectá; aperturá ovali-oblongá, intus concolore; peristomate acuto, simplice, vix expansiusculo, margine columellari in laminam triangularem tenuem reflexo, perforationem ferè occultante.*

Long. 26, diam. 11 mill.

From Merida, New Granada (Funck).

16. Achatinella Mighelsiana, Pfr. *Ach. testá ovato-coniformi, lævigatá, opacá, nitidá, niveá, strigis cinereis variegatá; spirá conicá, apice acutiusculá; suturá submarginatá; anfractibus* $5\frac{1}{2}$ *convexis, ultimo infra medium lineá nigricante (interdum duplicatá) cincto; plicá columellari validá, dentiformi, basi castaneá; aperturá semiovali, fusco-marginatá; peristomate simplice, acuto.*

Long. 17, diam. 8 mill.

From Molokai, Sandwich Islands.

17. Achatina magnifica, Pfr. *Ach. testá ovato-subfusiformi, tenuiusculá, leviter striatulá, haud nitente, luteá, strigis et flammis virentibus et castaneis, fasciáque* 1 *luteo et castaneo articulatá, supramedianá variegatá; spirá conicá, apice obtusissimá; anfractibus* $5\frac{1}{2}$ *vix convexiusculis, ultimo spiram paulò superante; suturá angustè marginatá; columellá rectá, verticali, callo introrsum albo, extrorsum nigricante indutá, basi rubrá, ad basin aperturæ ellipticæ, intus cærulescenti-albidæ obliquè truncatá.*

Long. 47, diam. 21 mill.

From Quito, Equador; in woods (De Lattre).

18. Achatina Funcki, Pfr. *Ach. testá subperforatá, ovato-conicá, tenui, striatulá, nitidá, pellucidá, stramineo-hyaliná; spirá conicá,*

acutâ; anfractibus 6 *convexis, ultimo spirâ paulò breviore; aperturâ semiovali; pariete aperturali medio plicâ lævi, intrante munito; columellâ medio lamellatim truncatâ; peristomate simplice, acuto.*

Long. $12\frac{1}{2}$, diam. 6 mill.

From the province of Merida, New Granada (Funck).

19. Balea Funcki, Pfr. *Bal. testâ sinistrorsâ, vix subrimatâ, turritâ, truncatâ, sublævigatâ, fuscâ; anfractibus (spec. trunc.)* 5 *convexiusculis, ultimo basi rotundato; aperturâ oblongo-semiovali, intus fulvâ; plicâ parietali validâ, compressâ, columellari obliquâ, obsoletâ; peristomate albo, expanso, reflexiusculo, marginibus callo junctis, externo sinuato.*

Long. (spec. trunc.) 14, diam. 4 mill.

From Chachopo, province of Merida, New Granada (Funck).

MISCELLANEOUS.

On the Red Corpuscles of the Blood of the Mud-fish (Lepidosiren annectens). By Andrew Smith, M.D., Deputy Inspector-General of Hospitals, and George Gulliver, F.R.S., Surgeon in the Royal Horse Guards.

In the uncertainty as to whether the *Lepidosiren* is to be classed among Reptiles or Fishes, it is interesting to examine the characters of its blood-discs; and Dr. Andrew Smith having procured some dried specimens of its blood, we have examined them together, and the following are short notes of the results:—

In shape and structure these blood-corpuscles are the same as those of the naked amphibia, and in size range between the blood-corpuscles of the *Siren* and of the *Triton*. The long diameter of these blood-corpuscles of the *Lepidosiren* is $\frac{1}{570}$th, and the short diameter $\frac{1}{941}$st of an inch, and the nuclei are $\frac{1}{1455}$th long and $\frac{1}{2900}$th broad: these are the average sizes in vulgar fractions of an English inch.

Now no blood-corpuscles, so far as we know, of any fish, are so large as these of the *Lepidosiren*; while this great size is characteristic of the blood-corpuscles of some of the amphibious reptiles, as was long ago described by Professor Wagner, and may be seen, for comparison, in Mr. Gulliver's measurements of the blood-corpuscles of the *Proteus, Siren,* and *Triton,* in his Notes to the edition of Hewson's works printed for the Sydenham Society, and in the Proceedings of the Zoological Society, February 1848, p. 38.

Filago apiculata, *G. E. Smith.*

The Rev. G. E. Smith discovered in Yorkshire a plant to which he gave the above name (Phytol. ii. 575), considering it a distinct species from *F. germanica* (Linn.). Although favoured with specimens by him, I was unable to satisfy myself of its just claims to specific rank. Recently (July 28) I had the pleasure of gathering it near Thetford, close to the station on Redneck Heath of *Apera in-*

terrupta, and am now quite satisfied of its distinctness. Its leaves are all blunt and apiculate, oblong; its heads are ten to twenty in each cluster, and prominently 5-angled as in *F. Jussiæi* (C. et G.), but they are deeply sunk in tomentum as in *F. germanica*; the cluster is overtopped by one or two blunt leaves which are wanting in the latter and acute in the former. There are also other differences. It is the *F. lutescens* of Jordan (Plantes Nov. de la France, iii. 201. pl. 7. fig. B.); that name was published in Sept. 1846, Mr. Smith's name in July 1846.

The pubescence of the three plants is very different and they are quite distinguishable at sight. I may add that the *F. Jussiæi* (C. et G.), which occurs plentifully from within two miles of Cambridge to the town of Linton, is probably, as remarked by Jordan, the *F. spatulata* (Presl); if so, that name must displace the one given by Cosson and Germain.

I believe that, previously to the discovery of *F. Jussiæi* near Linton by Mr. G. S. Gibson, it had been found in Sussex by Mr. Mitten, and in Dorsetshire by Mr. Woods.—C. C. B.

Note on the genus Allorisma. By William King, Esq.

Having satisfied myself that this genus, as I first described it (Annals of Natural History, November 1844), comprises two distinct genera, one of which is the *Edmondia* of De Koninck, I will here briefly point out a few of its distinctive characters, as now restricted, reserving a fuller description for my Monograph. I consider *Allorisma regularis** as the type of the genus. *Allorisma* possesses a siphonal inflexion, an edentulous hinge, and an external cartilage. It differs from *Pholadomya*—a closely-related genus—in the want of ribs proceeding from the umbones to the ventral margins, the valves being more or less wrinkled transversely. The anterior muscular impressions have a low or proximo-ventral position as in *Thracia pubescens*.

Allorisma elegans, n. sp. *Form* very inequilateral: *both ends* closed; anterior one the shortest, and oblique superiorly; posterior one squarish: *umbones* somewhat gibbous: *dorsal slopes* with a faint angle running from the umbone to the posterior end of the shell: *surface* slightly wrinkled transversely, and crowded with minute pimples: *pallial sinus* shallowish. *Amphidesma lunulata*, Keyserling, of the Petchora Permian marls, may be the same species. Humbleton and Whitley.—*Catalogue of the Organic Remains of the Permian Rocks of Northumberland and Durham.*

Melilotus arvensis, *Wallr.*

On a recent visit to the neighbourhood of Thetford (July 28) in company with Mr. Borrer, Mr. G. S. Gibson, and Mr. Newbould, I had the pleasure of gathering specimens of this plant which grows there in considerable quantity. I am unable to state to which of the party the discovery belongs, but believe that it lies between Mr.

* Geol. Russ. vol. ii. pl. 19. fig. 9.—The fossil under this name, in pl. 21. fig. 11, is an *Edmondia*.

Borrer and Mr. Newbould. The plant is so like *M. officinalis* (Willd.) that it has probably been overlooked in many places; indeed I now (Aug. 2) find that it is far from rare between Cambridge and the Gogmagog Hills. The proportions of the parts of its flower, and the shape and surface of its pod, are so different from those of *M. officinalis* (which also grows near Cambridge), that a very slight examination of the two plants is sufficient to show their specific distinctness. In the 2nd edition of his Synopsis, Koch has altered the names of these plants, calling the present species *M. officinalis* (Desr.); the *M. officinalis* (Willd.) he names *M. macrorhiza* (Pers.). —C. C. B.

On the Parasitical Habits of Scrophularineæ. By Professor Henslow.

The supposed parasitism of the Scrophularineæ (in *Euphrasia*, *Odontites*, *Melampyrum*, *Rhinanthus*, &c.), detected by Decaisne, has more than once been called in question. You may remember that I stated, in the *Gardeners' Chronicle* last autumn, my own conviction of the fact, and mentioned my having obtained the roots of *Euphrasia officinalis* and *Odontites rubra* attached by succors to the roots of grass. This fact appeared to me sufficiently satisfactory at the time; but I determined to follow up the inquiry by sowing seeds of *Rhinanthus* and *Odontites*, both near and at a distance from other plants. The results of my experiment are as follows:—Several plants of *Rhinanthus Crista-galli* came up at a distance from other plants, but did not thrive; they scarcely attained an inch or an inch and a half in height; only two produced one flower each, and then the whole withered without any seed being formed. A single plant, which came up close to a plant of wheat, attained the usual dimensions and flowered freely, but I neglected to observe whether its seeds were perfected. The specimens of *Odontites rubra* came up more freely than the *Rhinanthus*; and they all flowered, both those that were near other plants and those at a distance. On examining them I found abundance of examples of the succors, or succor-like protuberances, on their roots attached to the roots of wheat and rye; and, in two instances, I traced fibres of the *Odontites* spreading more than a foot from the spot where the plant was growing till they had reached and intermixed with the fibres of the rye. In some cases I could detect no appearance of succors, and nothing like an attachment to the roots of other plants.

I learn from Mr. Bentham that he has met with instances where there were certainly none of the succor-like appendages to the roots of some specimens of *Euphrasia*, *Melampyrum*, and *Odontites* examined by him. There is, therefore, something yet to be ascertained concerning the precise character of the parasitism of these plants, if indeed they be truly parasitic. As the question is of some importance to cultivators, I would suggest the following experiment to those who have fields in which *Rhinanthus Crista-galli* is abundant. Let them keep a space of about three yards square perfectly cleared of this plant for two or three years, and observe whether the grass on that patch flourishes beyond that which surrounds it. I shall propose repeating my own garden experiments with more care than I had thought necessary this year, having hitherto felt sufficiently convinced that Decaisne's statement was correct.

I send you a preparation in spirits of the succors (?) on the roots of *Odontites rubra*, attached to the fibres of wheat, and you will see what a parasitic aspect they have assumed, whatever their real functions may be. I am very desirous of procuring seeds of *Melampyrum arvense* for experiment, and if any of your correspondents could procure me a few, I shall feel much obliged to them. Hitcham, Sept. 14. —*Gardeners' Chronicle*, Sept. 23.

METEOROLOGICAL OBSERVATIONS FOR AUG. 1848.

Chiswick.—August 1. Heavy showers. 2. Very fine. 3. Rain. 4. Cloudy and fine. 5. Heavy showers. 6. Fine: cloudy: showery. 7. Very fine. 8. Fine: rain. 9. Clear: showers: clear. 10. Very fine: rain at night. 11. Overcast: rain. 12. Cloudy. 13. Overcast: rain. 14. Heavy rain. 15. Densely clouded. 16. Foggy: overcast: clear. 17. Hazy and damp: overcast. 18. Very fine. 19. Rain. 20. Very fine. 21. Heavy rain: showery. 22. Heavy shower: clear. 23. Fine. 24. Showery: clear, with lightning at night. 25. Hazy: rain: cloudy and fine. 26. Uniformly overcast: rain. 27. Rain. 28. Cloudy: slight rain. 29. Fine. 30. Very fine. 31. Very fine till 5 P.M., when a very heavy thunder-storm commenced and continued upwards of two hours—an inch of rain falling in the time.

Mean temperature of the month	58°·74
Mean temperature of Aug. 1847	62 ·47
Mean temperature of Aug. for the last twenty years	62 ·32
Average amount of rain in Aug.	2·41 inches.

Boston.—Aug. 1. Cloudy: rain early A.M. 2. Fine. 3. Rain: rain A.M. 4. Fine. 5. Rain: rain A.M. 6. Fine: rain P.M. 7, 8. Fine. 9. Fine: hail-storm and rain A.M. 10, 11. Fine. 12. Fine: rain P.M. 13. Fine. 14. Rain. 15. Fine. 16, 17. Cloudy. 18. Fine: rain P.M. 19. Cloudy: rain A.M. and P.M. 20. Fine. 21. Rain: rain A.M. and P.M.: very stormy. 22. Cloudy: rain A.M. and P.M. 23, 24. Fine. 25. Fine: rain P.M. 26. Cloudy: rain A.M. 27. Cloudy: rain P.M. 28. Cloudy. 29—31. Fine.

Applegarth Manse, Dumfries-shire.—Aug. 1. Fine: one slight shower. 2. One shower. 3. Showery. 4. Slight showers. 5. Fine throughout: thunder. 6. Fine: shower P.M. 7. Fine and fair. 8. Heavy rain all day: thunder: flood. 9. Frequent showers. 10. Frequent showers: thunder. 11, 12. Fair and fine. 13. A few drops: fine. 14, 15. Fair and fine. 16. Fair and fine: a few drops P.M. 17. Heavy rain A.M.: cleared and fine. 18. Fine A.M.: heavy rain P.M. 19. Heavy rain A.M.: very high flood. 20. Fine, but cloudy A.M.: shower P.M. 21. Dull A.M.: rain P.M. 22. Showers. 23. Gentle showers: thunder. 24. Showers. 25. Fair and fine. 26. Complete day of rain: flood. 27. Fair and fine. 28. Rain: cleared P.M. 29. Fine till 6 P.M.: then heavy rain. 30. Fair till 11 A.M.: rain and hail P.M. 31. Very fine day throughout.

Mean temperature of the month	53°·7
Mean temperature of Aug. 1847	57 ·1
Mean temperature of Aug. for the last twenty-five years.	57 ·1
Rain in Aug. 1847	2·23 inches.
Average amount of rain in Aug. for twenty years	3·60 „

Sandwick Manse, Orkney.—Aug. 1, 2. Bright: clear. 3. Cloudy: clear. 4—6. Bright: clear. 7. Cloudy: clear. 8. Bright: clear: aurora. 9. Bright: rain. 10. Showers. 11. Showers: clear: cloudy. 12. Cloudy: clear. 13. Clear. 14, 15. Fine. 16. Bright: frost: clear. 17. Rain: clear. 18. Clear: cloudy. 19. Rain: showers. 20. Showers: clear. 21. Clear: aurora. 22. Clear: cloudy. 23. Showers. 24. Clear. 25. Clear: frost: fine. 26. Cloudy: showers. 27. Clear. 28. Cloudy: clear: drops. 29. Clear: drops. 30. Clear: showers. 31. Bright: cloudy.

Meteorological Observations made by Mr. Thompson *at the Garden of the Horticultural Society at* Chiswick, *near London; by* Mr. Veall, *at* Boston; *by the* Rev. W. Dunbar, *at Applegarth Manse,* Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse,* Orkney.

Days of Month.	Barometer.							Thermometer.							Wind.				Rain.			
	Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.
1848. Aug.	Max.	Min.		9 a.m.	9 p.m.	9½ a.m.	8½ p.m.	Max.	Min.		Max.	Min.	9¾ a.m.	8½ p.m.								
1.	29·669	29·369	28·82	29·19	29·41	29·36	29·44	69	50	64	64½	50	56	56	sw.	w.	wnw.	calm	·34	·52	......	......
2.	29·949	29·880	29·33	29·62	29·69	29·57	29·60	67	44	61	60½	49½	56	56	sw.	w.	w.	sw.	·10	·08	......	·06
3.	29·856	29·707	29·34	29·64	29·58	29·57	29·60	68	43	59	60	47	58	54	sw.	w.	w.	calm	·15	·02	......	......
4.	29·671	29·652	29·17	29·53	29·50	29·53	29·55	73	48	62	63	40	58	54	sw.	w.	w.	calm	·05	......	......	......
5.	29·532	29·429	29·03	29·38	29·27	29·50	29·44	71	50	57	67	42½	58	54	sw.	s.	ne–se.	calm	·11	·38	......	·04
6.	29·775	29·639	29·12	29·45	29·48	29·50	29·56	72	46	63	66½	44	60	54	sw.	w.	sw.	e.	·12	·77	......	·09
☽ 7.	29·972	29·924	29·40	29·72	29·78	29·70	29·80	73	40	60·5	62½	47½	58	56	sw.	w.	sw.	ne.	......	·13	......	......
8.	29·896	29·763	29·42	29·75	29·68	29·85	29·87	68	45	63	54	48½	58	54	s.	w.	sw.	ne.	·13	......	1·50	......
9.	29·851	29·803	29·26	29·65	29·70	29·80	29·83	69	40	62·5	61½	46½	54	50	sw.	w.	w.	n.	·23	......	......	......
10.	30·022	29·952	29·40	29·80	29·83	29·80	29·89	74	43	61	62½	45½	53	50	sw.	w.	w.	nw.	·15	·16	......	·38
11.	30·054	29·994	29·53	29·90	29·91	29·94	29·95	70	52	62	63	41½	53	52	sw.	w.	w.	w.	·19	......	......	·09
12.	30·018	29·963	29·48	29·91	29·89	29·88	29·91	73	54	63	63	43½	54	47½	n.	w.	var.	n.	......	......	......	·05
13.	29·990	29·951	29·47	29·90	29·94	29·97	30·05	66	53	61	60	43	51	47½	n.	w.	ene.	nnw.	·21	·08	......	·03
○ 14.	29·872	29·711	29·48	29·92	29·85	30·05	30·04	69	53	55	60	40	52½	48	e.	ne.	ene.	ne.	·68	......	......	......
15.	29·896	29·846	29·45	29·88	29·87	30·04	30·04	68	55	60	61	43½	53½	47	ne.	ene.	ene.	se.	......	·76	......	......
16.	29·896	29·759	29·38	29·80	29·74	29·92	29·82	70	51	61	63	45½	54½	52	e.	e.	ene.	se.	·12	......	0·45	......
17.	29·956	29·881	29·38	29·60	29·79	29·49	29·71	65	44	59	61½	55	54½	52½	sw.	e.	wnw.	w.	·02	......	......	·24
18.	30·016	29·884	29·58	29·91	29·50	29·87	29·73	75	54	57	62	40	57	53	s.	w.	s–sse.	se.	......	......	......	·03
19.	29·841	29·718	29·18	29·36	29·53	29·09	29·23	69	42	62	60½	50	59	52	sw.	s.	var.	sw.	·06	·07	......	·50
20.	29·960	29·882	29·37	29·66	29·68	29·43	29·58	71	45	59	60½	46½	55½	54	sw.	wsw.	w.	sw.	·26	·09	......	·16
☾ 21.	29·718	29·478	29·21	29·39	29·29	29·53	29·44	69	51	53·5	54	47½	54½	50½	sw.	s.	sw.	calm	·17	·15	......	·04
22.	29·643	29·577	29·05	29·30	29·32	29·38	29·43	65	44	56	56	48½	54	49	sw.	sw.	w.	wnw.	·06	·09	......	......
23.	29·797	29·527	29·14	29·45	29·62	29·48	29·69	70	42	57	60	45½	49	49	sw.	w.	sw.	w.	·04	·25	1·70	·10
24.	30·020	29·887	29·39	29·74	29·82	29·75	29·84	64	41	55	58½	41	53	50½	w.	nw.	w.	w.	·03	......	......	......
25.	30·034	30·005	29·55	29·88	29·80	29·85	29·83	66	50	56	61½	35½	55	51½	sw.	w.	s.	se.	·01	·05	......	......
26.	29·837	29·815	29·34	29·54	29·40	29·57	29·32	70	54	58	60	51½	56½	57½	sw.	s.	se.	s.	·04	·03	......	......
27.	29·839	29·816	29·24	29·60	29·56	29·53	29·54	69	63	68	63	51½	56	51	sw.	wsw.	sw.	s.	·01	......	......	·07
● 28.	29·956	29·821	29·20	29·47	29·63	29·36	29·41	74	56	68	61½	53	56½	54	sw.	wsw.	sw.-s.	s.	·10	·07	......	......
29.	29·995	29·970	29·44	29·70	29·68	29·49	29·56	70	47	62	61½	54	57	54	s.	sw.	sw.	ssw.	·01	......	......	·10
30.	30·050	30·022	29·48	29·78	29·89	29·69	29·90	72	45	59·5	60	49	54	51	sw.	sw.	wsw.	nw.	......	......	1·25	......
31.	30·058	30·029	29·57	30·00	30·05	30·03	30·03	69	48	57	61	41	52	52	n.	sw.	e–sw.	ssw.	1·31	......	......	·06
Mean.	29·891	29·795	29·33	29·658	29·376	29·661	29·697	69·32	48·16	60·0	61·0	46·0	55·19	52·04					4·70	3·70	4·90	2·04

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

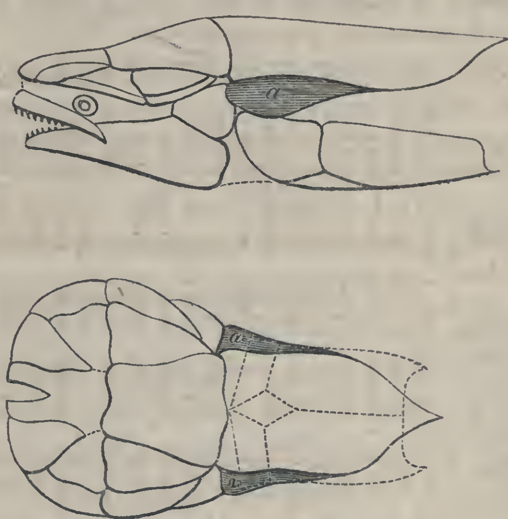
No. 11. NOVEMBER 1848.

XXXII.—*On some new Ichthyolites from the Scotch Old Red Sandstone.* By Frederick M'Coy, M.G.S. & N.H.S.D. &c.*

Placodermi†.

Coccosteus (Ag.).

In the *C. latus* (Ag.) I have observed a pair of lateral plates on the anterior part of the dorsal aspect of the carapace, which seem to have escaped the notice of M. Agassiz, and are omitted in his restored figures of the genus, although represented in the small figure given by Mr. H. Miller in his "Old Red Sandstone." Those plates are lengthened and triangular, the base in front parallel with the truncated anterior margin of the great dorsal plate, with which one of the long sides of each is articulated; the apex reaching to about half the length of the dorsal plate, terminating a little in front of the lateral angle on each side; the base being connected with the head and the outer margin with the anterior lateral ventral plate on each side. Those two peculiar plates might be called the "dorso-lateral plates."



Profile and dorsal aspect of the carapace of *Coccosteus* —the shaded plates *a* are the dorso-lateral plates.

* Drawings of all these species were sent to Prof. Phillips at the Meeting of the British Association at Swansea for the inspection of geologists.

† The characters of this group were noted by the author in the 'Annals of Natural History' for July 1848.

I might also remark that the posterior latero-ventral plates, instead of joining precisely in the middle, overlap considerably, that of the left side being in all the species larger externally than that of the right.

Coccosteus pusillus (M'Coy).

Sp. Char. Head and carapace orbicular, width about $2\frac{1}{2}$ inches, length 3 inches; tail about as long as the head and carapace, of very numerous small, weak (? slightly ossified) apophyses; dorsal fin small, weak; dorsal plate subpentagonal, 1 inch and 5 lines long, greatest width (at the lateral angles) 8 lines, tapering to a sharp point retrally, also narrowing about one-sixth towards the subtruncate anterior margin, all the margins concave, the anterior most so, middle of the plate obtusely keeled, the tuberosity and fossa (for lodging the dorsal spine ?) rather more than one-third the length from the posterior apex; all the plates of the carapace minutely and regularly tuberculated, granules nearly equal, about their own diameter apart, fourteen in the space of a quarter of an inch, intervening spaces very minutely granulated; teeth slender, cylindrical, pointed, their own diameter apart, one-third of a line in diameter, nearly a line long.

The very small size and imperfect development of the vertebral apophyses, together with the small size and orbicular form of the cephalothorax, easily distinguish this species. The peculiar proportion of the dorsal plate, as well as the distance of its tuberosity and fossa from the apex, and the minuteness and regularity of the tuberculation, distinguish it from the young of the other species; besides, I find all the characters constant in five nearly perfect specimens which I have examined.

Not uncommon in the black flags of the old red sandstone at Orkney.

(*Col.* University of Cambridge.)

Coccosteus microspondylus (M'Coy).

This species resembles the *C. oblongus* (Ag.) in size and granulation, but has a much shorter dorsal plate, and the posterior external angles of the posterior ventral plates are produced into long curved processes as in the *C. latus* (Ag.), from which it differs in its strong, regular, close granulation; it differs besides from both species in the plates of the carapace being shorter, and most remarkably in the much smaller size and slight ossification of the vertebræ, giving a peculiarly weak and slender appearance to the tail. The bodies of the vertebræ have all left their separate impressions, so that the vertebral column was certainly not in this case a continuous cartilaginous cord as suggested by M. Agassiz in the case of the *C. latus*, in which they leave no trace. There is evidence of a thick spine, about an inch long, being attached to the tuberosity of the dorsal plate. The dorsal plate is $2\frac{1}{2}$ inches long and $1\frac{1}{4}$ wide, with straight parallel sides, not being perceptibly narrower in front than at the lateral angles, in which it differs from the *C. pusillus* (M'Coy) as well as in size.

Rare in the black flags of Orkney.

(*Col.* University of Cambridge.)

Coccosteus? trigonaspis (M'Coy).

Sp. Char. Mesial ventral plate subtrigonal, slightly convex, 13 lines long and 7 lines wide at the lateral angles, which are only 2 lines behind the rounded or very obtusely angular anterior end; lateral posterior margins straight, converging to form the retral point; four or five irregular rows of tubercles, half a line in diameter, and less than their diameter apart, run round the margin, leaving a central, ovate, convex space more obscurely tuberculated; each tubercle consists of a hemispherical smooth centre (frequently perforated in the middle), surrounded by a thickened base which is radiatingly ridged, intervening space irregularly dotted.

This beautiful species is easily distinguished from all others by the shortness of the anterior end of its ventral mesial plate, which is the only part yet known. The tubercles resemble those of a small *Cidaris* or *Asterolepis*.

(*Col.* University of Cambridge.)

(*Acanthodidæ.*)

Chiracanthus pulverulentus (M'Coy).

Sp. Char. Elongate, fusiform, tapering very gradually from the pectorals, where the depth is little more than one-sixth of the length; tail moderate, lunately forked; the bony ray of the dorsal fin is slightly nearer the anal than the ventral fins, those latter being half-way between the pectorals and anal; the ventral spines are about half the depth of the body at their base, the others are about two-thirds of the depth; scales flat, rhomboidal, but the length and width nearly equal, apparently not imbricated, the posterior, inferior angle tumid, pointed; seven scales occupy a space of two lines; surface dull, covered with an exceedingly minute, crowded granulation (only visible under a strong lens). Length 8 inches.

The squamation of this species is so peculiar that a comparison with its congeners is rendered unnecessary; in general appearance it resembles the *C. Murchisoni* (Ag.). The head is imperfect, but seems rather pointed and about one-sixth of the entire length.

Rare in the old red flags of Orkney.

(*Col.* University of Cambridge.)

Chiracanthus grandispinus (M'Coy).

Sp. Char. Elongate, fusiform; tail slender, caudal fin large, moderately lobed; bony spines of the anal, ventral and pectoral fins of great size, their length being about three-fourths of the depth of the body at their base; the spine of the anal fin is gently curved backwards, those of the ventrals and pectorals straight; dorsal spine also of great thickness, but its length unknown, situated a little behind the line of the ventrals; scales rhomboidal, length and width nearly equal, about seven in the space of two lines, convex, strongly striated diagonally in the direction of the length of the fish, one of the diagonal grooves generally much deeper than the rest in the middle. Length from base of pectoral fin to extremity of tail nearly 8 inches, depth of body at base of dorsal fin 2 inches; pectoral and ventral spines nearly $1\frac{3}{4}$ inch long and $1\frac{1}{2}$ line wide at base, all apparently smooth.

In the great size and strength of its spines this resembles a great *Diplacanthus* rather than one of the comparatively feebly armed Chiracanths; it however has got no second dorsal opposite the anal fin, and is clearly a peculiar species of the latter genus, from all the species of which the very large spines and strongly striated scales distinguish it. The branchiostegous rays are very numerous, slender and distinctly ossified; the cincture supporting the pectorals is very strong and bony.

Rare in bituminous flags of the old red at Orkney.

(*Col.* University of Cambridge.)

Chiracanthus lateralis (M'Coy).

Sp. Char. Slender, fusiform; dorsal nearly intermediate between the anal and ventral fins, slightly nearer the latter; spines of the ventral and anal fins very small, slightly curved, not more than half the depth of the body at their base, the dorsal spine about one-fifth longer than the others; sides of the body impressed by a strong, straight, lateral line, rather nearer the ventral than the dorsal margin; scales rhomboidal, a little higher than wide, smooth, each with a vertically diagonal, strong, angular mesial gibbosity, about six scales in the space of one line; length of anal spine 7 lines, depth of body at base of dorsal $1\frac{1}{4}$ inch.

I have only seen two tolerably good specimens of this species, which in size and general form both of body and spines resembles closely the *C. pulverulentus* (M'Coy), from which it is distinguished by its smaller and more pointed, vertically gibbous smooth scales, and having slightly smaller spines, and the ventral and anal spines being proportionally further apart, being about equal to the depth of the body at the ventrals in the former, but exceeding it in the present species. What renders the *C. lateralis* most remarkably distinct from the other species of this and the allied genera, is the presence of a very strongly marked lateral line.

Rather rare in the old red sandstone flags of Orkney.

(*Col.* University of Cambridge.)

Diplacanthus gibbus (M'Coy).

Sp. Char. Very thick, fusiform, depth of the body behind the pectorals equal to the distance between the two dorsal spines; the dorsal spines are equal, about 1 inch long and 1 line wide, the first dorsal less than the depth of the body at its base; anal spine much shorter than the second dorsal; scales rhomboidal, length and width nearly equal, each with a large, vertically diagonal, oval gibbosity occupying nearly its entire area, about five scales in one line, surface seems very minutely granular. Length about $4\frac{1}{2}$ inches, greatest depth $1\frac{1}{2}$ inch.

This species has more equal-sided scales than the *D. striatus* (Ag.), and is nearly double the proportional depth; the spines are longer and more slender than in the *D. crassispinus* (Ag.), besides the difference in the scales.

Very rare in the old red flags of Orkney.

(*Col.* University of Cambridge.)

Diplacanthus perarmatus (M'Coy).

Sp. Char. Body thick, short, fusiform; tail very short, nearly square, its width only two-thirds the length of the second dorsal spine, the upper lobe projecting but little beyond the lower; spines smooth, extremely long, first dorsal equal in length to the space between the first and second dorsals, slightly less than the depth of the body at its base, gently curved; posterior spine straighter and about one-eighth longer than the anterior; pectoral spines half the length of the second dorsal; anal spine curved, only two-thirds the length of the second dorsal; ventral, medial and thoracic spines slightly curved and of moderate length; scales slightly higher than wide, nearly flat, minutely granulated (the impressions only seen), about three in the space of one line. Length from the base of the pectoral to the tip of the tail $4\frac{1}{2}$ inches.

This is most allied to the *D. longispinus* (Ag.), but has still longer spines, the second dorsal being especially remarkable; the dorsal spines are much longer in proportion to the distance between them and the depth of the body, the anal spine being on the other hand comparatively shorter; the tail is still smaller and more equal-lobed, and the scales much smaller and with the proportion of length to width reversed; I am doubtful about their surface, but the impressions seem distinctly though minutely and irregularly granulated.

Rare in the old red sandstone flags of Orkney.

(*Col.* University of Cambridge.)

Chirolepis velox (M'Coy).

Sp. Char. Very slender; head slightly longer than the greatest depth of the body at the base of the pectorals, but less than one-fifth the entire length of the fish; body tapering gradually from the head; tail deeply forked, lobes narrow; pectorals very large, broadly rounded, height two-thirds the depth of the body at their base; ventrals nearly equalling the pectorals in length, and two-thirds their height; there is only one-third of their length interval between those fins; at the same distance behind the ventral is placed the large triangular anal; it is larger than the dorsal, which is scarcely one-third of its length posterior to it; both of those fins exceed in height the depth of the body at their base, and are more than their own length in advance of the caudal; scales very convex, rhomboidal, diagonally sulcated, four in the space of one line. Length 9 inches. Fulcral scales of tail very slender, from 2 to 3 lines long and about $\frac{1}{3}$rd of a line wide.

From its slender form, very large fins and forked tail, this would seem to have been one of the swiftest-swimming fishes of the Old Red period, and the above specific name will remind the ichthyologist of those characters. Its lengthened body and small head distinguish it from all of the genus except the *C. uragus* (Ag.), from which it differs in the great size of all the fins, their height in proportion to the depth of the body, the deeply forked tail, and the dorsal and anal fins being so far removed from the caudal. (Described from two beautifully perfect specimens.)

Old red bituminous flags of Orkney.

(*Col.* University of Cambridge.)

Chirolepis curtus (M'Coy).

Sp. Char. Short, fusiform, mouth very oblique; head very large, nearly one-third the entire length of the fish; body rapidly tapering from the head to the tail which is very small, and with a shallow concave posterior margin; fins small, ventrals nearly three times longer than high, reaching to the anus, where the anal begins; the anal is about twice the height of the ventral fins, and not quite so long, rather less than its own length in advance of the caudal; the dorsal is slightly less in all directions than the anal, and is about one-third of its length behind it; scales rhomboidal, four in the space of one line, each with a long, prominent, oval tubercle in the middle, parallel with the posterior margin (some of those on the tail are diagonally sulcated in the direction of the length of the fish).

In the form and position of its fins this much resembles the *C. Cummingiæ* (Ag.), from which it differs in its larger head, more oblique mouth, smaller tail, and much shorter and more rapidly tapering body and tuberculated scales; by the latter character it approaches the *C. Traillii* (Ag.), from which it differs in the position of its fins, and equally with the *C. Cummingiæ* (Ag.) in the other characters mentioned above. Length $7\frac{1}{2}$ inches, greatest depth of body $1\frac{1}{2}$ inch. Fulcral scales broad, oval, 2 lines long and $\frac{3}{4}$ths of a line wide.

Rare in the old red sandstone of Lethen Bar.

(*Col.* University of Cambridge.)

Chirolepis macrocephalus (M'Coy).

Sp. Char. Body thick, fusiform; tail short, abruptly narrowed from behind the anal fin to half the depth of the body at the pectorals; head very large, nearly one-third the entire length; teeth nearly equal, conical, pointed, width of the base two-thirds of the height, their bases nearly in contact; pectoral fins narrow, oval; ventrals nearly central, of moderate size, half their length distant from the anal, which is triangular, its height two-thirds its length, although less than half the depth of the body at its base; the dorsal is only two-thirds the length of the anal, but its height slightly exceeds its length; its anterior extremity is vertically over the middle of the anal fin, the posterior extremity extending slightly behind the extremity of the anal; caudal very large, deeply forked, but the upper lobe twice the length of the lower; fulcral scales very slender, about half an inch long and half a line wide, granulated; scales rhomboidal, four in the space of one line, gibbous, strongly sulcated diagonally except at the posterior angle. Total length 11 inches.

The great proportional size of the head distinguishes this from all its congeners except the *C. curtus* (M'Coy), from which it differs in the form and position of its fins, large tail, and diagonally sulcated scales.

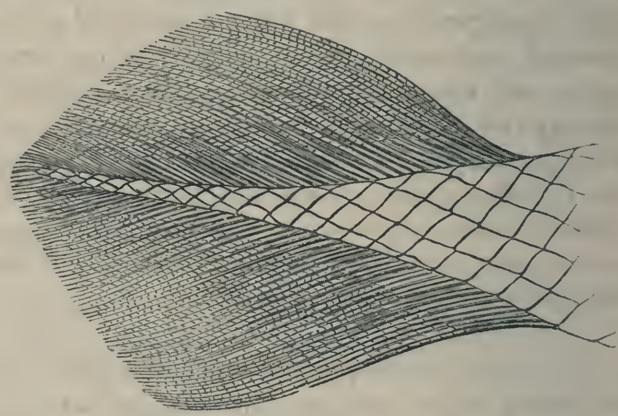
Rare in the old red sandstone of Orkney.

(*Col.* University of Cambridge.)

(*Saurodipteridæ.*)

Diplopterus (Ag.).

M. Agassiz has described the species of this genus as having heterocercal tails, and in his 'Monog. des Poissons Foss. du Vieux Grès Rouge' he gives a restored figure of the genus with a heterocercal tail, the caudal fin large, obliquely subtruncate or slightly concave in the middle of the posterior margin, and confined to the lower side of the spine. I find, from the examination of probably more perfect specimens than were at the disposal of Prof. Agassiz, that the tail of this genus really presents a very different and peculiar structure; so far from being truly heterocercal*, there is almost as great a development of fin-rays above as below the spinal prolongation, the caudal fin having a rhomboidal form, the posterior margin pointed in the middle; the spinal prolongation is much attenuated, reaching nearly to the extremity of the fin; it is not precisely in the middle, but a little above it, as in the sketch.



Diphycercal tail (*Diplopterus*).

This form of tail I find in all the species of *Diplopterus* (Ag.), and also in *Gyroptychius* (M'Coy), and as it is in some measure intermediate in appearance between the "homocercal" and "heterocercal" types, though possessing some structural peculiarities of its own, I would propose to designate it in the descriptions by the term "diphycercal" (from διφυής, *duas habens naturas,* and κέρκος, *cauda*). In the "homocercal" or ordinary form of tail of most recent and the newer fossil fishes, we usually find a few of the last vertebræ anchylosed, and from the terminal mass so formed the greater portion of the caudal fin is developed, as much from the upper as from the lower aspect, and only the few short rays at the commencement of the fin being intercalated with the spinous processes of the preceding normally-formed vertebræ; in the "heterocercal" type the vertebræ do not coalesce into a terminal

* Some of the recent examples of heterocercal tails do not present the strongly-marked characters of the older fossil Ganoids; I allude particularly to the sharks, which when the skin is removed show a fringe of fin-rays *above* the spine, although much smaller than the great fins developed from the under side, thus making an approach to our fossil "diphycercal" type; this has been also noticed by Prof. Müller of Berlin, who hence remarks that the heterocercal and homocercal types pass into each other; in the fossils however the distinction is generally speaking a very marked and valuable one, and is scarcely affected by the discovery of the peculiar structure above illustrated, the notice of which will on the other hand remove some erroneous impressions.

mass, but diminish gradually in size to the last, forming a very slender prolongation of the body, inclining upwards, and the rays of the caudal fin being developed from the under side only, and being intercalated with the spinous processes of a great number of vertebræ; the "diphycercal" type agrees with the "homocercal" in the nearly mesial position of the termination of the body, and the nearly equal development of the caudal fin above and below; in those points it differs from the "heterocercal," while it agrees with the latter and differs from the former in the gradual attenuation of the spinal prolongation, the terminal vertebræ not being anchylosed into a vertically dilated mass, and the rays of the caudal being manifestly connected with the spinous processes of a large number of vertebræ. Those who think the theory of 'progressive development' worth refuting may be glad to find that some of the oldest-known *perfect remains* of fishes *have not exclusively heterocercal or "embryonic" types of tails as was hitherto supposed.*

Diplopterus gracilis (M'Coy).

Sp. Char. Very slender, depth about one-eighth of the length, nearly equal from head to tail; head narrow, subtrigonal, obtusely pointed, about one-fourth longer than wide; pectorals placed rather far back, small, narrow, ovate, about three-fourths the depth of the body, their base covered with scales as large as those of the tail, but more square; dorsal and anal fins nearly equal, opposite each other, their own length apart; they are triangular and pointed, their height exceeding their length; tail diphycercal, of moderate size; attenuated prolongation of the body nearly medial, the caudal fin itself being rhomboidal, pointed in the middle retrally; scales rhomboidal, those of the flanks about $2\frac{1}{2}$ lines high and $1\frac{1}{2}$ long, those of the tail smaller, more obliquely rhombic, but still with nearly equal sides; all appear under the lens minutely and closely punctured, the under side with a strong mesial articular ridge extending about two-thirds the length. Total length about 14 inches, head about one-seventh of the length.

Its small head and extremely narrow elongate form easily distinguish it from the other species.

Not uncommon in the old red flags of Orkney.

(*Col.* University of Cambridge.)

Osteolepis brevis (M'Coy).

Sp. Char. Very short, fusiform, length about 5 inches, body broadest at the anterior part, where the width is rather more than one-fourth the length, tapering abruptly to the tail, the pedicle of which is about one-third the depth of the body;

head very obtusely rounded, nearly semicircular, depressed, twice as wide as long, the length being only two-thirds the depth of the body; scales thick, nearly equilateral except on the flanks, where they are one-third higher than long, length of each about one line, surface minutely and uniformly punctured under the lens, the pores rather distant; two anal fins very small, ovate, their own length apart, the second touching the caudal; one large triangular dorsal fin, longer than high, opposite the space between the two anal fins (anterior dorsal not seen).

Easily distinguished from the other *Osteolepi* by its very wide, short figure, and from the great width of the head it is almost always found with the anterior part of the body crushed vertically. The teeth are very small, close and slender.

I have seen five specimens from the old red schists of Caithness and Orkney.

(*Col.* University of Cambridge.)

Tripterus (M'Coy), n. g.

Gen. Char. General shape of the body and form of the plates of the head and body as in *Osteolepis*, but having only one dorsal fin, which is precisely over the first anal fin.

The fishes of this genus are very much allied to *Osteolepis* in general habit, but instead of having two dorsal alternating with two anal fins, there is but one dorsal, which instead of alternating with or being vertically over the interval between the anal fins (as would be the case in *Osteolepis*, if only one fin was preserved), is *precisely over* the first anal as in *Diplopterus*, which it also greatly resembles, but from which it differs in wanting the second dorsal, and in having a perfectly heterocercal tail—a character which I have ascertained does not exist in *Diplopterus*.

Tripterus Pollexfeni (M'Coy).

Sp. Char. Ovate, gradually tapering from the head, which is broad, depressed, semi-elliptical, obtusely pointed in front, its width at base equal to its length, and being about one-fifth the entire length of the fish; pectoral fins small, broad, ovate, their height about two-thirds the width of the body at their base; tail small, perfectly heterocercal, retral margin very concave, and the upper lobe twice the length of the lower; two anal fins nearly equal, triangular, one-third higher than long, rather more than their own height apart, the second almost touching the caudal fin; dorsal fin narrow, ovate, almost twice as high as long, precisely over the first anal; scales rhomboidal, those of the body flat, about one-third higher than long, those of the tail longitudinally gibbous, lozenge-shaped, and about twice as long as high; under the lens they are all very minutely and uniformly punctured as in *Osteolepis* and *Diplopterus*. Total length about 7 inches, greatest width of body $1\frac{1}{4}$ inch, length of body scales $1\frac{1}{2}$ line.

So completely identical are the plates of the head of this fish with those of the *large imperfect* example figured by Agassiz (Pois. Foss. vol. ii. pl. 2 *b*, fig. 2), that I cannot help suspecting that that figure may represent a portion of a fish of the present species, the imperfection of the retral part of the body having perhaps permitted M. Agassiz to refer it to the *Osteolepis macrolepidotus*, although even without seeing the fins we might distinguish it by its wide, rapidly tapering figure from that species, which is correctly represented by the fig. 1 of the same plate so far as it goes. The teeth are minute, slender, conical, rather distant, apparently in several rows, and of irregularly unequal size. I have examined three perfect specimens of this species presented to the University collection at Cambridge by the Rev. W. Pollexfen, by whom nearly all the Orkney fishes here noticed were collected, and whose zeal I am happy to commemorate by dedicating this to him.

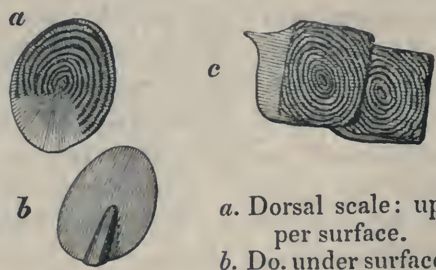
Not uncommon in the flags of the old red sandstone at Orkney. (*Col.* University of Cambridge.)

(Cœlacanthi.)

Gyroptychius (M'Coy), n. g.

Gen. Char. Slender elongate ganoid fishes, with large semi-oval depressed heads, from which the body gradually tapers to the tail, which is diphycercal, the caudal fin being rhomboidal, pointed in the middle of the retral margin, and the prolongation of the body extending a little above the medial line nearly to the end; two small elliptical dorsal fins exactly opposite two similar anal fins; pectoral fins broad, rounded, placed rather far back; scales subrhomboidal on the flanks, nearly oval on the back, imbricated, the exposed portion of each with minute rough ridges which converge towards the retral end, seeming to gyrate round a nearly central point; the anterior concealed portion nearly smooth (or under a strong lens minutely radiated as in *Holoptychius*); under surface of each scale nearly smooth, with a strong mesial keel which extends from the anteal edge

Scales of *Gyroptychius* × two diameters.



a. Dorsal scale: upper surface.
b. Do. under surface.
c. Lateral scales.

only as far as the central point, where it abruptly terminates to allow of the imbrication of the remainder of the scale on the next behind; bones of the head covered with granules which are sometimes confluent into short ridges; teeth small, conical, nearly equal.

In form, number and position of the fins and structure of the tail these fishes resemble *Diplopterus,* while the imbrication of the scales, as well as their sculptured, instead of simply porous surface, places them close to *Holoptychius,* and in a different family of Agassiz' system from the former; while from the latter they differ in form and number and position of the fins, structure of the tail, and in the ridge on the under side of the scales, which reminds us of what we see in *Osteolepis* and many other fishes with juxtaposed scales, but instead of extending entirely across the scale, it only reaches half-way, the half-ridge of one scale joining that of the next behind and before when in their natural imbricated position. The *Gyroptychii* are thus intermediate between *Holoptychius* and *Diplopterus,* and serve to connect the great groups of Cœlacanth and Sauroid fishes to which those genera respectively belong, having at the same time a style of sculpturing of the scales peculiar to themselves and easily recognizable. There are two imperfectly known and imperfectly characterized genera of M. Agassiz, *Glyptopomus* and *Platygnathus,* which require a few words in connexion with the present fishes. The first of those genera is founded on a short, thick, fusiform sauroid fish, with simply juxtaposed, rhomboidal, granulated scales; the fins being nearly unknown. The slender form, and the shape, sculpturing and imbrication of the scales are sufficient distinctions, the fins being unknown. *Platygnathus* is a genus founded by Agassiz on the jaw of one fish and the tail of another; the jaw agrees nearly with *Bothriolepis,* but has fewer laniary teeth and needs no comparison with *Gyroptychius*; the tail portion is more analogous, but the great scales seem to have simply the structure of *Holoptychius,* and the fins are developed beyond all comparison; further, this genus is founded on such imperfect and perhaps discordant materials, and the jaw seeming to have been most in view in naming and defining the genus, it is obvious that even an *identity* between *one* of those elements and the present perfectly known type would not invalidate *Gyroptychius* as a genus. Judging from the figure and description of M. Agassiz, however, there seems, as above noted, to be no great affinity between them.

Gyroptychius angustus (M'Coy).

Sp. Char. Head semi-oval, obtusely pointed, about one-sixth the entire length; depth of the body greatest immediately behind the head, where it is one-seventh of the length, tapering very gradually from thence to the tail, the pedicle of which is about one-third the greatest depth of the body; caudal fin large, rhomboidal, obtusely pointed behind, lower side largest, the supramedial spinal prolongation extending nearly to the end; posterior anal fin semi-elliptical, equalling the depth of the body at its base in height, which is about double the length; both the posterior anal and dorsal fins nearly touch the caudal, and are fully their own height behind the anterior and dorsal fins, which are about one-third less in size; the pectoral fins are broad ovate, scarcely two-thirds the depth of the body at their base in height, and placed nearly their own height behind the head; scales about 2 lines high (or wide) and about one-third longer, elliptical and with a small, nearly central boss, round which seem to gyrate very numerous minute rough ridges, less than their own diameter apart, which are arranged in converging curved lines parallel with the margin of the elliptical free end of the scale; the small portion of the ridges anterior to the central boss are frequently broken into little tubercles; the more anterior concealed portion is smooth or very minutely radiated, the (? articular) ridge on the under side strongly marked; bones of the head closely sculptured with small granules and short vermicular ridges. Length nearly 1 foot; length of exposed portion of scales slightly more than 2 lines.

This beautiful fossil much resembles the *Diplopterus gracilis* (M'Coy) in form, but is at once distinguished by the structure and sculpturing of the scales.

Rare in the old red sandstone of Orkney.

(*Col.* University of Cambridge—two fine examples.)

Gyroptychius Diplopteroides (M'Coy).

Sp. Char. Head semi-elliptical, depressed, sides flattened, slightly longer than wide, pointed in front, about one-fifth of the entire length; body tapering rapidly from the head to the tail, the pedicle of which is less than half the width of the body; caudal fin rather large, rhomboidal, submedial spinal prolongation slender; posterior dorsal elliptical, twice as high as long, close to the base of the caudal, and reaching about half the length of its lateral angle; anterior dorsal little more than half the size of the posterior; pectorals short, broadly rounded, placed rather more than their own length behind the head; scales of the back oval, imbricated; concealed portion, anterior to the subcentral point, smooth or very minutely radiato-punctate, all the posterior or exposed portion rough with small, irregular, minutely flexuous ridges, those of each side running parallel with the curved margin of the scale, and of course converging towards the middle, they are crossed by fine radiating striæ; scales of the sides rhomboidal, nearly square and juxtaposed, each scale articulated to the preceding and superior one by a narrow smooth border on the superior and anterior sides, extending into an angular articulating process at the anterior superior angle (as in *Osteolepis*, &c.); the quadrate exposed portion has a small central point, round which the little rough ridges gyrate diagonally; bones of the head sculptured with small vermicular ridges and granules.

Length about 11 inches, greatest width of body 2 inches; length of exposed portion of scales about 2 lines.

The different shape of the scales, and the wide, short, rapidly tapering figure easily distinguish this from the last.

Not uncommon in the old red schists of Orkney.

(*Col.* University of Cambridge.)

Holoptychius (Ag.).

Although so large a number of species of this genus are now published, I believe the form of the tail, and number and position of the vertical fins remain unknown. I have recently ascertained that the tail is short and perfectly heterocercal, and that one dorsal and one anal fin, nearly equal, but the dorsal largest, exist close to the caudal fin, and opposite each other; the ventrals are broad, placed behind the middle of the fish near the anal fin.

Holoptychius princeps (M'Coy).

Sp. Char. Scales subquadrate, slightly convex, each about 3 inches wide and $2\frac{1}{2}$ inches long; anterior concealed margin widest, convex; posterior, exposed portion about one-third narrower, subtruncate rounded, sides slightly concave; whole of the exposed surface closely covered with irregular tubercles about half a line in diameter and half their diameter apart; most of the tubercles are a little elongated, but in irregular directions, and towards the anterior margin a few of them are generally confluent at their bases, forming short, irregularly twisted, strongly tuberculated ridges; concealed anterior portion and interval between the tubercles minutely porous.

This species far exceeds the *H. nobilissimus* (Ag.) or *H. giganteus* (Ag.) in size; it is easily distinguished by its entirely tuberculated surface. A fragment of this species is well figured (without a name) in Murchison's 'Silurian System,' pl. 2 *bis*, fig. 3.

Old red conglomerate of Scat Craig.

(*Col.* University of Cambridge.)

Holoptychius Sedgwickii (M'Coy).

Sp. Char. Body fusiform, very thick, depth in the middle one-third of the length, abruptly narrowed towards the tail, the pedicle of which at the base of the anal and dorsal fins is scarcely half the depth of the body; head more than one-fourth of the length; tail very short, nearly square, the thick, articulated, frequently branched rays developed from the under side, forming a broad triangular caudal fin, obliquely truncated on its posterior margin; dorsal rather larger than the opposite anal fin, both semi-elliptical, twice as high as long; the anal about one-third the length of the base in advance of the caudal; ventral fins broad, their length about equalling their height, rather more than the length of their bases in advance of the anal fin; lateral line nearly medial, strongly marked: scales thin, rounded, those of the flanks half an inch in diameter, subtrigonal, posterior margin semicircular, concealed anterior margin very broad, subtruncate, with very minute radiating punctate striæ; immediately in front of this a small space towards the middle of the scale is covered with a distinct granulation (frequently but not always seen when the scales are *in situ*); all posterior to this, or the constantly exposed portion covered with a minute, longitudinal, irregularly flexuous, striate punctation, intermixed with numerous sharp, narrow, irregularly interrupted, longitudinal thread-like ridges, of very irregular number and length, but usually two or three times their diameter apart; the exposed part of the scales of the flanks, when *in situ*, is about one-third higher than long. Teeth conical, one-third longer than wide, half the diameter of their bases apart.

Length 11 inches, depth nearly 4 inches; length of teeth $\frac{3}{4}$ of a line.

This species, like the *H. Flemingii* (Ag.), is remarkable for being found on its side, indicating apparently a compressed, instead of a depressed form; it also resembles that species in the sculpturing of the scales, but has them (in the same parts of the body) smaller, more rounded, and the exposed portion much less high in proportion to their length.

Not uncommon in the old red sandstone flags of Orkney.

(*Col.* University of Cambridge.)

Conchodus (M'Coy), n. g.

Gen. Char. (Teeth in pairs in each jaw as in *Ceratodus*?); each tooth large, somewhat semicircular, pointed in front, subtruncate behind, deeply concave on the grinding surface; internal margin straight, thickened, and with an abruptly deflected edge; external border convex, much raised and strongly undulato-plicate, the ridges being largest in front, and gradually diminishing towards the external and posterior portion of the tooth; the plicæ are produced by a thickening of the substance of the ridges and a scooping-out of the intervening hollows, so that the under side of the tooth remains even; under surface coarsely osseous; upper surface polished, with small obscure undulations and minutely porous.

This genus is closely allied to *Ceratodus* and *Ctenodus*, but differs in the grinding surface being concave, the tooth resembling the inside of a plicated oyster. The internal microscopic structure was developed for me by the kindness and skilful manipulation of my friend Mr. Anthony of Caius College, Cambridge; it was very complex and peculiar, but the prepared fragment has unfortunately been mislaid, so that I am unable now fully to describe it. I only know one species, the following.

Conchodus ostreaformis (M'Coy).

About $1\frac{1}{2}$ inch long, 1 inch wide, and $1\frac{1}{2}$ line thick, the grinding surface deeply concave, the surface of attachment equally convex; the external semicircular margin gives origin to six or seven coarse, rugged, converging ridges, the most anterior about 7 lines long and slightly inclined to the straight inner margin, the most posterior is about 2 lines long and at right angles with the inner margin; the ridges are separated by deep, wide hollows.

Found along with *Dendrodus latus* (Ow.), *Holop. giganteus* (Ag.), and *Hol. princeps* (M'Coy), in the old red conglomerate of Scat Craig.

(*Col.* University of Cambridge.)

XXXIII.—*On an apparently undescribed state of the* Palmelleæ; *with a few observations on Gemmation in the lower tribes of Plants.* By G. H. K. Thwaites, Lecturer on Botany and Vegetable Physiology in the Bristol Medical School.

[With a Plate.]

The importance—the necessity, it may be said,—of an acquaintance with the lower forms of the vegetable kingdom, in order to afford a clear insight into the real character of the phænomena of growth and reproduction in the higher tribes of plants, is now pretty generally felt and acknowledged by physiologists. From the study of the simpler organisms only can we hope to obtain a correct understanding of the changes which take place during the very early or embryonic condition of the more complicated structures; whilst a comparison with these latter may serve best to show us the true nature of certain phænomena connected with the development of those simpler organisms.

The *Palmelleæ* have generally been looked upon by botanists as occupying the lowest place in the vegetable kingdom, and on this account any new fact connected with their mode of growth is of peculiar interest. These simple plants generally appear as gelatinous masses of an irregular form, and, viewed under the microscope, as consisting of a number of similar cells imbedded in a gelatine; these cells having no essential organic connexion with each other, but being merely held together by the gelatine with which each is surrounded. In the opinion of some physiologists, each of the cells, on account of its possessing an independent vitality and seeming capable of performing all the functions necessary for the growth and reproduction of the species, is to be regarded as representing an individual plant. If, however, we adopt this view of the matter, we must suppose every process of fissiparous division taking place in the cells as a true reproduction of the species, which surely cannot be the case, as will be endeavoured to be shown.

In the gelatinous masses of the *Palmelleæ* numerous branched filaments are found to occur; these have been figured by Professor Kützing in his 'Tabulæ Phycologicæ*,' as pointed out to the writer by Mr. Berkeley; and they have been described by Mr. Hassall in his 'British Freshwater Algæ†,' but neither of these two authors seems to have understood the real character of these filaments. Mr. Hassall remarks that they "may either be parasitic growth, or else form part of the organization of the frond; and in the latter case they may be presumed to be connected with respiration." To the researches of Mr. C. E. Broome, however, is due the discovery of their true nature. When examining in January last some portions of a mass of *Palmella botryoides*, Greville, this excellent observer found that the cells, in an early stage of the plant, are attached singly to the extremities of branched tubular filaments, which are filled with endochrome, and are attached to and radiate from a central large cell of irregular shape (Pl. X. fig. 1); that the cells subsequently become detached, and each is then seen situated at the end of a mucous prolongation (Pl. X. fig. 2) such as is described and figured by Mr. Hassall‡ in some species of this natural family.

The writer has been enabled to confirm his friend Mr. Broome's interesting discovery by detecting the attachment of the cells to

* Tab. Phycologicæ, tab. 19. iv., 21. v., 24. i., 25. i. & v., 26. i. & ii.

† Brit. Freshw. Algæ, p. 318.

‡ Ibid. p. 323, tab. 80.

branched filaments in the *Coccochloris rubescens,* Brébisson, as well as in the above-named *Palmella.* This is rendered more interesting from the circumstance of the *Cocc. rubescens* being one of the species in which M. de Brébisson, as stated by Mr. Ralfs*, has observed conjugation taking place, a process which will probably be found to be general amongst the *Palmelleæ,* and to be the true mode of reproduction in all the species.

Upon comparing the filamentous condition of the *Palmella,* as above described, with one of the lower Fungi—with a *Botrytis,* for example,—we might at first feel disposed to conclude that in one as in the other the cells terminating the filaments are to be deemed the true reproductive organs, since in both species the cells become detached and give origin to structures having no organic connexion with the original ones. Upon reflection, however, we shall find that very different is the relation in which the detached cells of the *Palmella* and those of the *Botrytis* stand to the filaments from which they have respectively become separated. In the *Botrytis* the plant has reached its perfect development, and the terminal deciduous cells are evidently the reproductive spores; but the *Palmella* is in an immature state, and the branched filaments may more correctly be compared with the mycelium of the higher Fungi, or with the early confervoid filaments of the Mosses. In the *Palmella* the separation of the cells from the filaments may be considered as really a subdivision of the plant—a gemmation—a multiplication of the individual rather than a reproduction of the species; and the subsequent fissiparous division of these detached cells into other equally independent organisms as a continuation of the process of gemmation; the individual plant itself being the aggregate of all the cells so produced previously to true reproduction taking place.

It is very interesting and important to observe the extent to which the process of gemmation takes place in the lower tribes of plants, and this is especially evident in the Mosses. From the negative evidence adduced by Bruch and Schimper, there can be little doubt that the theca of the moss, with its contents, is the product of the fertilization of the *pistillidium.* It would follow then that the theca and the entire mass of sporules contained within it are equivalent to one embryo of the flowering plant, and that consequently the subdivision of this reproductive matter into a number of sporules is equivalent to the multiplication of the individual plant by a process of gemmation;—that in fact it may be termed an intra-thecal or sporangial gemmation. Again, in tracing the development of one of these sporules after its escape from the moss-theca, we find that it gives origin to a con-

* Ralfs's 'British Desmidieæ,' p. 37.

fervoid structure*, and that subsequently upon this latter are produced a number of gemmæ, each of which commences an independent growth and quickly puts on the perfect moss-structure. Finally, after the moss-phyton has become fully developed we still perceive the process of gemmation going on,—either by the production of gemmæ upon the stem, as in *Aulacomnion androgynum*, Schwaegr., or upon the confervoid roots.

In the Mosses then we find the *species reproduced* by a process of impregnation;—at least such seems most probable. And we see the *individual plant multiplied*—1st, by a subdivision of the embryonic matter into a number of sporules (*sporangial gemmation*); 2ndly, by the production of gemmæ upon the confervoid filaments previously to the moss putting on its perfect form (*mycelial gemmation*); and 3rdly, by gemmæ being developed upon the moss when in its mature state (*gemmation proper*).

There can be little doubt that these same phænomena obtain in many if not in most of the lower plants; and there is every reason to believe that what is frequently described as a second form of fructification amongst the Algæ—for instance, the *tetraspores* of the *Florideæ*, the *opseospermata* of the *Chætophoreæ*, and the terminal "*spore*†" of *Vaucheria*—are in reality true gemmæ: and although it may be some time before we shall be able to determine with certainty, in some of these lower forms, the true character of what is usually termed *fruit*, yet we may at once get red of the anomaly of one plant being said to produce two kinds of true spores; and we shall doubtless in course of time arrive at the discovery of some general laws to guide us in the right discrimination of these structures.

It is a fact well known to botanists that some species of Mosses rarely if ever occur with true fructification in certain localities, and the same may be said of other cryptogamous plants. As instances of this kind amongst Mosses may be cited *Encalypta streptocarpa*, Hedwig, and *Trichostomum flexicaule*, B. & S.; and *Parmelia physodes*, Ach., and *Placodium canescens*, DeCand., amongst Lichens. These then and many others owe their multiplication and dispersion principally to the agency of gemmæ. If we

* Some cryptogamous plants, in this stage of their growth, exhibit so close a resemblance to the mature state of other plants still lower in the scale of vegetation, that without due care in watching the progress of their development, they may easily be set down as distinct species.

† The circumstance of such an organism being for a short period in its earliest condition provided with mobile cilia seems scarcely to furnish an argument in favour of its possessing a higher character of organization than it does subsequently when these organs have disappeared. There is little doubt that the motion of the cilia is due to the changes taking place within the cell, and the cilia themselves are probably a mere modification of ordinary cell-membrane.

duly consider this fact, how much does it exalt the lower tribes of plants in our estimation! since we may contemplate an individual plant of them not as the single phyton—not as the single frond—not as the single cell—but as the aggregate of, it may be many thousands of, these;—view it occupying as much space and exercising as great an influence in the œconomy of nature as the largest forest tree; and as rivalling this even in longevity. It must be remembered that in the tree the manifestation of vitality is entirely in the recently formed leaf-buds in progress of development.

Under the influence of preconceived opinions it is difficult at first to take the view of the subject now offered, and it seems easier to view each leaf-bud of the tree, rather than the tree itself, as a distinct individual plant, comparing the former with the phyton of the lower plant. We must, however, go further than this:—the gemmæ of the *Palmella* are *analogous*, it is true, to the *leaf-buds* of the higher plant, but they are *homologous*, which is of higher importance with reference to this question, to the *individual cells* of the higher plant. To be consistent, therefore, we should be driven to the necessity of regarding the higher plant as made up of as many individual plants as there may be cells in its tissues. Now there can surely be few physiologists who would be disposed to adopt such an opinion; notwithstanding it cannot be denied that each of such cells possesses a greater or less independent vitality of its own. The application too of such a doctrine to the animal kingdom would appear to be impossible.

To some it may appear of little importance whether any particular vegetable organism is to be regarded as a complete individual plant, or as merely a part or subdivision of such,—whether it is the entire product of a true impregnation or a portion of it; but to the physiologist the general question is one of very great interest, since the solution of it enables him to compare correctly the higher with the lower forms of vegetation, and to understand what may previously have appeared anomalies in the vegetable kingdom.

EXPLANATION OF PLATE X.

Fig. 1. Portion of mass of *Palmella botryoides*, Grev., in an early stage of development, showing the cells attached to the tubular filaments.

— 2. Cells of the same species, when in a more advanced stage of growth, each seated at the end of a mucous prolongation.

All highly magnified.

XXXIV.—*Remarks on the 'Observations sur l'*Ornithorhynque*' par* M. Jules Verraux. By Prof. Owen, F.R.S.

One of the admirable characteristics of the National Museum of Zoology in France is the staff of "Naturalistes Voyageurs" attached to the Jardin des Plantes. These gentlemen, after receiving the requisite zoological acquirements, are sent to various parts of the world to collect animals and plants for the museum at the expense of the government*. Their preparatory pursuits eminently fit them for observing the living phænomena of rare animals in their native environment, and the names of several of these collectors have obtained high and deserved repute in the records of zoological science: those of Diard, Duvaucel, Delalande, will readily suggest themselves, and to these we may add that of the enterprising nephew of Delalande, M. Jules Verraux, who after having spent some years in Australasia, has recently returned to Paris with rich collections for the Jardin des Plantes.

During a sojourn of fifteen months in Tasmania, M. Verraux devoted much time and pains to studying the habits of the *Ornithorhynchi* in their native rivers, and has published the general results in the 'Revue Zoologique' for May of the present year. His observations are the more valuable as they appear to have been made without the knowledge of any of the recent steps that had been taken towards a resolution of the mystery of the generation and development of the paradoxical mammal, and I propose, therefore, to notice them here in connection with the actual state of our knowledge of those points prior to the publication of M. Verraux's remarks.

He found the *Ornithorhynchi* most abundant in the river of New Norfolk, Tasmania, but succeeded in killing some individuals at a considerable altitude on Mount Wellington.

His description of their burrows accords with that given by Mr. George Bennett†: those excavated in clayey soils, though they have numerous outlets—one always below or level with the surface of the stream—contain only a single nest, placed at the extremity furthest from the water, and spacious enough to hold three or four of these animals: the nest is composed of reeds and other aquatic plants, and is thick enough to defend the animal from the damp.

The *Ornithorhynchus* is an excellent burrower. M. Verraux saw one dig a hole of more than two feet deep, in a very hard gravelly soil, in less than ten minutes: during this operation the

* In the year 1835 there were eight of these officers engaged in travelling in Hindostan, Madagascar, the Cape, Nubia, &c., at an expense to the government in that year of 25,000 fr.

† Trans. Zool. Soc. vol. i. 1834.

webs that extend beyond the nails when the animal swims, are retracted, and the nails are exposed; and from its attitude and action it would be taken for a mole rather than a swimmer. As it burrows it uses its tail, like a beaver, to beat the earth and consolidate the sides of the burrow.

The *Ornithorhynchi* are chiefly, but not exclusively, nocturnal; they are most vivacious by night, swimming then with the velocity of fishes, and moving about on land with remarkable agility: but the female, when she has young ones in the nest, will leave them during the noon-tide heats and swim about.

With regard to the generative œconomy of the *Ornithorhynchus* I may premise, that examination of the ovarium and of the ova, both ovarian and uterine, had led me to the conclusion "that they were, like the Marsupialia, ovo-viviparous; and I conjectured that the utero-gestation would be more prolonged, and the allantois and umbilical vessels probably more developed*. But the period of gestation remained to be determined, and the decisive proof of ovo-viviparity, by the discovery of the fœtus *in utero* and the examination of its membranes, was a desideratum. This M. Verraux appears not to have supplied, but he says: "The number of *Ornithorhynchi* which I have possessed has perfectly demonstrated to me that this animal does not lay eggs, as has been supposed, but that it is ovo-viviparous. The ovaria, which form part of my collections, sufficiently prove this." *Ib.* p. 130. No doubt, had M. Verraux obtained the decisive proof above referred to, viz. the impregnated uterus, he would have mentioned it†. He does not specify his physiological deductions from the ovaria, but they were probably those which led me to the same conclusion in my memoir in the Philosophical Transactions for 1834. In that memoir I had stated that "the season of copulation was probably at the latter end of September or beginning of October:" but this point also remained to be determined by observation, together with the manner of the coitus. The latter is thus described by M. Verraux:—"Pendant le mois de septembre je parvins à découvrir que l'accouplement avait lieu dans l'eau. Caché soigneusement sous un cabane fabriquée exprès, et au fond de laquelle il me fallait rester des nuits entières sans oser me

* Phil. Trans. 1834, p. 564. Art. *Monotremata*, Cyclopædia of Anatomy.

† It is to the absence of this proof that Dr. Carpenter appears to refer, where he remarks, in his excellent 'Principles of Human Physiology,' 1842, p. 40, "No *positive* evidence has yet been obtained that its young are born alive." The minute size of the ovarian ovum and consequently of the vitellus; the presence of small ova with a delicate chorion and without chalazæ or shell, in the uterine portion of the oviduct; the absence of any shell-forming portion of the oviduct,—all are elements of a body of *positive* evidence in favour of the ovo-viviparity of the *Ornithorhynchus*, which needs only the discovery of the fœtus *in utero* for decisive confirmation.

mouvoir, car l'Ornithorhynque est d'un naturel excessivement méfiant, je pus suivre tous leurs mouvements. Le mâle, après avoir poursuivi sa femelle plus d'une heure, finissait toujours par l'amener au milieu des roseaux. Là, se cramponant solidement à l'aide de son bec, il tenait fortement la peau du cou, tandis que les éperons s'appliquaient sur la partie postérieure. La femelle, tout en se débattant énergiquement, nageait et poussait des cris plaintifs qui offrait quelques rapports avec ceux d'un petit cochon, et qui allaient toujours augmentant : l'accouplement durait cinq ou six minutes, ensuite les deux animaux jouaient ensemble pendant plus d'une heure." *Ib.* p. 130.

We have seen that M. Verraux draws his conclusions from the ovaria of the female, that she is ovo-viviparous. The period of gestation has yet to be determined. I have calculated it at about six weeks, judging from the size of the uterine ova in a female killed December 8th in the Murrumbidgee river, and from that of young ones found in the nest in the banks of the same river two months afterwards. M. Verraux, alluding to the habit of the female to quit her burrow during the heat of the day, says that this occurs—"lorsqu'elles ont des petits, c'est-à-dire depuis novembre jusqu'en janvier," *ib.* p. 132: meaning, that she has young ones in her nest at that time. He states that "a gentleman in Tasmania, Dr. Casy, had discovered (but the date is not given) two nests of the *Ornithorhynchus*, one with a single young one, the other with two; they were naked, but vigorous in proportion to their size. Their beak did not at all recall the form of that of the adult, but was short, broad and thick, and could embrace in that state the mammary areola concealed by the hairs of the mother." This accords with the description and figures of the beak of the young *Ornithorhynchus* given in my memoir on the young *Ornithorhynchus* in the 1st vol. of the Zoological Transactions; where it is also shown, that "the tongue, which in the adult is lodged far back in the mouth, advances in the young animal close to the end of the lower mandible; all the increase of the jaws beyond the tip of the tongue, which in the adult gives rise to a form of the mouth so ill-calculated for suction or application to a flattened surface, is peculiar to that period, and consequently forms no argument against the fitness of the animal to receive the mammary secretion at an earlier stage of existence. The disproportionate breadth of the tongue is plainly indicative of the importance of the organ to the young animal both in receiving and swallowing its food. The mandibles are surrounded at their base by a thin fold of integument, which extends the angle of the mouth from the base of the lower jaw to equal the breadth of the base of the upper one, and must increase the facility for receiving the milk ejected from the mammary areola of the mother." The arrangement of the muscles for compressing the mammary glands I had described in a previous memoir (Phil. Trans. 1832, p. 517).

M. Verraux adds :—"The young ones, while suckling, continually rub or triturate the mother's belly with their fore-feet, and sometimes with their hind-feet." "At the end of fifteen to twenty days the new-born are covered with a silky hair and are able to swim" (Revue Zool. p. 132).

And he likewise describes another mode in which the young obtain their lacteal nourishment :—"I redoubled my attention and care, and by dint of perseverance, having at my disposition (always on the banks of the New Norfolk) a pretty considerable number of adults and young, I saw the latter accompany their mothers, with which they played, especially when they were too far from the bank to take their nourishment. I distinguished very well that when they wished to procure it they profited by the moment when the mother was amongst the aquatic plants, near the land, and where there was no current. The female having her back exposed, one can easily conceive that on the exercise of a strong pressure, the milk would float to a little distance, and that the young might suck it up with facility; this it does, turning about so as to lose as little as possible. The manœuvre is the more easy to be distinguished, since one can see the beak move with rapidity. I cannot better compare the greasy liquid of the female than to the iridescent colours produced by the solar rays upon stagnant water. I have witnessed the same fact repeated daily and nightly. I have also remarked that the young, when it was fatigued, climbed upon the mother's back, who brought it to land, where it caressed her*."

With regard to the anomalous weapon of the hind-legs of the

* "J'examinai aussi avec le plus grand soin la structure des mandibules du jeune, et la trouvant conforme à mes idées je compris parfaitement comment il pouvait obtenir sa nourriture. Je redoublais d'attention et de soin, à force de persévérance, ayant à ma portée (toujours sur les rives de New Norfolk) un nombre assez considérables d'adultes et de jeunes; je vis ces derniers accompagner leurs mères avec laquelle ils jouaient, surtout lorsqu'ils étaient trop éloignés du bord pour prendre leur nourriture. Je distinguai très-bien que lorsqu'ils voulaient se la procurer, ils profitaient du moment où la mère se trouvait parmi les herbes aquatiques, à peu de distance de la terre, là où il n'y a aucun courant. La femelle ayant tout le dos découvert, l'on conçoit aisément qu'une fois la pressure fortement exercée, le lait surnageait à peu de distance, et que le jeune pouvait le humer" (suck it up) "avec facilité; chose qu'il fait en tournoyant afin d'en perdre le moins possible. Cette manœuvre est d'autant plus facile à distinguer, qu'on voit le bec se mouvoir avec célérité. Je ne peux mieux comparer le liquide graisseux de la femelle, qu'aux couleurs irisées produites par les rayons solaires sur l'eau croupie. J'ai vu le même fait se répéter tous les jours et toutes les nuits. J'ai remarqué aussi, que le jeune, lorsqu'il était fatigué, grimpait sur le dos de la mère, qui se dirigeait sur la terre, où il la caressait."—*Revue Zoologique*, 1848, p. 131, *note*.

male *Ornithorhynchus,* the evidence of its function was summed up in my article *Monotremata* as follows:—"An objection to the theory of the spur and gland being a defensive apparatus is their absence in the female. Since then this apparatus forms a sexual character, it may be presumed that its function is connected with that of generation. Whether the spur be a weapon for combat among the males,—or, like the *spiculum amoris* of the snail, be used to excite the female, the injected secretion being an additional stimulus,—or whether the spur be mechanically useful in retaining the female during the coitus,—are conjectures which must be verified or disproved by actual observation *."

M. Verraux states:—"Quant aux crochets qui arment les membres postérieures du mâle, et qui, chez la femelle, sont rudimentaires, ils n'ont d'autre destination, d'après moi, que de maintenir la femelle pendant l'acte de copulation."—"Les expériences souvent réitérées à diverses époques m'ont attesté que ces crochets n'avaient rien de nuisible. J'ai même observé qu'en tracassant l'animal, jamais il ne cherchait à s'en servir comme moyen de défense," *ib.* p. 133. This precisely accords with what Mr. G. Bennett has recorded in the Zoological Transactions, vol. i. p. 236.

Upon the whole then, M. Verraux's evidence goes to confirm the ovo-viviparous theory of the *Ornithorhynchus,* determines the season and mode of coitus, agrees with the calculations previously made as to the period of gestation, establishes the function of the mammary glands, and describes two modes by which the young acquire the lacteal secretion: it also demonstrates one use of the perforated spurs of the male, though that of the secretion which they emit is still conjectural. The chief points then that remain to be determined by actual observation are—

1st. The precise period of utero-gestation.

2nd. The nature of the membranes or other structures developed for the support of the fœtus during gestation, and the order of their appearance.

3rd. The exact size, condition and powers of the young at the time of birth.

4th. The period during which the young takes the lacteal nourishment.

5th. The age at which the animal attains its full size.

The most important desideratum for the physiologist is the impregnated uterus of the *Ornithorhynchus* at different periods. Such specimens are indispensable for the determination of the second point. It would seem that they might be obtained without

* Cyclopædia of Anatomy, vol. iii. p. 407.

any very great difficulty at New Norfolk river: it would require only to take or kill a female *Ornithorhynchus* at the latter part of September, and repeat the capture of other females during each week of the months of October and November, or in December if the specimen taken at the end of November was still pregnant. The hinder half of each of such specimens, with the female organs, or simply the impregnated uterus, should be preserved in strong colourless spirits; and if this should meet the eye of my esteemed correspondent Mr. Ronald Gunn, or of Dr. Casy, I would earnestly solicit their kind co-operation in transmitting such specimens to me at the Royal College of Surgeons, London.

XXXV.—*An Account of the Germination of* Isoëtes lacustris. By Karl Müller*.

[With two Plates.]

[Continued from p. 188.]

6. *Formation of the Third Leaflet.*

In order to make the appearance of the third leaflet particularly clear, I have given an illustration of the development of a single individual up to this point, as it may be seen either by the unassisted eye or under a lens; the embryos of fig. 24 *a–g* represent this. I do not think it necessary to enter again upon the details of the earlier stages, and I pass now at once to the actual appearance of the third leaflet.

After I had made many conjectures as to the point where this leaf would appear, it was formed, in the most fitting place, in the middle, between the first and second leaves. Like these two it issued gradually as a very delicate cone, the cells of which speedily became more firm the more it came to light. The formation, as a whole, had nothing else particularly striking about it.

I was now extremely anxious to know how the third root would be developed. With all my many embryos I have not attained the satisfaction of becoming acquainted with this point, since all died in this stage. I here communicate my experience of the rearing of *Isoëtes* to botanical gardeners, in order to spare them the vexation of seeing their young, hopeful crop all die away in this stage. Success will be most surely attained by using a glass of considerable size instead of a pot; which must be filled pretty

* Translated by Arthur Henfrey, F.L.S., from the Botanische Zeitung, May 5, 1848.

high up with clean sand, the ripe ovules strewed upon this and loosely covered by a thin layer of sand. Germination is sure to follow. If the lower portion of sand be deep enough, the young roots penetrate down with great strength into this layer; and if the glass be high enough to allow of its being filled up with a considerable depth of water, the young leaflets also grow upward with great rapidity. These deep strata of water and of sand act like a wonderful charm upon the young embryos. If these however cannot attach themselves very firmly by their roots, they come to the surface of the water, and then it is impossible to set them again so as to make them thrive any longer. They are sure to die.

The reason why I wished so much to observe the formation of the third rootlet was the desire to solve, by indubitable proofs obtained from the course of development, the question once propounded by H. v. Mohl, as to the reason why the youngest roots of the rhizome of *Isoëtes* occur in the centre and the older in the periphery.

I cannot settle this question from the experience of my embryos, yet I believe that it may be brought near to a decision through fig. 24 *d*.

There is no question that the root of the third leaflet must be developed in a different way from the two preceding. These must be formed outwardly, since the leaves which belong to them lie toward the exterior. But the third leaf lies in the interior, between the two first leaflets (fig. 24 *d*, *x*); consequently its root must also be formed in the interior. Now since the vascular bundle of the leaf constantly ran into the root in the two first leaflets, it is probable that the vascular bundle of the third leaf will do the same. Then it must penetrate the rudiment of the young rhizome and make its appearance as the youngest root, between the two older, consequently in the centre of the rhizome. Under these circumstances, we have to wonder less at the peculiar mode of issue of the root than at the phænomenon that the vascular bundle belonging to every leaf is elongated out from it through the rhizome downward, and there comes to light as a root. The latter consequently has a wholly dependent connexion with the leaf. We can therefore as little talk of a principal root in *Isoëtes* as in the *Selaginellæ*, in spite of Schleiden's opinion.

A. Braun some time ago* also gave an explanation of the peculiar arrangement of the roots in *Isoëtes*. He said that it might readily be explained if it were assumed that the vessels, in-

* Flora, 1847, No. 3.

stead of breaking forth outward from the vascular cylinder, turned inward and perforated the rhizome. According to this therefore a proper vascular cylinder must be present in the rhizome, and as such must be understood the internal medullary layer*. This is not clear to me. From Mohl's illustrations I do not know in what relation the vessels, occurring in the lower part of the medullary layer, stand to the leaves. According to these figures the upper vessels most certainly stand in connexion with the leaves, and they admit of its being conceived that the above ground of explanation which I have deduced from the course of development actually hits the fact; that the vessels of the youngest roots correspond to the youngest leaves.

The gradual death of the young embryos appeared to me very peculiar: I have represented it in the figures (fig. 24 *e, f, g*). The root of the first leaflet went first, and the coats of the primine with the secundine still adhered to the first leaflet (fig. 24 *e*). Then this also was lost (fig. 24 *f*), and by this means the third leaflet became more free. Next the root of the second leaflet disappeared (fig. 24 *g*), and after that the leaf itself. At last only the third leaflet remained: this lived, fresh and growing for some time; but the true vital foundation appeared to have departed from it, and after several weeks' vegetation it died like the rest.

Now that we have become fully acquainted with the course of development of *Isoëtes* up to this point, I consider the observation of the further progress will be very easy, if any one, in whose neighbourhood *Isoëtes* occurs, will take the pains to fish up young embryos out of the water, and continue the examination from the point at which I have ceased. The embryos are probably not difficult to find in their natural condition. I imagine that they must grow socially, in great numbers close together, since they will in any case germinate simultaneously out from the oophoridia of the decaying parent plant, as often happens in aquatic plants.

7. *Retrospect.*

A. *Special course of development of* Isoëtes.

1. The foundation of all cell-formation of the embryo is a delicate granular mass which exists very early in the ovule and completely fills it (fig. 4).

2. This mass becomes transformed into starch, and is thus brought into a condition for solution (fig. 5).

* See the illustrations, by H. v. Mohl, Linnæa, 1840, t. 3. (Also in Vermischt. Schrift. plate 5.)

3. The dissolved starch takes the appearance of oil-globules, and these alone constitute the *protoplasm* of the first cells of the embryo (fig. 6).

4. The embryo, which is already formed at a period when no alteration is to be observed in the coats of the ovule, first appears as a solitary cell.

5. It becomes a mother-cell, new daughter-cells being soon formed within it. This certainly is effected through cytoblasts (figs. 7, 8).

6. Soon after this the mother-cell has become a wholly cellular, oval corpuscule (figs. 9, 10).

7. Hereupon, a growth toward two sides is seen at the base, and the corpuscule becomes curved in the middle, in which a solitary cell displays itself: this is the rudiment of the scale of the first leaf. The growth toward two sides marks the rudiments of the vagina and alimentary organ (fig. 11).

8. Two more organs are now associated with the preceding. The alimentary organ becomes more evident by growing out in a rounded form; through this originates a curve on the base of the embryo which is also partly caused by the root of the first leaf, which is equally visible in its rudimentary condition. By this also the vagina becomes directed upward, it is connected with the future furrow of the leaf, and incloses, together with the mother-cell of the first scale, the newly added one of the second leaflet (fig. 12).

9. The first leaf having become cylindrically elongated, it has also acquired a green colour. At this time the alimentary organ, root, vagina, scale and mother-cell of the second leaflet are clearly distinct organs. The alimentary organ, which occupies one-half of the germinal body while the other half belongs to the radicle, has become filled with starch which suffices for the nutrition until the second leaflet has become tolerably developed. The root is still a little conical body formed of very delicate cellular tissue. The vagina looks sideways, and incloses now the two mother-cells of the scale and the second leaflet. The former becomes a flat membrane, the latter remains a round, but internally already cellular body (figs. 15, 17).

10. The scale and root alone now visibly hasten forward in their formation. The former has attained its full development, while the second leaflet has only become cellular and the vagina applied itself more closely upon it. The root has most visibly advanced; it has become considerably elongated and acquired two vascular cords (fig. 18).

11. The next succeeding development of all parts is merely a relative expansion of them (fig. 20).

12. The vagina has merely become a very delicate membrane, and the vascular cords of the root united into one mass at that time when the second leaflet issues from the vagina as a green, somewhat flattened corpuscule. The root now expands only at its apex by cell-formation, since its only point of vegetation lies there (fig. 21).

13. When the second leaflet has issued from the vagina, which now forms a long, delicate membrane obliquely cut off at its open end, the starch of the alimentary organ has disappeared. The vascular bundle of the first root has again separated into two portions; each portion however consists of several, usually two cords. The root of the second leaflet now shows itself, at first only as a very transparent compact protuberance (fig. 22).

14. The further development of this radicle appears to have become the principal matter in the whole plant. As in the first root, the vessels are first formed as two cords (fig. 23).

15. Then they become elongated, like those of the first, with all the gradations of the preceding formation (fig. 24 *b*).

16. After the second root has attained its full development, the third leaf makes its appearance between the two first (fig. 24 *c*, *d*).

B. *Comparison of the course of development of* Selaginella *and* Isoëtes.

No comparison is possible between the earliest stages of development of these two genera, since those of *Selaginella* are yet unknown. Nevertheless they perfectly agree in one point,—that the element of cell-formation is in both a granular mass, which becomes converted first into starch and then into protoplasm. At this point our comparison is terminated, and we begin again at a considerably advanced period of development, in the young plant.

The young embryo of *Selaginella* consists, like that of *Isoëtes*, of three essential parts: 1. the alimentary organ; 2. the radical portion; 3. the terminal bud.

The alimentary organ is here a special body originally very imperfectly, but in further-developed states of the plant perfectly round. This alone remains within the ovule, to attach the little plant to it (fig. 25 *a*). No starch is deposited in its interior; the protoplasm which must be formed from the granular mass (fig. 25 *d*) still existing within the ovule, is taken up by it and carried onward to the remaining portions of the embryo. In this variation this body does not wholly represent the organ in *Isoëtes*. The most peculiar point in it however is, that it does not become wholly rounded off until a subsequent period.

The radical portion does not lie, as in *Isoëtes*, with the alimentary body, inside the ovule, but outside this, beside the terminal bud (fig. 25 *b*) : therefore the ovule is never perforated by a root as in *Isoëtes*.

The most important distinction between the genera, is that in *Selaginella* an actual terminal bud is produced, in *Isoëtes* none, which is naturally explained by the fact, that in *Selaginella*, elongated axes are developed, while in *Isoëtes* the axis always remains short and appears as a rhizome. On this account also the individual organs are never produced symmetrically here in *Isoëtes*, as they are so strictly in the terminal bud of *Selaginella*.

These may be taken as the most essential points which allow of comparison in the young embryos of the two genera. We trace in them all the similarity which may be concluded from the relationship, but also all the dissimilarity that has its ground in the different type of the two genera, which is at once expressed in the course of development. The most essential relationship between the two, however, is above all the formation of the embryo in the interior of an ovule, without a pollen-tube.

It is exceedingly desirable that, in order to complete our knowledge of the mutual relationship, some one may be able very shortly to furnish the history also of the earliest stages of development of the *Selaginellæ*.

Possible Results.

After it has been shown in the foregoing how a cell is able to form in an independent manner, inside a perfectly closed organ, without a pollen-tube! I might repress all further conclusions against those who derive the formation of the embryo of sexual plants from a constricted pollen-tube. But I have one more observation on *Isoëtes* to subjoin, which I could not pass over in silence, since it appeared to me to possess great importance in regard to that controversy.

It is well known that in many plants two embryos sometimes appear within one and the same ovule. This phænomenon is explained by Schleiden by the penetration of two pollen-tubes. I have observed the same phænomenon in *Isoëtes*, where two independent embryos had been formed in one and the same ovule, and I have represented the case in fig. 19. It was evident however that neither of the embryos were in a good condition; though they were normally formed, both suffered from it, in various places. One was developed considerably at the cost of the other, and possessed two vascular cords in its root. Nothing of these could be seen in the other. It would have fared badly with both also, afterwards, since neither of them had any of the starch, the so necessary nutriment, in the alimentary organ (fig. 19 *e*).

But it is perfectly clear from all this that so many pollen-tubes are not necessary for the formation of any given number of embryos.

The formation of the embryo in *Isoëtes*, or in the *Lycopodiaceæ* generally, must also be of interest in other ways in regard to that of the sexual plants. In *Isoëtes* no pollen-tubes penetrate, and yet the embryo-cell is developed independently. In the sexual plants a pollen-tube must first have entered, before that cell can be formed. I here of course assume that the indulgent reader agrees with me that the germinal cell first originates in the embryo-sac after the penetration of the pollen-tube in the sexual plants; in favour of which I have already elsewhere furnished my observations *. This appears to me capable of explanation in a consequential manner. In *Isoëtes* the ovule contains the true *protoplasm*, from which may be developed a peculiar mother-cell like that of the embryo; in the sexual plants this matter is not present in the embryo-sac. It must be furnished in a different way and is brought by the pollen-tube.

In conclusion, let me hope that I have succeeded in the foregoing pages in exhibiting, fulfilled and completed, the three principal objects of these investigations, which I mentioned in the introduction: how far *Isoëtes* and *Selaginella* are allied in their course of development; how the peculiar formation of the root takes place in *Isoëtes*; and how the uteral formation of the embryo in an asexual plant is related to that of the sexual plants.

EXPLANATION OF PLATES II. & III.

N.B. The Numbers 5, 20, 50, 250 and 400 give the enlargement of the object.

Fig. 1. An ovule with the two outer coats just burst, and the coat of the nucleus (*a*) visible.
— 2. This last magnified to show its peculiar structure.
— 3. The great papilliform cell with the contiguous cells, magnified.
— 4. The granular contents of the ovule.
— 5. The same converted into starch.
— 6. The latter transformed into protoplasm.
— 7. *a*, *b*. The first or embryo-cell.
— 8. *b*. The same. *c*. A free cytoblast. *d*. A cytoblast around which the membrane is formed.
— 9. *a*, *b*, *c*. The embryo-cell now become a cellular corpuscule. *c*. Treated with iodine to show how the cell-membrane of the mother-cell incloses the cellular contents like a sac.
— 10. *a*. The embryo, becoming elongated. *b*. A single cell with cytoblastema.
— 11. The same. *a*. Alimentary organ. *b*. Vagina. *c*. Cell of the first scale; all just begun to be developed.

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* Bot. Zeitung, 1847. Beit. z. Entwicklungsgesch. d. Pflanzen-embryo, p. 737 *et seq.*

Fig. 12. Further stage. *a.* Alimentary organ. *b.* Radical portion. *c.* Mother-cell of the second leaflet. *d.* Vagina. *e.* First leaf. *f.* Cell of the first scale.

— 13. The same, drawn from the face. *a.* A cell which is the support of the cell of the first scale. *b.* Mother-cell of the second leaflet. *c.* Cells of the vagina. *d.* Cell of the first scale.

— 14. Ovule bursting open. *a.* Primine. *b.* Secundine. *c.* Nucleus.

— 15. *a.* Ovule, when the young embryo has just broken through the apex of the coat of the nucleus; the young embryo shines through, of a green colour, at the summit of the coat of the nucleus. *b.* The young embryo extracted. *c.* Alimentary organ: *d.* Cell of the first scale. *e.* Mother-cell of the second leaflet. *f.* Radical portion. *g.* Vagina.

— 16. *a.* Ovule, when the embryo has entirely broken through the apex of the coat of the nucleus and issued all except the germinal body (pro-embryo). *b.* The little plant extracted: this is otherwise not normally formed: the alimentary organ and radical portion are not yet visible. *c.* First scale. *d.* Cell of the second leaflet.

— 17. *a.* Embryo elongating by the expansion of its cells, extruded from the coat of the nucleus as far as the germinal body. *b.* The same magnified 250 times. *c.* First scale. *d.* Second leaflet. *e.* Root. *f.* Alimentary organ. *g.* Outermost portion of the root, in the cells of which all the contents have become fluid and transparent.

— 18. *a.* Embryo of the natural size. *b.* 250 times enlarged. *d.* Alimentary organ. *e.* Apex of the root. *f.* Vessels. *g.* Epidermoid outermost layer of cells of the root, with cytoblasts. *h.* First scale. *i.* Cells of the vagina. *k.* Second leaf.

— 19. *a.* Two embryos in a single ovule, of natural size. *b.* Magnified 20 times. *c.* Magnified 50 times. *d d.* Second leaflets. *e e.* Empty alimentary organs.

— 20. *a.* Embryo, nat. size, when the root breaks through the lowermost part of the coat of the nucleus. *b.* Magnified 50 times with *g*, the extruded root. *c.* Extracted. *d.* Second leaf. *e.* First scale. *f.* Alimentary organ. *h.* Vagina.

— 21. *a.* Embryo prepared free from the ovule; 50 times enlarged. *b.* Spiral vessel, 400 times enlarged. *c.* Alimentary organ. *d.* Second leaflet. *e.* Point of vegetation on the apex of the root. *f.* End of the spiral vessel in the root. *g.* Vagina.

— 22. *c.* Empty alimentary organ. *d.* Vagina. *e.* Second leaflet. *f.* Second radical portion.

— 23. *a.* Embryo, nat. size. *b.* Magnified 50 times. *c.* Empty alimentary organ. *d.* Vagina. *e.* Second root.

— 24. Development of an individual up to the formation of the third leaflet. *a.* First leaf. *b.* Second leaf. *c.* Third leaf. *d.* The same magnified 50 times with *x*, the third leaf. *e.* The stage when the plants died: first root gone. *f.* First root and first leaf gone. *g.* First root, first leaf and second root gone.

— 25. Germinating plant of *Selaginella*. *a.* Germinal body (pro-embryo). *b.* Radical portion. *c.* Terminal bud. *d.* Granular contents of the ovule.

XXXVI.—*On the recent species of* Odostomia, *a genus of Gasteropodous Mollusks inhabiting the seas of Great Britain and Ireland.* By J. G. Jeffreys, F.R. & L.S.*

The subject of this paper has originated in a wish expressed by my friend Professor Edward Forbes, that I would exhibit at the meeting my specimens of British *Odostomiæ* with a view to the elucidation of the species; but I thought it might be more generally interesting to the naturalists who are now assembled that I should prepare and read a few notes explanatory of the specimens to be exhibited.

I propose to give a *catalogue raisonné* of all the species mentioned in the title of this paper, referring to other works where any of the species have been already described, and describing any new or unpublished species. As the admirable work of Professor Edward Forbes and Mr. Hanley on the British shells, which is now in course of publication, will contain figures of all the species, it would be superfluous in me so to illustrate this paper; but the mode in which I propose to illustrate it, by an exhibition of specimens, will probably be more interesting to those members who may take the trouble of examining and comparing them.

The first notice which appears to have been published of any of these shells, if we except the *Turbo lacteus* of Linnæus (Syst. Nat. 1766), is in Walker's (or rather Jacob's) work on the Minute and Rare Shells discovered by Mr. Boys on the seashore near Sandwich, and which was published in 1784.

Mr. Adams described and figured several additional species (from the Pembrokeshire coast) in his papers which were published in the 'Transactions' of the Linnæan Society in 1795. The descriptions and figures in these publications are however very indistinct and difficult to make out.

Col. Montagu added many others in his 'Testacea Britannica' and the Supplement of that work, which were published respectively in 1803 and 1808.

Dr. Turton (in his Conchological Dictionary of the British Isles) does not appear to have increased the number or knowledge of the species.

Lamarck did not notice any of these shells in his 'Histoire naturelle des Animaux sans Vertèbres' published in 1822.

Dr. Fleming (to whom, as will be presently shown, we are indebted for his generic discrimination of the shells) added, in his

* Read at the Meeting of the British Association at Swansea in August 1848; and communicated by the author.

'History of British Animals' published in 1828, only one species (*Odostomia scalaris*), which he referred to the *Turbo indistinctus* of Montagu.

Philippi, in his excellent work on the Sicilian Mollusca (1836 and 1844), did more than any preceding author with respect to some of the species, which he at first included in the genus *Melania*, but afterwards in *Chemnitzia* and *Eulima*. He does not however seem to have been acquainted with any of the true *Odostomiæ* except *O. conoidea*, which he referred to the *Auricula conoidea* of Férussac and Recluz, who described the *Odostomia interstincta* (*Turbo interstinctus*, Mont.) under the name of *Rissoa Deshayesiana*. Other continental conchologists do not appear to have observed these shells.

Of late years several additions to the British and Irish species have been made by Messrs. MacGillivray, Thompson, Alder, Hanley and Forbes, as well as by myself in the 'Annals of Natural History,' Thorpe's 'British Marine Conchology,' and Mr. Alder's 'Catalogue of the Mollusca of Northumberland and Durham.'

To Dr. Fleming is attributable the merit of proposing the genus *Odostomia* for these shells; and although the name has been objected to, as not being formed according to strictly classical rules, the whole nomenclature of natural history requires so much revision as to render any attempt to change established names productive of greater inconvenience than would be occasioned by retaining them.

In the Supplement to the 'Encyclopædia Britannica' (published in 1818) under the article "Conchology," the author, Dr. Fleming, says, "Perhaps a rigorous examination of the Turbines of British writers might justify the formation of one or two new genera; yet we shall content ourselves with noticing those species into which we have formed the genus *Odostomia*, in which the columella is furnished with a tooth. The *Turbo interstincta, unidentata, plicata, Sandvicensis* and *insculpta* of Montagu are of this genus. They have no resemblance in their structure to the Linnæan *Volutæ*, although they have been inconsiderately associated with them by the authors of the 'Descriptive Catalogue.' The preceding genera are formed of marine shells: those that follow live on the land."

I have given a full extract from this article with respect to the formation of the genus, because Mr. S. V. Wood, in his very able and interesting treatise, lately published by the Palæontographical Society, on the Univalves of the Crag Mollusca from the middle and upper tertiaries of the East of England (p. 85), states that the name as proposed by Dr. Fleming "appears to have been intended for the reception of a number of land shells with a denticulated aperture, such as *Pupa, Clausilia,* &c., but was subsequently restricted, or rather transferred, by that author in his 'Hist. of Brit. An.' 1828, to a series of submarine shells with an oval aperture and a single plait upon the columella."

The name was also included by Dr. Fleming, in his 'Philosophy of Zoology,' (published in 1822,) among the marine *Turbonidæ.*

In an 'Enumeration of Marine Shells' found on the Devonshire coast, which was edited by Dr. Turton and published in 1829, the generic name of *Odontostoma* was proposed by him for these shells, the character being thus given: "Shell conic oval; pillar with a single tooth or fold towards the middle; operculum none. Includes *Turbo unidentatus* and others." But this description as regards the absence of an operculum is obviously incorrect.

To show the extent of confusion which prevails in the synonymy of this genus, I may remark that Herrmannsen in his 'Index Generum Malacozoorum' gives no less than nineteen synonyms for the genus *Chemnitzia* of D'Orbigny, which forms a group of the present genus.

Equal confusion seems to prevail as to the synonymy of the British species. The *Turbo unidentatus* of Montagu is a very different shell from the *Turbo unidentatus* of Turton and *Odostomia unidentata* of Fleming; and the shell described in Thorpe's work as the last-named species is again very different from either of the two former. Other specific errors have been occasioned by authors taking their descriptions from imperfect specimens. Having through the kind liberality of many authors on the subject of British Conchology, as well as the possession of the late Dr. Turton's collection, had an opportunity of examining their specimens, I am enabled to clear up most of these errors.

It is in my opinion impossible, without doing considerable violence to the established ideas of the system on which generic differences are founded, to separate *Chemnitzia* or *Eulimella* from this genus. The same character, viz. the shell forming a more or less cylindrical cone, having the peristome incomplete retrally, and leaving the upper part of the pillar exposed, belongs to all the species; and although the tooth or fold on the pillar is characteristic of the typical species, the case of *O. indistincta,* which is scarcely distinguishable from its congener *interstincta* (the latter being destitute of any tooth or fold), shows that this character cannot be relied upon for generic distinction. Typical specimens of *Odostomia plicata* are also closely allied in form as well as in the glossy smoothness of their shells to *O. acicula,* which would otherwise be a *Eulimella.* The *Chemnitzia densecostata* of Philippi, which is described by that author as having the aperture "superne subplicata," is another case to show the fallacy of this distinction.

There can be no objection however to make them subgenera if it be considered desirable to adopt that mode of classification.

From Mr. Lowe's description (in the Proceedings of the Zoological Society) of the animal of his genus *Parthenia,* which is identical with that of *Chemnitzia,* it would appear not to differ from that of *Odostomia* except in having the tentacula "basi coalita;" but as the position of the eyes is described by that author to be the same, "superne ad basim internam positi," the account of both animals may be consistent with each other.

Mr. Alder, in his Catalogue above-mentioned, says that, according to his observations, "the animal of Forbes's genus *Eulimella* is essentially the same as that of *Chemnitzia,* and that it only differs in the more polished surface of the shell."

Professor Lovén in his 'Index Molluscorum litora Scandinaviæ occidentalia habitantium' (published in 1846) has united all the species noticed by him under the name of *Turbonilla* of Leach; but that name was only published by Risso in his 'Histoire Naturelle de l'Europe Méridionale' in 1826, being eight years subsequent to the publication of Dr. Fleming.

The tooth or fold on the columella or pillar of the shell is, as I have before remarked, one of the distinctive characters of the genus, and in this respect as well as the general form of the shell it bears rather a close analogy to the genus *Pyramidella* of Lamarck.

Another character which appears to be peculiar to this genus (if we perhaps except *Ianthina*), and which is found in almost all the species, is that the two first-formed whorls are *ab ovo* heterostrophe, and subsequently reflected on the next. The figure 29 of Walker (Test. Min. rar.) is a tolerably correct, although a rude, representation of this peculiarity of form in the fry of *Odostomia spiralis*; and in pl. 10. fig. 2. of Mr. Wood's 'Catalogue of the Crag Fossils' it is well delineated with reference to his *Chemnitzia rufa.* Montagu also remarked it in his description of *Odostomia lactea* (*Turbo elegantissimus,* Mont.), as well as Lovén in his description of the shells forming his genus *Turbonilla.*

Although I have examined many hundred specimens of *Odostomiæ* from almost every part of the kingdom, I have only once met with a reversed shell, and which I referred to the *Turbo lævis* of Walker (fig. 35); but the specimen was unfortunately broken after having been many years in my cabinet. I considered it to be a monstrosity of *Odostomia pallida.*

I do not propose to refer to Nyst (Coq. foss. de Belg.) or any other work on fossil shells except that of Mr. S. V. Wood on the

Crag Mollusca of Great Britain. The difficulty is very great, if indeed it is always possible, to identify fossil with recent shells, the characteristic striæ and other markings of so many species being wholly lost or abraded in a fossil state, and the whole structure of the shell being subject in that condition to such chemical and other changes. For example, the *Chemnitzia curvicostata* of the Crag Mollusca is evidently the *Turbo indistinctus* of Montagu; but the interstitial striæ or punctures in the latter shell were not observable by Mr. Wood.

I have arranged the localities according to the dates of publication or discovery.

The generic character of *Odostomia* may be thus expressed:—

Odostomia, *Fl.*

Animal elongatum; caput latum, robustum; tentacula duo, conica, complanata; oculi bini, ad basim tentaculorum in medio juxtapositi; sustentaculum depressum, antice latius et truncatum; operculum corneum, subspirale, longitudinaliter striatum, testæ aperturam obtegens.

Testa conoidea seu pyramidalis, anfractibus duobus primariis heterostrophis; peristoma retro incontinuum, ad basim aperturæ subeffusum; columella subverticalis, denticulo aut plica plerumque instructa.

Odostomia, Fl., Macg., Thorpe, Wood, and other modern authors.
Turbo (pars), Linnæus, Mont., and other authors.
Helix (pars), Mont., Turt.
Voluta (pars), Maton, Rackett.
Turbonilla (Leach), Risso, Lovén.
Phasianella (pars), Fl.
Turritella (pars), Fl.
Odontostoma, Turt.
Melania (pars), Phil., Forbes.
Eulima (pars), Phil., Jeffr.
Auricula (pars), Phil.
Chemnitzia, D'Orb., Phil., and other authors.
Parthenia, Lowe, Thorpe.
Odontostomia, Jeffr.
Pyramidella (?), Jeffr.
Pyramis (pars), Br.
Rissoa (pars), Phil., Br., Recluz, and other modern authors.
Jaminia (Bruguière), Br.
Cingula (pars), Thorpe.
Eulimella, Forbes.

A few of the species (viz. *O. Rissoides*, *plicata*, *unidentata*, *interstincta* and *lactea*) are sublittoral, or inhabit the coasts at low-water mark, lurking under loose stones and in the roots of the *Corallina officinalis*, which are left uncovered by the recess of the tide. The rest inhabit gravelly and stony ground in various depths of water, ranging from 1 to 50 fathoms and probably more, and are found in the crevices of stones and shells and at the roots of *Laminaria digitata*. The animal is most probably zoophagous, inasmuch as they are not found on sea-weed, and they frequently occur beyond the range of vegetable life in the deeper parts of the sea.

Specierum enumeratio.

A. Columellari denticulo seu plica instructæ.

* Læves aut concentrice striatæ.

1. pallida.	7. albella.	13. conoidea.
2. notata.	8. acuta.	14. diaphana.
3. Rissoides.	9. turrita.	15. obliqua.
4. alba.	10. cylindrica.	16. insculpta.
5. nitida.	11. plicata.	17. dolioliformis.
6. dubia.	12. unidentata.	

** Longitudinaliter costatæ.

18. spiralis.	19. interstincta.

B. Edentulæ et plica carentes.

* Longitudinaliter costatæ aut decussatæ.

20. indistincta.	23. excavata.	26. rufa.
21. pellucida.	24. clathrata.	27. formosa.
22. fenestrata.	25. scalaris.	28. lactea.

** Læves.

29. Scillæ.	31. acicula.	32. affinis.
30. clavula.		

1. *Odostomia pallida.*

Turbo pallidus, Mont. Test. Brit. 325. tab. 21. fig. 4.
Voluta ambigua, Mat. and Rack. in Linn. Trans. viii. p. 132.
Turbo unidentatus, Turt. Conch. Dict. 222.
Odostomia unidentata, Fl. Brit. An. 310; Macg. Moll. Aberd. 154.
Phasianella pallida, Fl. Brit. An. 302.
Pyramidella (?) *pallida*, Jeffr. in Ann. Nat. Hist. 1841, p. 165.
Rissoa pallida, Br. (2nd ed.) 13. pl. 8. fig. 24.
Jaminia unidentata, id. 21. pl. 9. figs. 34, 35.
Odostomia pallida, Ald. Cat. 51.

Salcomb Bay, Devonshire (Montagu). Western coasts and Dublin Bay (Turton and J. G. J.). Northumberland coast (Alder). Exmouth (Mr. Clark and J. G. J.). Oban; Lochs Broom, Kishorn and Carron, Ross-shire; Zetland, five miles east of Lerwick, in forty fathoms; Swansea; Whitesand Bay, Cornwall. West coast of Scotland; Arran Isle, county Galway (Mr. Barlee). Torbay (Dr. Battersby).

Var. *a.* solidior.

Birtabuy Bay, co. Galway (Mr. Barlee).

Var. *b.* gracilior, anfractibus productioribus.

Odostomia eulimoides, Hanley in Zool. Proc. 1844; Thorpe, Br. Mar. Conch. 36. fig. 12.

Tenby; Lerwick; Oxwich Bay near Swansea. Oban and west coast of Scotland; Guernsey (Mr. Barlee). South coast of Devon (Mrs. Richard Smith). Torquay (Dr. Battersby).

Var. *c.* minor, subovalis.

Dealvoe, Zetland. West coast of Scotland (Mr. Barlee). Torquay (Dr. Battersby).

Var. *d.* 1–6 transversis carinis notata.

N.B. These ridges appear to be caused by the confluence and excessive prominence of the irregular spiral striæ which are sometimes observable in this species.

Odostomia crassa, Thompson in Ann. Nat. Hist. vol. xv. (1845), p. 315. pl. 19. fig. 5.
Jaminia pullus, Br. 22. pl. 9. fig. 11.
Turbonilla crassa, Lov. 18.

Birtabuy Bay, co. Galway (Mr. Barlee). Torquay (Mr. Hanley).

Var. *e.* ovalis.

Zetland, five miles east of Lerwick, in forty fathoms.

Monstr. spira producta et anfractibus complanatis.

Birtabuy Bay, co. Galway (Mr. Barlee).

One of the most common species.

It may be objected to the specific name here proposed to be retained as that of Montagu, that he described the shells "as destitute of any tooth." But the tooth in this species is very much sunk within the aperture and not easily perceptible, and Montagu evidently made the same mistake with respect to his *Turbo decussatus* (*Odostomia pellucida* of Searles Wood and this catalogue), in which he did not notice the fold on the pillar lip. It ought also to be recollected that it is now nearly half a century since the publication of Montagu's work, and although the general accuracy of his descriptions is undeniable, the materials which he had at that time were by no means equal to those which the use of the dredge and other appliances have in modern days placed at the disposal of (so to say) marine naturalists.

2. *Odostomia notata.*

Testa oblongo-ovata, tenuis, nitida, opaca, concentrice striis æquis confertis impressis et fere undulatis notata; anfractus 6, convexi, ultimo $\frac{2}{5}$ spiræ subæquante, cæteris sensim decrescentibus; apex obtusus; sutura distincta; apertura oblongo-ovata, infra subeffusa et incrassata; umbilicus vix ullus; denticulus validus, obliquus. Longitudo plus quam $\frac{1}{8}$, latitudo $\frac{1}{12}$ unciæ.

Differs from the last species (to which it is allied) in form and texture, in the whorls being more rounded and the suture more distinct, and especially in the regular impressed concentric striæ.

Zetland, five miles east of Lerwick, in forty fathoms water, where one specimen only occurred to me.

3. *Odostomia Rissoides.*

Odostomia scalaris, Macg. Moll. Ab. 154.

Odostomia Rissoides, Hanley in Zool. Proc. 1844; Thorpe, 36. fig. 9.

Aberdeen (Macgillivray). Guernsey (Hanley and Mr. Barlee). Caswell and Langland Bays near Swansea; Tenby; Fishguard; Whitesand Bay, Cornwall; Scarborough. Exmouth (Mr. Clark). Roundstone and Arran Isle, co. Galway (Mr. Barlee).

Var. *a.* scalariformis.

Burrow Island, Devonshire (Mr. Barlee).

Var. *b.* plus ovalis et anfractu ultimo majore.

Aberdeen (Mr. Macgillivray).

The specific name of *scalaris* was preoccupied by Philippi at the time of Professor Macgillivray's publication, although the last-named author is perhaps entitled to priority in distinguishing the species.

A local species.

4. *Odostomia alba.*

Testa oblongo-ovata, tenuis, nitida, glabra, alba; anfractus 5–6, ventricosi, sensim increscentes, ultimo reliquos exsuperante; apex subacutus; sutura profunda; apertura magna, rotundata et subtus vix effusa; umbilicus valde conspicuus; denticulus parvus, columella subobtectus. Long. $\frac{1}{6}$, lat. $\frac{1}{12}$ unc.

Somewhat resembles *Rissoides*, but the whorls are more swollen and tapering. The umbilicus also is a very distinct character, there being none in the other species.

Oxwich Bay near Swansea.

Var. *a.* paullo major et plus conica.

Bantry Bay (Mr. MacAndrew).

A rare species.

5. *Odostomia nitida.*

Odostomia nitida, Alder in Ann. Nat. Hist. (1844), p. 326. pl. 8. fig. 5; Id. Cat. 52.

Tynemouth (Mr. Alder). West coast of Scotland (Mr. Barlee). Torquay (Dr. Battersby).

Var. *a.* paullo major, ad basim subcarinata et latior.

West coast of Scotland (Mr. Barlee).

Var. *b*. spira elatiore.

Southampton; Oxwich Bay near Swansea.

Rare.

6. *Odostomia dubia.*

Testa ovalis, tenuis, nitida, pellucida, glabra, alba; anfractus 5, convexi, ultimo $\frac{2}{3}$ spiræ subæquante; apex obtusus; sutura distincta; apertura ovalis, paullulum subtus effusa; peristoma postice reflexum; denticulus parvus sed conspicuus; umbilicus distinctus. Long. $\frac{1}{12}$, lat. $\frac{1}{20}$ unc.

Differs from *nitida* in the spire being more produced, the volutions not being so gibbous, and in the aperture being more oval and the tooth smaller. From *albella* it differs in its smaller size, its less cylindrical form, the proportionate size of the last whorl (which is only half the size of the spire in that species), as well as its having a distinct umbilicus, and the tooth being much stronger and more conspicuous; from *pallida* in the volutions being more convex, the presence of an umbilicus, and the tooth being more conspicuous. From *Rissoides* it differs in its smaller size, and in not being turriculate as in that species.

Southampton. Exmouth (Mr. Clark). Torquay (Dr. Battersby). West coast of Scotland (Mr. Barlee). Rare.

Var. *a*. major et plus ovalis.

Lerwick. West coast of Scotland (Mr. Barlee).

7. *Odostomia albella.*

Turbonilla albella, Lov. 19.
Odostomia albella, Ald. Cat. 51.

Tynemouth and Cullercoats (Alder). Oban and other parts of the west coast of Scotland; Roundstone, co. Galway; Guernsey (Mr. Barlee).

Var. *a*. spira breviore.

Torquay (Dr. Battersby).

A local species.

8. *Odostomia acuta.*

Testa oblonga, conica, solidula, nitida, glabra, rufescenti-alba; anfractus 8, convexi, teretes, ultimo dimidiam testæ subæquante et paullulum carinato; apex acutus; sutura distincta; apertura rotundato-ovalis, subtus effusa; peristoma non reflexum; denticulus validulus, acutus; umbilicus conspicuus. Long. $\frac{1}{6}$, lat. $\frac{1}{12}$ unc.

Exmouth (Mr. Clark). Loch Fyne and west coast of Scotland; Arran Isle, co. Galway (Mr. Barlee). Torbay (Dr. Battersby). Local.

Odostomia unidentata var. Alder Cat. 51?

This elegant species differs from *plicata* in the spire being much more pointed and the last volution being proportionably larger, in its colour and glossy appearance, and in its being umbilicated.

9. *Odostomia turrita.*

Odostomia turrita, Hanley in Zool. Proc. 1844; Thorpe, 36. fig. 10.
"*Odostomia striolata*," Alder MSS.

Guernsey (Mr. Metcalfe). Oxwich Bay near Swansea; Loch Fyne; Zetland, five miles east of Lerwick, in forty fathoms water. Ilfracombe (Mr. Alder). Rare.

As the solitary specimen from which Mr. Hanley's description was taken is so battered and wants one of the principal characters of this species (the transverse striæ), I have added a description from my own specimens.

Testa cylindrica, solidiuscula, nitida, alba, opaca, striis confertis concentrice notata; anfractus 6, convexiusculi, turriculati, ultimo dimidiam testæ subæquante; apex prominulus; sutura distincta; apertura subrhomboidea, subtus rotundata et parum effusa, superne ad angulum exteriorem contracta; peristoma in columellam vix reflexum; denticulus parvus, acutus; umbilicus angustus, in adultis tantum discernendus. Long. $\frac{1}{10}$, lat. $\frac{1}{20}$ unc.

Differs from *plicata* in the volutions being more convex, in the concentric striæ which are distinctly visible by the aid of a magnifier, and in the contraction of the aperture at its upper and outer angle.

10. *Odostomia cylindrica.*

Odostomia cylindrica, Alder in Ann. Nat. Hist. 1844, p. 327. pl. 8. fig. 14.

Ilfracombe; Land's End; Kilkee (Alder). Cork Harbour; Whitesand Bay, Cornwall; Scarborough (Mr. Bean). Burrow Island, Devonshire (Rev. M. Beevor and Mr. Barlee). Guernsey (Mr. Barlee).

11. *Odostomia plicata.*

Turbo plicatus, Mont. 325. tab. 21. fig. 2; Turt. 222.
Voluta plicata, Mat. and Rack. Linn. Trans. viii. 131.
Voluta plicatula, Dillwyn, Descr. Cat. i. p. 509.
Melania (subg. *Eulima*) *plicata*, Forbes, Malacologia Monensis, 16.
Odontostomia plicata, Jeffr. in Mal. and Conch. Mag. (1839) pt. 1. p. 34.
Odostomia unidentata, Maclaurin in Trans. Berw. Nat. Club (1842), p. 40.
Odostomia plicata, Macg. 154.
Odostomia Annæ, id. 157 (described from a small and worn specimen).
Jaminia plicata, Br. 21. pl. 8. fig. 10.
Odostomia turrita, Ald. Cat. 51.

Salcomb Bay, Devon (Montagu). Western coasts and Dublin Bay (Turton). Cruden Bay, Aberdeenshire (Macgillivray). Lumsdain, Berwickshire (Maclaurin). Isle of Man (Forbes). Tynemouth (Alder). Swansea and adjacent bays; Tenby; Weymouth; Exmouth; Scarborough; Bantry Bay; Lerwick. West coast of Scotland; Arran Isle, co. Galway (Mr. Barlee). Northumberland coast (Mr. Richard Howse). Torquay (Dr. Battersby).

Var. *a*. ultimo anfractu subcarinato; apertura subrhomboidea.

Falmouth; Penzance; Swansea and adjacent bays; Tenby; Whitesand Bay, Cornwall; Oban; Lerwick Sound, in from five to ten fathoms; Skye. West coast of Scotland (Mr. Barlee). Torquay (Dr. Battersby).

Var. *b*. spira breviore; apertura subrhomboidea.

Swansea and adjacent bays; Tenby; Oban; Skye; Lerwick Sound, in from five to ten fathoms. West coast of Scotland (Mr. Barlee). Torquay (Dr. Battersby).

A very common species.

I subjoin a description of the animal of var. *b*.

Animal luteum; tentacula breviuscula, cylindrica, complanata, ad basim eorum divergentia, aliquantulum producta ultra sustentaculum gradiente animali; oculi bini, parvi, juxtapositi in medio spatii inter tentacula ad eorum basim; proboscis antice rotundatus; sustentaculum angustum, longiusculum, antice latius et aliquantulum lobatum; operculum corneum, subspirale.

Animal hoc solet, ut cæteri pectinibranchiati gasteropodes, supra dorsum natare et gradi oculis retractis sub anteriore parte testæ perquam illi conspicui sunt.

It has the same faculty as many other of the pectinibranchous gasteropods of swimming on its back, and (like the animal of *Rissoa glabra* described by Mr. Alder in the 'Annals of Natural History,' or *Turbo nivosus* of Montagu) it has occasionally the habit of walking with its eyes retracted within the shell, through which they are distinctly seen. The specific difference between the animals of this species and *unidentata* is very slight.

12. *Odostomia unidentata.*

Turbo unidentatus, Mont. 324.

Voluta unidentata, Mat. and Rack. in Linn. Trans. viii. 131; Dillw. i. p. 508.

Turbo pallidus, Turt. 222.

Odostomia plicata, Fl. 310; Thorpe, 35. fig. 13.

Melania (subg. *Eulima*) *unidentata*, Forbes, Mal. Mon. 15.

Turbonilla oscitans, Lov. 19.

Odostomia unidentata, Alder, Cat. 50.

Salcomb Bay (Mont.). Dunbar (Laskey). Western coasts and Dublin Bay (Turton). Douglas, Isle of Man (Forbes). Swansea and adjacent bays; Tenby; Ilfracombe; Scarborough; Oban; Loch

Carron, Ross-shire; Lerwick Sound, and five miles eastward, in forty fathoms. Clonakilty, Ireland (Mr. Dillwyn). Northumberland coast (Mr. Richard Howse, jun.). Exmouth (Mr. Clark). West coast of Scotland; Guernsey (Mr. Barlee).

Monstr. spiræ basi complanato et late umbilicato.

Torquay (Dr. Battersby).

13. *Odostomia conoidea.*

Auricula conoidea (Fer.), Phil. i. p. 143.
Odostomia unidentata, Thorpe, 35. fig. 11.
Turbonilla plicata, Lov. 19.
Odostomia Eulimoides, Jeffr. in Ann. Nat. Hist. 1847, p. 17.
Odostomia plicata, Wood, Cr. Moll. part 1. p. 85. tab. 9. fig. 3 *a–b*.

Guernsey (Mr. Metcalfe). Skye, Oban, Loch Fyne, and other parts of the west coast of Scotland (Mr. Barlee).

Var. *a*. spira productiore; anfractibus rotundatis et non carinatis.

Odostomia plicata var. *β*, Wood, *l. c.*

Torquay (Dr. Battersby).

The variety appears to show specifically distinct characters; but I have only seen a single specimen, which is not in good condition.

Var. *b*. minor et plus conica.

Birtabuy Bay, co. Galway (Mr. Barlee).

14. *Odostomia diaphana.*

Testa cylindrica, tenuis, diaphana, nitida, glabra, alba; anfractus 4, convexiusculi, sensim increscentes, ultimo $\frac{2}{3}$ testæ subæquante; apex obtusus; sutura obliqua, profunda; apertura ovato-oblonga, infra rotundata et subeffusa, superne exteriore angulo fere contracta; peristoma in columellam reflexum et subincrassatum; plica indistincta. Long. $\frac{1}{12}$, lat. $\frac{1}{24}$ unc.

Hab. Exmouth (Mr. Clark). Very rare.

Differs from *obliqua* in its smaller size, in the last whorl not being so disproportionately large and tumid, and the spire being consequently more tapering, in being quite smooth and not (as in that species) spirally striated at the base of each volution, and in the nearly total absence of a fold on the pillar.

15. *Odostomia obliqua.*

Odostomia obliqua, Alder in Ann. Nat. Hist. 1844, p. 327. pl. 8. fig. 12.

Tynemouth (Alder). West coast of Ireland (Mr. Thompson). Falmouth; Exmouth; Caswell Bay near Swansea; Bantry Bay; Cork Harbour. Burrow Island (Mr. Bean and Mr. Barlee). West coast of Scotland (Mr. Barlee).

16. *Odostomia insculpta.*

Turbo divisus, Adams in Linn. Trans. iii. 254?
Turbo insculptus, Mont. Suppl. 129; Turt. 221.
Voluta insculpta, Dillw. i. p. 509.
Odostomia insculpta, Fl. 310; Macg. 329; Thorpe, 173; Alder, Cat. 52.
Pyramidella (?) *insculpta*, Jeffr. in Ann. Nat. Hist. 1841, p. 165.
Jaminia insculpta, Br. 22.
Turbonilla obliqua, Lov. 19.

Linny Bay, Pembrokeshire (Adams). Coast of Devon (Montagu). Aberdeen (Macgillivray). Tynemouth and Cullercoats (Alder). Tenby; Langland Bay near Swansea; Ullapool, Ross-shire; Zetland, five miles east of Lerwick, in forty fathoms. Hebrides and Loch Fyne (Mr. Barlee). Torquay (Dr. Battersby).

Var. *a.* plus cylindrica; spira elatiore.

Rissoa Warreni, Thompson in Ann. Nat. Hist. vol. xv. (1845), p. 315. pl. 19. fig. 4?

Portmarnock, Dublin Bay (Mr. W. H. Warren). Birtabuy Bay, co. Galway (Mr. Barlee).

17. *Odostomia dolioliformis.*

Testa ovalis, *Dolio Perdix* forma assimilans, tenuis, pellucida, alba, circa 20 striis undulatis transversim exarata; anfractus 4, ventricosi, subproducti, ad apicem cujusque complanati, ultimo $\frac{2}{3}$ testæ æquante; apex subacutus; sutura profunda; apertura rotundato-ovalis, subtus vix effusa, angulo exteriore superne in ultimum anfractum inflexa; columella fere recta; peristoma retro subreflexum et incrassatum; umbilicus parvus, angustus; denticulus validus, conspicuus. Long. $\frac{1}{13}$, lat. $\frac{1}{20}$ unc.

Hab. Exmouth (Mr. Clark). Swansea shore; Tenby; Sandwich; Scarborough. Rare.

This shell can scarcely be the *Turbo Sandvicensis* of Mont. (from Walker), because that is described as "elegantly reticulated." It is extremely difficult to say what many of Walker's shells are, by reason of his descriptions and figures being so very indistinct.

The fry of this species is, I believe, the *Helix resupinata* of Montagu (p. 444), from Walker's figure 24.

18. *Odostomia spiralis.*

Turbo longitudinaliter striatus, quinque anfractibus, apertura subrotunda, Walker, 13. fig. 40?
Turbo spiralis, Mont. 323. tab. 12. fig. 9; Turt. 221.
Voluta spiralis, Mat. and Rack. in Linn. Trans. viii. 130.
Voluta pellucida, Dillw. i. 508.

Odostomia spiralis, Fl. 310; Macg. 155; Dr. Johnston in Trans. Berw. Nat. Club (1841), 273; Thorpe, 172; Alder, Cat. 52.
Melania (subg. *Eulima*) *spiralis*, Forbes, Mal. Mon. 16.
Rissoa spiralis, Br. 13. pl. 9. fig. 49.
Turbonilla spiralis, Lov. 19.
Young. *Odostomia plicatula*, Macg. 156.
Fry. *Helix striata, apertura subovali, anfractibus supra dorsalibus*, Walk. 8. fig. 29.
Helix striata, Mont. 445.

Salcomb Bay, Devonshire (Mont.). Aberdeen (Macgillivray). Eyemouth, Berw. (Dr. Johnston). Kiristal, Isle of Man (Forbes). Northumberland coast (Alder). Swansea and adjacent bays; Tenby; Fishguard; Whitesand Bay, Cornwall; Exmouth; Sandwich; Bantry Bay; Cork Harbour; Oban; Lerwick Sound in from five to ten fathoms, and five miles east of Lerwick in forty fathoms. West coast of Scotland; Birtabuy Bay, co. Galway (Mr. Barlee).
Fry. Sandwich (Boys).

Rather a common species.

It is very difficult to say whether this species or *interstincta* was meant to be represented by Walker's description and figure no. 40. The figure more nearly agrees with this species; but the slight indication of the species given in the description may apply to either.

19. *Odostomia interstincta*.

Turbo canaliculatus, Adams in Linn. Trans. iii. (1796), 253.
Turbo interstinctus, Mont. 324. tab. 12. fig. 10; Turt. 223.
Voluta interstincta, M. and R. in Linn. Trans. viii. 131; Dillw. i. 509.
Odostomia interstincta, Fl. 310; Macg. 155; Thorpe, 175; Alder, Cat. 52.
Rissoa Deshayesiana, Recluz in Rev. Zool. 1842, p. 105.
Pyramis Lamarckii, Br. 15. pl. 9. fig. 39?
Jaminia interstincta, id. 21. pl. 9. fig. 10.
Jaminia obtusa, id. 22. pl. 9. fig. 38.
Pyramidella (?) *interstincta*, Jeffr. in Ann. Nat. Hist. 1841, p. 165.

Linny Bay, Pembrokeshire (Adams). Bigberry Bay, Devonshire (Mont.). Aberdeen (Macgillivray). Tynemouth and Cullercoats (Alder). Whitburn (Mr. Richard Howse). Swansea coast; Tenby; Sandwich; Scarborough; Cork; Dublin Bay; Oban. West coast of Scotland; Birtabuy Bay, Galway; Guernsey (Mr. Barlee).

Var. *a*. angustior et plus cylindrica.

Odostomia oblonga, Macg. 157.
"*Odostomia costata*, Bean MSS.," Alder, Cat. 52.

Aberdeen (Macgillivray). Scarborough (Bean). Exmouth; Falmouth; Whitesand Bay, Cornwall; Tenby; Oban; Lochs Kishorn and Broom, Ross-shire; Lerwick Sound in five fathoms; Bantry Bay. West coast of Scotland (Mr. Barlee).

Var. *b.* elongata; costæ pauciores et obliquiores; denticulus validior.

Oxwich Bay near Swansea; Cork Harbour.

One of our most common species.

The *Turbo interstinctus* of Adams (to whom Montagu has referred) is described by him as "testa *lævi* quinque anfractibus, costa tenui interstinctis;" and I have little doubt that this species is his *Turbo canaliculatus*. But his descriptions and figures are too indistinct to justify my changing Montagu's name.

20. *Odostomia indistincta.*

Turbo turritus septem anfractibus strigatis, apertura ovali, Walk. 11. fig. 40?
Turbo indistinctus, Mont. Supp. 129; Turt. 215.
Turritella truncata, Fl. 303.
Chemnitzia terebellum, Ph. ii. 138. tab. 24. fig. 12.
Pyramis indistinctus, Br. 14. pl. 9. fig. 47.
Chemnitzia indistincta, Alder, Cat. 48.
Chemnitzia curvicostata, Wood, Crag Mollusca, part 1. p. 79. tab. 10. fig. 1–1[a].

Exmouth; Tenby; Bantry Bay; Cork Harbour; Zetland, five miles east of Lerwick, in forty fathoms. West coast of Scotland; Birtabuy Bay, co. Galway (Mr. Barlee).

Var. *a.* minor.

Rissoa Balliæ, Thomps. Ann. Nat. Hist. v. 98. pl. 2. f. 9.

Youghal, Miss M. Ball (Thomps.). Oxwich Bay near Swansea.

Var. *b.* spira elatiore.

Falmouth; Weymouth; Dublin Bay.

A local species.

I am not quite satisfied that this species is distinct from the last (*interstincta*). The only distinguishing characters appear to be its more cylindrical form and the absence of a tooth. It is also a thinner shell.

I do not know the *Pyramis lacteus* of Brown (p. 15. pl. 9. fig. 58), unless his description was taken from a worn specimen of this shell, as he describes the longitudinal ribs as being "not very distinct."

21. *Odostomia pellucida.*

Turbo quatuor anfractibus, subumbilicatus, reticulatus, apertura ovali, Walk. 14. fig. 52?
Turbo pellucidus, Adams in Linn. Trans. vol. iii. p. 66. figs. 33, 34.
Turbo decussatus, Mont. 322. tab. 12. fig. 4; Turt. 210; Fl. 299; Thorpe, 169.
Helix arenaria, Mat. and Rack. in Linn. Trans. viii. 214.

Turbo arenarius, Dillw. ii. p. 839.
Rissoa arenaria, Br. 12. pl. 9. fig. 12.
Cingula decussata, Thorpe, 43.
Odostomia pellucida, Wood, Crag. Moll. part 1. p. 86. tab. 9. fig. 4 *a–b* ?

Sandwich (Boys). Pembrokeshire coast (Adams). Salcomb Bay (Mont.). Western coasts and Dublin Bay (Turton). Exmouth; Bantry Bay; Oban; Lerwick Sound, and five miles east of Lerwick, in forty fathoms. West coast of Scotland; Arran Isle, co. Galway (Mr. Barlee).

A local and rare species.

22. *Odostomia fenestrata.*

Testa conico-cylindracea, solidula, sordide albescens; anfractus 8, complanati, turriti et sensim decrescentes, longitudinaliter notati 16 obliquis costellis qui 3 majoribus et 1 minore costellis transversim decussati sunt, duobus superioribus cæteros anfractus subtus circumornantibus, basi testæ glabro; apex prominulus; sutura profunda; apertura ovalis, $\frac{1}{4}$ testæ subæquans, subtus parum effusa aut subcanaliculata; peristoma aliquantulum incrassatum ad columellam; umbilicus nullus. Long. fere $\frac{1}{8}$, lat. $\frac{1}{20}$ unc.

Dredged by Mr. MacAndrew off Dartmouth, and since by Dr. Battersby at Torquay.

A local species.

It may possibly be the *Pyramis spirolinus* of Brown (15. pl. 9. fig. 66), but he describes that shell as having numerous spiral striæ instead of the four ribs at the base of each whorl.

This species was first noticed and named by Professor Edward Forbes at the meeting of the British Association in 1846, but no account of it appears in their reports.

23. *Odostomia excavata.*

Rissoa excavata, Phil. vol. i. p. 154. tab. 10. fig. 6.
Rissoa Harveyi, Thomps. in Ann. Nat. Hist. vol. v. (1840), p. 97. pl. 2. fig. 11.
Parthenia turrita (Metcalfe), Thorpe, 44.
Odostomia pupa, Wood, Crag Mollusca, part 1. p. 86. tab. 9. fig. 5 *a–b*.

Milltown Malbay, co. Clare (Mr. Harvey). Guernsey (Mr. Metcalfe and Mr. Barlee). Lamlash Bay, Buteshire (Mr. Bean). Burrow Island; Arran Isle, co. Galway (Mr. Barlee).

A local and rare species.

24. *Odostomia clathrata.*

Testa cylindrica, subnitida, rufescenti-fusca, 20 longitudinalibus subcurvis et complanatis costis instructa, costæ interstitiis latiores et ad basim ultimam testæ excurrentes, 6 costellis vix $\frac{1}{4}$ aliorum magnitudine clathratæ; anfractus 7, convexiusculi; apex subacutus; sutura profunda et subobliqua; apertura rotundato-ovalis; peristoma fere continuum et non reflexum; umbilicus distinctus, angustus. Long. $\frac{1}{6}$, lat. $\frac{1}{20}$ unc.

Birtabuy Bay, co. Galway, where a single specimen was found by Mr. Barlee.

Very distinct from any of its congeners.

25. *Odostomia scalaris.*

Turritella indistincta, Fl. 304; Thorpe. 191.
Melania scalaris, Phil. vol. i. p. 157. t. 9. fig. 9.
Eulima decussata, Jeffr. in Mal. and Conch. Mag. (1839), part I. p. 34.
Chemnitzia scalaris, Ph. ii. 137.
Chemnitzia rufescens, Forb. in Brit. Assoc. Rep. 1845; Jeffr. in Ann. Nat. Hist. 1847, p. 311.
Turbonilla interrupta, Lov. 18.
Chemnitzia rufa, Wood, Cr. Moll. part 1. p. 79. tab. 10. figs. 2, 2^a, 2^b?

Loch Broom (Fleming). Oban; Lochs Gair and Broom, Ross-shire. Loch Fyne and west coast of Scotland (Mr. Barlee).

A local species.

Var. *a.* testacei coloris; costæ admodum pauciores.

Exmouth (Mr. Clark, who gave to this variety the MS. name of *Jeffreysii*). Fishguard. Dartmouth; Milford Haven (Mr. MacAndrew). Guernsey (Mr. Barlee).

Local and rare.

Fragments of a shell resembling this variety, but stronger and of a pure glossy white colour, the ribs being also much sharper and more distant, occurred to me in dredging off Fishguard (in thirty fathoms water) in 1842. It may be the *Turbo marginatus* of Montagu. In *Turbo coniferus* (Mont.) the ribs are described as undulating, and in his *denticulatus* there occur transverse striæ.

26. *Odostomia rufa.*

Turbo simillimus, Mont. Suppl. 136?; Lask. Wern. Mem. 406. fig. 15?; Turt. 209?
Turritella simillima, Fl. 305?; Thorpe, 190?
Melania rufa, Phil. vol. i. p. 156. tab. 9. fig. 7.
Turritella fulvocincta, Thomps. Ann. Nat. Hist. vol. v. p. 98; Thorpe, 191. fig. 19; Alder, Cat. 48.
Chemnitzia rufa, Phil. ii. 136.
Pyramis crenatus, Br. 14. pl. 9. fig. 53.
Pyramis simillimus, id. 15. pl. 9. fig. 83?
Turbonilla rufa, Lov. 18.

Chemnitzia similis, Wood, Cr. Moll. part 1. p. 84. tab. 9. fig. 11 *a–c*?

Portmarnock near Dublin, Miss M. Ball (Thomps.). Northumberland coast (Alder). Oxwich Bay near Swansea in fifteen fathoms water; Fishguard in eight fathoms; Dublin Bay; Dealvoe, Zetland. Loch Fyne; Oban; Birtabuy Bay, co. Galway (Mr. Barlee).

Var. *a*. minor, angustior; costæ plus numerosæ et obliquiores.

Zetland, five miles east of Lerwick, in forty fathoms water. Bantry Bay (Mr. J. D. Humphreys). Oban; Loch Fyne (Mr. Barlee).

Var. *b*. multo minor et gracilior.

South of Devon (Mrs. Richard Smith).

A local species.

Most probably the *Turbo simillimus* of Montagu; but that author did not notice in his description the transverse striæ. Nor has Philippi described the rufous band which encircles each whorl at its base, although in every other respect the species agrees with his description of *rufa*. The *Odostomia simillima* of Wood, who refers it to the *Turbo simillimus* of Montagu, is a very different shell.

Under a powerful magnifier some indistinct longitudinal striæ are observable in the interstices of the ribs.

27. *Odostomia formosa.*

Testa elongata, gracilissima, solidula, alba, 20 longitudinalibus subrectis angustis et prominulis costis instructa, cujusque anfractus sutura interruptis, et transversim interstitiis striata; costæ subtus profunde punctatæ, striæ interstitiales curvæ sub lente lineas confertas efformantes, diameter cujusque costæ et spatii interstitialis fere æqualis; basis transversim striatus; anfractus 14, convexiusculi, superne turriculati; sutura subobliqua, profundissima et distincta; apex acutissimus; apertura ovato-quadrata et in superiore parte columellæ plica indistincta et obliqua instructa; labium columellare rectum. Long. $\frac{3}{16}$, lat. $\frac{1}{16}$ unc.

Oxwich Bay near Swansea. Shellness, Kent (Mr. G. B. Sowerby). Bantry Bay (Mr. MacAndrew).

Very rare.

This most elegant species is easily distinguishable from either of the slender varieties of *rufa* by the colour, much more slender and tapering form, the whorls being turriculate and suture rather oblique, the peculiar character of the interstitial transverse striæ, and by the more elongated and subquadrate form of the aperture.

28. *Odostomia lactea.*

Turbo lacteus, Linn. Syst. Nat. (13th ed.) 3604.

Turbo turritus novem anfractibus striatis, apertura rotunda, Walk. 11. fig. 39.

Turbo acutus, Donovan, Br. Sh. pl. 179.

Turbo elegantissimus, Mont. 298. tab. 10. fig. 2; Turt. 209.

Helix elegantissima, Mat. and Rack. Linn. Trans. vol. viii. 209.

Eulima elegantissima, Risso, vol. iv. p. 123; Jeffr. in Mal. and Conch. Mag. part 1 (1839), p. 34; Macg. Moll. Ab. 141.

Turritella elegantissima, Fl. 303; Thorpe, 189. fig. 34.

Melania Campanellæ, Phil. i. p. 156. tab. 9. fig. 5.

Melania (subg. *Eulima*) *elegantissima*, Forb. Mal. Mon. 15.

Chemnitzia elegantissima, Phil. ii. 136; Wood, Cr. Moll. part 1. p. 81. tab. 10. fig. 5[a]?

Rissoa turritella (Scacchi), Phil. ii. 136.

Pyramis elegantissimus, Br. 14. pl. 9. fig. 61.

Parthenia elegantissima (Lowe), Humphr. Fauna and Flora of Cork, 10.

Sandwich (Boys). Falmouth Harbour; Salcomb Bay; Ilfracombe (Mont.). Western coasts and Dublin Bay (Turton). Douglas Bay, Isle of Man (Forbes). Aberdeen (Macgillivray). Cork Harbour and Youghal Bay (Humphreys). Swansea and adjacent bays; Tenby; Exmouth; Weymouth; Bantry Bay at low water; Dublin Bay; Cork Harbour; Oban; Loch Carron, Ross-shire. West coast of Scotland; Arran Isle, co. Galway (Mr. Barlee). Milford Haven (Mr. MacAndrew).

Var. *a*. costæ obliquiores.

Cork Harbour.

Var. *b*. minor; spira breviore; costæ subrectæ.

Barricane, North Devon (Miss Jeffreys). Burrow Island (Mr. Barlee). Ilfracombe (Mr. Alder).

Var. *c*. minor; spira breviore; costæ obliquæ et curvæ.

Chemnitzia pusilla, Phil. ii. 224. tab. 28. fig. 21.

Exmouth (Mr. Clark).

Monstr. spira subarcuata.

Turbo subarcuatus, Adams in Linn. Trans. vol. iii. p. 66. figs. 27, 28.

Pyramis subarcuatus, Br. 14. pl. 9. fig. 62.

Pembrokeshire coast (Adams). Bantry Bay.

Var. *d*. minor et angustior; costæ plus numerosæ et subrectiores.

Chemnitzia gracilis, Phil. ii. 137. tab. 24. fig. 11.

Pyramis lacteus, Br. 15. pl. 9. fig. 58?

Oxwich Bay near Swansea; Falmouth; Bantry Bay; Dublin Bay. Birtabuy Bay, co. Galway (Mr. Barlee).

29. *Odostomia Scillæ.*

Eulima crassula, Jeffr. in Mal. and Conch. Mag. part 1 (1839), p. 34.
Eulima Scillæ, Phil. ii. (1844) 135. tab. 24. fig. 6.
Eulima MacAndrei, Forbes in Ann. Nat. Hist. (Dec. 1844) p. 412.
Turritella Scillæ, Lov. 18.
Eulimella crassula, Jeffr. in Ann. Nat. Hist. 1847, p. 311.

Oban; Loch Broom; Skye. Loch Fyne (Mr. Barlee and Mr. MacAndrew).

A local and rare species.

Var. *a.* ? minor, plus cylindrica.

A single specimen of this shell, which for the present I can only consider a variety of *Scillæ,* although the discovery of more specimens may give it a claim to specific distinction, was found by Mr. Barlee in dredging off Stornaway in the Hebrides last year. It is apparently only half-grown, but is peculiar from its wanting the conical form of the present species.

30. *Odostomia clavula.*

Turbonilla clavula, Lov. 18 (certe).

Torquay (Dr. Battersby). Brixham (Mr. Hanley).

Very rare. I have only seen four specimens from these localities. It is undoubtedly Lovén's species, as I have had an opportunity of examining specimens from, and named by, him. My reference (in the Annals of Nat. Hist.) of the next species to that shell was made before I had the opportunity of such examination and is erroneous.

This differs from the next species (*acicula*) in its much smaller size, the angular convexity of each whorl, and its possessing a distinct umbilicus.

31. *Odostomia acicula.*

Melania acicula, Phil. i. p. 158. tab. 9. fig. 6.
Eulima acicula, id. ii. 135; Alder, Cat. 49.
Pyramis lævis, Br. 14. pl. 9. figs. 51, 52?
Eulimella clavula, Jeffr. in Ann. Nat. Hist. 1847, p. 17.

Bantry Bay; Zetland, five miles east of Lerwick, in forty fathoms water. Burrow Island, Devonshire; Birtabuy Bay and Arran Isle, co. Galway; Loch Fyne and other parts of the west coast of Scotland (Mr. Barlee). Whitburn, Rev. G. B. Abbes and Mr. Howse (Alder).

Var. *a.* gracilior; anfractibus magis complanatis et subtus aliquantulum carinatis.

Tenby; Exmouth. Dartmouth (Mr. MacAndrew). Torquay (Dr. Battersby).

Var. *b.* spira elongata, anfractibus magis compactis.

Coast of Devon (Mr. Richard Damon).

Var. *c.* minor, spira et anfractibus compactis.

Oban. Torquay (Dr. Battersby).

A rare species.

Not the *Rissoa acicula* of Risso.

Fresh specimens are most minutely and closely striated in a concentric direction.

The variety *a.* may possibly be considered a distinct species; but judging from its analogy with other species of the same genus, I do not consider the distinctive characters sufficient to justify my separating it specifically.

32. *Odostomia affinis.*

Parthenia turris, Forb. Ægean Invert. in Brit. Assoc. Rep. 1843, p. 188?

Eulima affinis, Phil. ii. 135. tab. 24. fig. 7; Jeffr. in Ann. Nat. Hist. 1847, p. 17.

Eulimella gracilis, Jeffr. in Ann. Nat. Hist. 1846, p. 311.

Skye. Oban; Loch Fyne; Guernsey (Mr. Barlee).

A local and rare species.

I cannot identify any of these shells with the descriptions and figures in Gould's Report on the Invertebrata of Massachusetts, although Lovén has referred the *Odostomia scalaris* to the *Turritella interrupta* of that author and Totten.

The *Odostomia semicostata* and *Marionæ* of Macgillivray (Moll. Aberdeen) are the young of *Rissoa communis*.

On taking a review of this catalogue it appears that the total number of species here noticed and described are thirty-two; out of which nine (viz. *notata, alba, dubia, acuta, diaphana, dolioliformis, fenestrata, clathrata* and *formosa*) have been now for the first time described, and one (*clavula*) is new to this country; nine of the species (viz. *conoidea, indistincta, excavata, scalaris, rufa, lactea, Scillæ, acicula* and *affinis*) have been described and figured by Philippi as occurring on the coast of Sicily. Another species (*interstincta*) has been described by Recluz as occurring on the coast of Normandy. Ten species (viz. *scalaris, rufa, Scillæ, clavula, insculpta, conoidea, spiralis, albella, unidentata* and *pallida*) have been noticed by Lovén as inhabiting the Scandinavian coasts. Seven only (viz. *conoidea, indistincta, pellucida, excavata, scalaris, rufa* and *lactea*) are included in Wood's list of the Crag fossils; and one species (*lactea*) seems to be indigenous to the middle and south of Europe, but not further north than Scotland.

Before concluding, I would take the opportunity of expressing my thanks to the Rev. Dr. Fleming, Professor Macgillivray, Mr. Hanley, Mr. Metcalfe, Mr. Alder, Mr. Bean, Mr. MacAndrew, the Rev. G. M. Beevor, Dr. Battersby, and my zealous fellow-labourer Mr. Barlee, for the kind assistance they have afforded me in my examination of their collections as well as the transmission and use of their specimens for comparison.

XXXVII.—*Notices of British Shells.* By J. G. Jeffreys, F.R.S.

Rissoa pulcherrima.

Shell ovato-conical, thin, semitransparent, smooth and somewhat glossy, of a yellowish colour, marked on each whorl with four equidistant rows of reddish brown spots (about twelve in each row) which are generally confluent on the upper row, giving it a streaky appearance; whorls $4\frac{1}{2}$, convex and rather swollen, the last being about half the size of the spire; apex blunt; suture deep and distinct; base broad and spread; aperture roundish; peristome detached and simple, slightly thickened on the pillar side; umbilicus small but deep; length $\frac{1}{20}$, breadth $\frac{1}{30}$ of an inch.

Several specimens of this exquisite little shell were found by Mr. Barlee at the roots of *Corallina officinalis* on the shores of Guernsey and Sark.

Rissoa (?) *opalina.*

Shell ovato-globose, thin, transparent, very smooth and glossy, of a brownish colour and prismatic lustre; whorls 3, convex, the last exceeding in size $\frac{3}{4}$ths of the spire; suture distinct; apex blunt and rounded; aperture roundish oval, large; outer lip of the peristome thin, and not reflected or margined; inner lip rather straight and thickened, not detached from the pillar; umbilicus forming a narrow groove behind it; operculum horny, thin, concentrically striate, and having its nucleus on the side next the pillar-lip; length $\frac{1}{20}$, breadth $\frac{1}{25}$ of an inch.

It is probably allied generically to *Turbo nivosus* of Montagu (*Rissoa glabra* of Alder, not Brown), but the animal is not known.

At the roots of *Corallina officinalis* on the shores of Guernsey and Sark (Mr. Barlee): rare.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

June 6, 1848.—E. Forster, Esq., V.P., in the Chair.

Read a "Notice of some Peloria varieties of *Viola canina*, L." By Edward Forbes, Esq., F.R.S., F.L.S., Professor of Botany in King's College, London.

These monstrosities were collected by Prof. Forbes in the Isle of Portland in the month of April. The plants in which they occurred were infested by the parasitic fungus figured in Sowerby's 'English Fungi' under the name of *Granularia Violæ*, and afforded not only many distortions of the foliaceous organs evidently due to the presence of the fungus, but also various monstrosities of the flower, of which the author gives a particular description illustrated by drawings.

These were found chiefly in the small variety of *Viola canina*, figured in the 'Supplement to English Botany' as *Viola flavicornis*. One of these plants had two two-spurred flowers exactly similar and deviating from the ordinary structure in the following particulars:—There were four sepals, all enlarged and diseased, the superior being smaller than the others, the two lateral equal but abnormally large, and the anterior largest and not quite regular. The petals were also four in number, the two uppermost being regular and the two lowermost spurred. Each of the former had the little tufts of hairs seen on the lateral petals in the normal flower, and were similarly pale at the base and lineated with purple, while the two spurred petals were smooth and lineated. Of the four stamens the three uppermost were normal, the fourth much enlarged; there were no antherine appendages, but at the bottom of each petal-spur there was a strong ridge not usually present and as if representing these appendages. From these appearances the author infers that in these instances the two superior petals were abortive, the tufts of hairs on the two remaining superior petals showing that they correspond with the two lateral petals of the ordinary flower; and that the two spurred petals were developed in the place of the ordinary single anterior petal. He regards the enlarged anterior stamen as consisting of two, each making an unsuccessful effort to develope an appendage; and the enlarged anterior sepal also as made up of the union of the two ordinary lower sepals.

In the former case the floral envelopes were regulated by the number 4: Prof. Forbes proceeds to describe a still more remarkable case of *Peloria*, in which they were regulated by the number 3. The three sepals are of normal and equal dimensions and the three petals all spurred, and nearly but not quite equal, the odd one, which is inferior, having a larger spur than either of the other two. There is no tuft of hairs on any of the petals, but they are all lineated. The stamina are five, all furnished with appendages, the two lowermost of which, fully developed, penetrate the spur of the anterior petal, while the spur of the left upper petal receives the fully-developed appendage of one of the stamina, and that of the right also one fully-developed appendage, the appendage of the fifth stamen (small and only partially developed) bending back after proceeding only a little way. A little below the flower, between it and the true bracteæ, which present their usual appearance, there is a whorl of five bract-like sepals, between two of which, and directly beneath the largest-spurred petal of the monstrous flower, is a single petal partially developed and exhibiting an abortive spur. "In this case," the author proceeds, "we have the outer whorl of floral envelopes developed, and an effort made towards the development of the second in the aborted basal petal; then the axis elongating and terminating in a flower in which two of the sepals are aborted and four of the petals, viz. the two laterals and two superior ones, for the absence of tufts of hairs prevents our regarding two of the three as the former, and the presence of lineated bases shows that they are not the latter. They are repetitions of the basal petal, which in this instance is multiplied by three, as in the cases before described it was multiplied by two." In this plant no traces of the fungus were observed.

Prof. Forbes cites the instances of Peloria among Violets recorded by Leers and DeCandolle, and refers to the view adopted by the latter and by M. Moquin-Tandon, viz. that the Peloria is caused by the tendency of all the petals to assume a spurred condition in consequence of a general effort as it were on the part of an irregular flower to become regular. He states that DeCandolle's figures are not sufficient to enable him to judge if such was the case in the instances depicted by him, but maintains that the Peloria Violets which form the subject of the present communication "owe their monstrous regularity to a very different phænomenon, viz. *the effort of an irregular flower to become regular by the multiplication and symmetricalization of its irregular parts.*"

Read also "Descriptions of some new or imperfectly known species of *Bolboceras*." By J. O. Westwood, Esq., F.L.S. &c.

In this paper Mr. Westwood proceeds, in continuation of his former communication (see p. 143), containing a Synopsis of the Australian species of *Bolboceras*, to give descriptions of others of the genus from various parts of the world, and especially from the East Indies. The descriptions were accompanied as before with illustrative drawings.

1. Bolboceras Cyclops, *Fabr.* (Ent. Syst. i. p. 15; Oliv. Ent. i. 3. t. 15. f. 140); ferrugineus; clypeo anticè carinâ transversâ tuberculisque duobus acutis instructo, vertice lineâ tenui parùm elevatâ inter oculos, pronoto utrinque excavatione profundâ subrotundâ anticè cornu acuto alteroque minori versus medium armato: spatio inter cornua intermedia plano punctato anticè lineâ semicirculari parùm elevatâ cincto canali vix distincto longitudinali ante scutellum terminato, elytris punctato-striatis striis tenuibus, tibiis anticis 8-dentatis. ♂—Long. corp. lin. 9.

Variat mas magnitudine dentium capitis et pronoti necnon profunditate excavationum hujus lateralium.

Hab. in Javâ, Assam, et Indiâ centrali. Mus. Hope (olim Lee) et nostr. (*Hearsey*).

2. Bolboceras grandis, *Hope MSS.*; rufo-castaneus, capite dentibusque tibiarum anticarum nigricantibus, clypeo carinâ tenui semicirculari, vertice carinâ transversâ inter oculorum partem anticam, pronoto convexo carinâ semicirculari tuberculisque duobus versus marginem anticam lineâque tenui longitudinali impressâ mediâ in parte posticâ.—Long. corp. lin. 9.
Hab. in Indiâ orientali? In Mus. D. Hope.

3. Bolboceras furcicollis, *De Laporte* (An. Art. Coleopt. vol. ii. p. 104. no. 3); castaneo-rufus, sub lente granulosus, clypeo maris quadrato plano anticè bisinuato angulis lateralibus anticis in cornua duo porrectis, pronoto posticè elevato disco in medio cornubus duobus erectis distantibus recurvis alterisque duobus intùs concavis versus angulos posticos canali lævi mediano versus marginem posticam, elytris punctato-striatis, tibiis anticis extùs 6-dentatis.—Long. corp. lin. 10.
B. Lecontei, *Dej. Catal. Coleopt.*
Hab. in Americâ boreali (teste De Laporte et Mus. Hope et Gory), an recte?

4. Bolboceras ferrugineus, *De Laporte* (Hist. Nat. An. Art. Col. vol. ii. p. 104. no. 4); castaneo-fulvus sub lente granulosus, capite anticè carinâ sinuatâ anticâ tuberculoque subbifido tertio inter oculos, pronoto ante medium spatiis duobus parùm elevatis lævibus lineâ tenui impressâ punctatâ (ferè ad marginem posticum extensâ) divisis utrinque etiam versus angulos posticos impressione obliquâ suprà carinâ lævi marginatâ, elytris punctato-striatis, tibiis anticis 6-dentatis.—Long. corp. lin. 9½.
Hab. in Indiâ orientali! In Mus. Gory, nunc Hope.

5. Bolboceras carenicollis, *De Laporte* (Hist. Nat. An. Art. Coleopt. vol. ii. p. 104. no. 2); *B. ferrugineo* affinis sed magis castaneus, sub lente granulosus, capite carinâ tenui marginali curvatâ verticeque tuberculis duobus parvis conicis inter oculos carinâ connexis, pronoto obscuro in medio carinâ transversâ abbreviatâ instructo maculâque nigrâ utrinque versus angulos posticos, elytris striatis striis punctis minutis, tibiis anticis 5-dentatis.—Long. corp. lin. 10.
Hab. in Indiâ orientali. In Mus. Gory (nunc Hope).

6. Bolboceras Calanus, *Hope MSS.*; fulvus vel rufo-castaneus, clypeo posticè bicornuto, prothorace cornubus 4 versus marginem anticam duobus intermediis contiguis et a reliquis cavitate rotundatâ utrinque separatis.—Long. corp. lin. 7–8½.
Hab. in Indiâ orientali, Bombay. In Mus. Melly et Hope.

7. Bolboceras lævicollis, *Westw.*; fulvo-castaneus, vertice ante medium bidentato, prothorace glabro tuberculis 4 versus marginem anticam æquidistantibus duobus intermediis carinâ tenui curvâ conjunctis.—Long. corp. lin. 9½.
Hab. in Indiâ orientali. In Mus. Hope.

8. Bolboceras lateralis, *Westw.*; castaneus, capite pedibusque nigricantibus, capite inermi, prothorace ferè lævi, excavationibus duabus lateralibus rotundatis singulâ suprà tuberculo acuto armatâ.—Long. corp. lin. 6.
Hab. in Indiâ orientali, Gogo. In Mus. Hope.

9. Bolboceras nigricans, *Westw.*; piceo-niger nitidus, clypeo tuberculo conico anticè armato, verticis marginibus lateralibus utrinque bituberculatis discoque carinâ elevatâ inter oculos instructo, prothorace glabro

nitido anticè retuso 4-dentato dentibus subæquidistantibus.—Long. corp. lin. 6.

10. Bolboceras politus, *Westw.*; nitidus fulvus, capite et pronoto magis castaneis, capite anticè tricorni cornu antico majori erecto, prothorace excavatione maximâ dorsali posticè trisinuatâ, elytris punctato-striatis, tibiis anticis 5-dentatis dentibus anticis magnis acutis.—Long. corp. lin. 6½.

Hab. in Senegaliâ. In Mus. Hope (olim Gory) nomine *Athyreus porcatus*, Lap., *senegalensis*, Dej., haud rectè inscriptus.

11. Bolboceras Coryphæus, *Fabr.* (Ent. Syst. i. p. 9; Oliv. Ent. i. 3. tab. 16. f. 150); rufo-fulvus, capite suprà plano, clypeo anticè bicorni cornubus recurvis apice nigris posticèque mucrone elevato brevissimo nigro, pronoto anticè retuso cornubus duobus brevibus approximatis anticè porrectis apice nigris in medio disco positis posticè gibbere obtuso in excavatione parùm profundâ instructo, elytris punctato-striatis, tibiis anticis 5-dentatis.—Long. corp. lin. 8.

Hab. ad Caput Bonæ Spei (teste Fabricio). In Mus. Hope (olim Lee).

12. Bolboceras scabricollis, *Chevrol. MSS.*; ferrugineus, capite et pronoto magis piceis punctis minutis plus minusve confluentibus scabriusculis, capite in medio carinâ brevi transversâ sub 3-lobatâ, pronoto impressionibus tribus longitudinalibus ferè obliteratis.—Long. corp. lin. 8.

Hab. apud Caput Bonæ Spei. In Mus. D. Chevrolat.

13. Bolboceras capitatus, *Westw.*; obscurè castaneus subnitidus, capite et pronoto minutissimè punctatis hoc utrinque excavatione maximâ cornubus duobus compositis magnis separatâ, tibiis anticis obtusè 6-dentatis.—Long. corp. lin. 10½.

Hab. in Assam, Indiæ orientalis. Mus. Melly et Saunders.

14. Bolboceras inæqualis, *Westw.*; rufo-castaneus, antennarum clavâ fulvâ, capite suprà concavo carinâ transversâ in parte posticâ, pronoto anticè valdè retuso suprà quadridentato fossulâque mediâ profundâ, elytris striato-punctatis, tibiis anticis 6-dentatis.—Long. corp. lin. 6¼.

Hab. in Indiâ orientali. *Col. J. B. Hearsey*; in Mus. nostr.

15. Bolboceras bicarinatus, *Westw.*; castaneo-fulvus, capite inter oculos et ad basin clypei carinis duabus transversis nigris, pronoto tuberculis duobus parvis parùm elevatis ante medium, tibiis anticis 7-dentatis.—Long. corp. lin. 8½.

Hab. in Indiâ orientali. Mus. Melly.

16. Bolboceras dorsalis, *Westw.*; rufo-castaneus, capitis vertice et pronoto medio nigris punctatis, capite in medio verticis tuberculis tribus conjunctis instructo, pronoto punctatissimo ferè regulari, tibiis anticis 8-dentatis.—Long. corp. lin. 7½.

Hab. in Indiâ orientali. Mus. W. W. Saunders.

17. Bolboceras nigriceps, *Westw.*; obscurè castaneus, punctatus, capite nigricanti carinâ arcuatâ ad basin clypei tuberculisque tribus verticalibus, pronoto lineâ longitudinali impressâ utrinque cum tuberculo parùm elevato, tibiis anticis 7-dentatis.—Long. corp. lin. 7½.

Affinis præcedenti et forsitan fœmina speciei diversæ.

18. Bolboceras transversalis, *Westw.*; fulvo-castaneus, capite lato carinâ rectâ transversâ elevatâ inter oculos, pronoto lineâ longitudinali anticè dilatatâ impresso.—Long. corp. lin. 4½.

Hab. in Indiâ orientali. Mus. Melly.

19. Bolboceras indicus, *Hope MSS.*; fulvo-rufus, capite anticè tuberculis duobus conicis erectis armato, pronoto lævissimo anticè excavatione semicirculari parùm profundâ notato, calcari pedum anticorum elongato obtuso, tibiis anticis 9-dentatis.—Long. corp. lin. 4.
Hab. in Indiâ orientali centrali. In Mus. Saunders et Hope.

20. Bolboceras lineatus, *Melly MSS.*; fulvus nitidus, capite nigro punctato inter oculos tuberculo apice subbifido armato, pronoto simplici maculâ discoidali nigrâ, elytris convexis suturâ striisque longitudinalibus elevatis nigris, tibiis anticis 8-dentatis.—Long. corp. lin. $3\frac{3}{4}$.
Hab. in insulâ Ceylon. In Mus. Melly.

Subgenus Eucanthus, *Westw.*

Corpus minùs depressum quàm in reliquis; pronoto anticè haud retuso. *Tibiæ* anticæ dentibus duobus apicalibus magnis aliisque minutis externis versus basin armato. *Elytra* punctato-striata; singulo striis 5 tantùm inter humeros et suturam, punctis profundis.

21. Bolboceras (Eucanthus) Melibœus, *Fabricius* (Ent. Syst. i. p. 20); rufo- vel piceo-niger, clypeo carinâ transversâ plùs minùsve elevatâ (quasi e tuberculis duobus conjunctis formatâ) verticeque cornu brevissimo truncato (parùm emarginato) instructis, pronoto subdepresso inæquali, canali punctatâ longitudinali in medio (marginem anticam haud attingente) impressionibusque lateralibus curvatis punctatis tuberculoque utrinque instructis, elytris glaberrimis punctato-striatis.—Long. corp. lin. 4–$5\frac{1}{2}$.
Bolboceras concinnus, *Dejean, Cat. Coleopt.*
Hab. in Americâ boreali. In Mus. D. Hope.

Mr. Westwood concludes with some observations on *Bolb. Lazarus*, Fabr., which he regards as closely allied to, if not identical with, *Bolb. Melibœus* of the same author.

June 20.—E. Forster, Esq., V.P., in the Chair.

Read a Postscript to Mr. Newport's paper on *Pteronarcys regalis*. The author referred to the paper already read to show that the genus *Pteronarcys* ought to be arranged after *Perla*, and before *Capnia* and *Nemoura*, which it most nearly approaches in the structure of its alimentary canal; while *Perla* has affinities with the *Orthoptera* through the *Blattidæ*. The *Perla arenosa* of Pictet was regarded as making the nearest approach to the latter family, and this species was shown to be the *Perla abnormis* of Newman. The larva and pupa of this species were described from specimens taken by Mr. Barnston in Canada, and now in the British Museum, and the habits of the species were detailed as observed by that gentleman.

The generic characters of *Pteronarcys* were proposed to be revised as follows:—

Pteronarcys, *Newm.*

Char. Gen. *Segmenta thoracica* etiam in Imagine branchiis externis prædita. *Alæ* magnæ, reticulatæ. *Palpi maxillares* labialibus multò longiores, 5-articulati; articulis 2 basalibus brevibus, reliquis elongatis, externè dilatatis. *Mandibulæ* parvæ, obtusæ. *Segmentum abdominale* octavum in mari processu longo ventrali munitum, in fœminâ paulò evolutum vel bifidum.

Mr. Newport added the following new species:—

PTERONARCYS CALIFORNICUS ♂; capite thoraceque saturatè brunneis, fronte clypeo labroque rufis, oculis ocellisque nigris, segmentis thoracicis lineâ longitudinali interruptâ flavâ, abdomine aurantiaco lateribus brunneis, stylis caudalibus basi flavis, antennis pedibusque totis atris, alis obscuris nigro-nervosis sed absque maculâ stigmali.
Hab. in Californiâ (*D. Hartweg*).

The following apparently new species of Canadian *Perlidæ* were described, with remarks on the habits of each as observed by Mr. Barnston.

1. PERLA CITRONELLA (*Barnston MSS.*); saturatè flava, antennarum articulis 33–35, oculis ocellisque brunneis, alis hyalinis pallidè luteis margine costali flavis, abdominis dorso brunneo.—Long. lin. 3–3½.
Hab. in Canadâ, ad Albany River, latit. 54°.

2. PERLA MINIMA (*Barnston MSS.*); nigra nitida, antennarum articulis circa 26 submoniliformibus pilosis, fronte paululùm excavato, palpis subclavatis, thorace angusto subquadrato, stylis caudalibus 13-articulatis, alis obscuris nigro-nervosis in mari brevibus obtusis abdomen semicooperientibus in fœminâ amplis corpore longioribus.—Long. lin. 1¾–2.
Hab. in Canadâ, ad Albany River.

3. CAPNIA VERNALIS, *Newp.*; nigra nitida pilosa, thorace posticè rotundato, antennarum articulis 30–33 pubescentibus, alis obscuris pilosiusculis nervis magnis nigris, stylis caudalibus subulatis 21–23-articulatis. —Long. lin. 2½.
Perla vernalis, *Barnston MSS.*
Hab. in Canadâ, ad Albany River.

The fourth species, distinguished from most other *Nemouræ* by the short anterior wings of the male, the author proposed to join with *Nemoura trifasciata*, Pictet, which is similarly formed, in a subgenus for which he proposed the name *Brachyptera*.

4. NEMOURA (*Brachyptera*) GLACIALIS (*Barnston MSS.*). *Mas* saturatè brunneus ferè niger, thoracis margine anteriore recto, alis anterioribus triangularibus rudimentalibus segmentum abdominale primum tantùm attingentibus; posterioribus albidis longissimis acutis emarcidis decussatis, antennis elongatis pubescentibus 53–56-articulatis, pedibus longis compressis cursoriis; paris postremi longissimis, abdominis segmento terminali lato plano pubescente.
Fœmina multò major, in reliquis tamen similis, capite paululùm excavato, alis amplis obscurè brunneis nigro-nervosis.—Long. unc. ½.
Hab. in Canadâ, ad Albany River.

MISCELLANEOUS.

How to prevent the Attacks of the Bed-bug, Cimex lectularius. By JOHN BLACKWALL, F.L.S.

So numerous and important are the advantages which result from an exact and comprehensive knowledge of entomology, that few persons of liberal education, in the present day, are disposed to bestow ridicule upon those who direct their attention to this interesting branch of zoology. That such was not the case, however, even at a recent period, many individuals now living can bear testimony. To what fortunate combination of events then is the rapid change which has taken place to be ascribed? Chiefly, I apprehend, to the increased intelligence of the age, and to a growing taste for natural history; a taste, as regards the particular department here alluded to, promoted by numerous valuable publications on the subject which of late years have issued from the press; and especially, in this country, by the excellent 'Introduction to Entomology' by Messrs. Kirby and Spence, which has greatly contributed to the removal of prejudices formerly entertained against the investigation of the minute beings so ably and extensively treated upon in its pages.

Among the various benefits deducible from an intimate acquaintance with the structure, functions and œconomy of insects, such as exercise a direct influence upon our persons and property unquestionably occupy the foremost rank; consequently, the simple means which I am about to propose of obtaining protection from a disgusting creature whose irritating movements and venomous punctures nightly disturb the repose of thousands of the human race, may be expected to meet with the cordial approbation of all those who are compelled by their avocations, or by any other circumstances, to reside in large towns, where the bed-bug generally abounds.

Being strictly nocturnal in its habits, this loathsome pest quits its retreat in quest of prey during the silent hours of darkness, and the sphere of its annoying operations is limited almost entirely, if not wholly, to the precincts of beds. Now in order that its access to them may be effectually prevented, a careful examination of its organs of locomotion, for the purpose of ascertaining with precision the true character and extent of their powers, is indispensable; and as it is apterous, although included in the Linnæan order *Hemiptera*, the legs alone require to be minutely inspected.

It is a well-known fact that many insects are enabled to ascend hard dry bodies having polished perpendicular surfaces by the emission of a viscous secretion from certain appendages connected with their tarsi, while others, and by much the greater number of species, are utterly incapable of doing so in consequence of not being provided with the parts constituting this climbing apparatus; and as observation and experiment supply conclusive evidence that the bed-bug is comprised under the latter head, and is disqualified for leaping by its organization, an easy and sure method of counteracting its troublesome propensities immediately presents itself.

From the particulars already stated, it is sufficiently obvious that the bed-bug can obtain access to beds in no other manner than by climbing; and it is equally plain that it cannot ascend hard dry objects whose surfaces are highly polished and are either vertical, convex, or inclined from the base outwards; if, therefore, a bed be so placed that it does not touch any part of the room in which it is situated except the floor with its feet, and if they consist of truncated cones of glass with the smaller end downwards; or if each of the ordinary wooden feet be terminated by a truncated cone of glass inverted, or be closely encircled by a zone of the same material several inches broad and having its external surface convex, the desired end, total exemption from annoyance, will be attained. It is scarcely necessary to remark that the bed-furniture must not be in contact with any part of the room, or with the glass feet or zones.

In hot climates, where noxious animals of various kinds swarm, security during the hours of repose in bed from many species, which, though unable to fly or leap, can walk with facility upon a vertical surface of clean glass, may be effected by placing the feet of beds, guarded in the manner above described, in shallow vessels of any convenient size, shape and material containing finely pulverized chalk, gypsum, flour of wheat, or other dry substances reduced to an almost impalpable powder; the minute particles by their attachment to the climbing apparatus completely preventing its adhesion to the glass. The success of this plan depends upon the substances employed being thoroughly well comminuted and kept free from moisture.

I may mention, in conclusion, that a scientific friend of mine has recently caused the proposed method of affording security from the bed-bug to be carried into effect, and the parties for whose benefit the experiment was made affirm that it succeeds perfectly. In one instance only it appeared to fail, but the cause was soon detected; part of the drapery of the bed was found to be in contact with the floor of the room, and up this the bugs had evidently climbed, for, when the intruders were secured and the drapery was removed, all further attempts of this noisome insect to obtain access to the bed were unavailing. Of course when beds are infested with bugs they must be taken down, and recourse must be had to the most approved means of exterminating the vermin, such as stoving, scouring, washing, &c., before the glass protectors can be applied with advantage.

Notice of an English locality for Helix revelata, *Ferussac.*

Helix revelata was added to the British fauna by Professor Forbes, who discovered it near Doyle's Monument in Guernsey. Specimens from that place and from the adjacent islet of Lihou, the donation of Mr. Lukis, are preserved in the British Museum. In Pfeiffer's Monograph the island of Jersey is stated as a habitat, but without the citation of any authority. In June 1847 I met with this shell under stones on the top of a bank upon the down crowning a cliff near the harbour of Rozel, and looking towards the coast of France. Mr. William Thompson (Ann. and Mag. Nat. Hist. 1840), when comparing the Irish species of land and freshwater mollusca with those of Great Britain, laid some stress on the circumstance that *Helix aperta* and *H. revelata* had never been found in Great Britain, but only in the island of Guernsey. I have now the good fortune to announce the interesting fact of the occurrence of the latter shell in England. The discovery is due to my son, Mr. Arthur E. Benson, who on the 16th instant brought in a depilated specimen which he obtained under a stone on the peninsula of the castle of Pendennis, near Falmouth, and which an examination with the description and a specimen from Rozel showed to belong to the same species. A renewed search presented him on the following day with other specimens, two of which were in a living state, and their epidermis was provided with the short, rigid, sparse hairs observable in the normal state of the shell. At Pendennis the species is procured, as in Jersey, under stones on an open down, and not in shady places among nettles, as in Guernsey. It is worthy of notice that the geological structure of the neighbourhood of the new habitat corresponds with that of the Channel Islands and Brittany, and that the tract also presents a botanical similarity, *Tamarix Gallica* being an abundant product of the cliffs overhanging the sea.

The island of Jersey may be recorded as another British station for *Helix Pisana*, which is confined to so few localities in Cornwall, Wales and Ireland. The species is abundant on thistles by the seashore between St. Helier's and St. Aubin's.

Falmouth, Cornwall, Oct. 18, 1848. W. H. Benson.

P.S. Mr. Alder, to whom I forwarded an example, informs me that a specimen of *H. revelata* was found by Mr. Bellamy near Mevagissey (between Falmouth and Plymouth), that it was exhibited in 1841 at the Meeting of the British Association at Plymouth, and was published in Mr. Couch's 'Cornish Fauna'; also that Mr. W. P. Cocks had in 1846 found a live shell at Pendennis, where Mr. Alder in June 1847 searched without success. Including empty, crushed, and broken shells, Mr. A. Benson has taken thirty specimens, of which two, recently crushed with the enclosed animal, were left on the ground, and nineteen were brought in alive. The largest specimens are seven millimetres in greatest diameter (Pfeiffer gives the same measurement). My best Jersey specimen exceeds this size by half a millimetre.

Although I was mistaken in concluding from Pfeiffer's omission of an English habitat that the animal had not been taken in this country, yet its recent capture at Pendennis, where it is not confined to a single spot, satisfactorily corroborates the evidence of its claim, hitherto resting on two solitary specimens, to be considered a native of England. W. H. B.

Oct. 25, 1848.

Colossal Bones of the Iguanodon.

Dr. Mantell has recently obtained from the Wealden of the south-east of England several portions of femora and tibiæ of the Iguanodon more colossal than any hitherto discovered. The *shaft* of a thigh-bone is twenty-eight inches in circumference, exceeding by several inches the largest in the British Museum, and requiring even longer condyles than the gigantic distal extremity of a femur of the Iguanodon in the possession of a collector at Hastings. The medullary cavity is so capacious that the hand and arm might be thrust into it.

Extracts from a Letter to Thomas Bell, Esq., F.R.S., *from* George Clark, Esq., *of Mauritius.*

Port Louis, May 1st, 1848.

* * * "You have doubtless seen specimens of the musk-shrew, which is so common in most hot countries, and are acquainted with its general habits. You have most likely heard of the singular fact that instinct in them seems totally at fault, by leading them to cry out as soon as discovered, and thus frequently to bring destruction on themselves. Are you aware that the mammæ, instead of being distributed along the abdomen and thorax, as in most other quadrupeds of that sort, (indeed all, as far as I have learnt,) are placed like those of a cow, in the groins, three on each side? If this fact is new to you, I will send you a specimen in spirit. If the same peculiarity is observable in our English shrew, of which I think the muzzle is equally elongated and tapering, I should think that the dugs are so placed to render suction more easy, from the action of the several nurslings being so concentrated, and thereby causing a greater flow of milk to that spot. From the attenuated muzzle of this creature, the power of suction must be but small, and the same circumstance would enable the whole brood to suck in such a position as to radiate from a centre. I should be greatly obliged by your opinion on this point. There is another highly interesting fact connected with this little animal, which is strangely at variance with, and may in some degree compensate for, the anomaly of *erring instinct* just mentioned. If their nest is discovered while the young are in an unfledged state, and before their tiny eyes are open, the mother walks away, and one little one takes hold of her tail, another holding his, and so on, and the whole brood following thus in a line are conveyed to a place of safety. I may conclude by stating that I have never seen more than six of these in one litter, and that all the females I have examined have only six mammæ.

"I have never seen in any other place so great a variety of goats as this place possesses, and the characteristics are so various that I think they may interest you. Among these the largest is generally called here the "up-country goat;" they are of Indian origin, and have enormously long legs with lank and lean bodies and coarse bones. The head is shorter than in the ordinary European goats, and considerably deeper, with a very convex forehead—in many, the profile forms the segment of a circle. The males of this breed have very spreading horns, of considerable length, and spiral in their growth, and they are decidedly less salacious and vigorous than the smaller breeds. The horns of the female are very different, being nearly upright, and rarely exceeding 6 or 7 inches in length. Both have a kind of dewlap under the throat, which extends lower in the males than in the females. A very singular feature in them is the ears, which are sometimes very long; I have seen one female in which they are 19 inches long and $4\frac{3}{4}$ broad in the widest part. When not long, it is very common to see them crumpled up like a piece of burnt leather, and this peculiarity may be often met with where the parents on both sides had long ears;

it is also often observable that two kids produced at the same birth exhibit this remarkable difference. These goats are less prolific than the smaller breeds, seldom producing more than two at a birth, and going longer between their bearing than the others. There is as remarkable a difference in their udders as in their ears. Some have immense teats, and yield a great quantity of milk, while others are very deficient. This breed is, I am told, highly esteemed in India, and they fetch a higher price at Calcutta than any others; but they are here remarkably obnoxious to pulmonary disorders, and I have seen so many instances of this, that I am never disposed to purchase them. They are generally covered with a rather coarse hair, of moderate length, but very long in the thighs and breech. Black is the prevailing colour, and it is very common to see the ears covered with small white specks. The neck of this breed is usually carried at a greater angle with the body than in the other kinds: in some specimens this gives them an appearance approaching that of the lama. I have seen males of this kind 3 feet high at the shoulder, and females as much as 2 ft. 9 in. Many goats are brought hither from Muscat. They are a very pretty breed, of moderate size, with long hair hanging down from each side nearly to the knees. They have very pretty little heads, and the horns are very fine, and form a pretty curve backwards, spreading so little that they sometimes require to be cut to prevent them from hurting the cheeks, when they have grown so long as to turn forward, which occurs at 5 or 6 years of age. These are generally excellent milkers, but are very obnoxious to pulmonary disorders, connected with which is a very singular fact, which I can vouch for from at least a dozen cases that have occurred in my own flock. Goats in general, but this breed most especially, are subject to be infested with a louse of a dark red colour, having six legs. If these insects are very numerous, it is an infallible sign that the lungs are diseased; and they increase with the progress of the disorder, till at last they are in such numbers, that in the hollow of the flanks and behind the shoulders you cannot put a pin's head between them. They may be destroyed with tobacco or mercury; but in a few days the beast will be as much infested with them as before, and cannot be kept free. No matter how healthy the creature may appear; if there are many of these lice on it, you may be perfectly sure that the lungs are not sound. Another variety much like this in form, but of rather smaller size and with remarkably close hair, is brought from the upper part of the Persian Gulf. They are the prettiest goats I know, having remarkably small heads with full eyes, and horns like the last-mentioned in point of fineness, but much less curved. They are a very healthy breed, and much disposed to carry flesh. The teats of this race are, as far as I have seen, invariably pointed at the end and very full at the top, and their udders are particularly thin and soft. I have never seen a male of this breed, but there is a very singular feature in the males of the last-mentioned kind: the testicles are so separated in the scrotum as to have much the appearance of teats, and I once saw a person at a sale give a high price for one, under the idea that it was a female, with a fine show of milk. This peculiarity is more or less observable in all the males of this sort I have seen. Another well-defined variety of goat, of very valuable qualities, comes from the eastern shore of the Persian Gulf. They are of good size with a remarkably stately carriage, and their horns are mostly lyre-shaped, like some breeds of antelopes. Their hair is of moderate length, generally fine and wavy, and long on the posterior portion of the spine, as well as on the fore and hind legs, a little above the hocks and knees. Their udders are of the shape last-mentioned, and they are excellent milkers. I have seen some give as much as three quarts of milk in a day. They are mostly black with fawn-coloured legs, and almost invariably have fawn-coloured marks down the sides of the face. We have a large and small breed from Bengal, with very short legs, both excellent milkers, prolific and hardy. The large breed is almost invariably coal-black, and when in good condition would furnish about 80 lbs. of meat. They frequently produce four at a birth and sometimes five, and it is not rare to see their teats touching the ground. The smaller breed is of the same form, but very diminutive, and of all colours; they average from 15 to 18 inches in height and about 2½ feet in length, and are as prolific as the last-mentioned, and wonderfully precocious. I have *seen* a female of this breed conceive at *ten weeks old*, and bring forth a healthy kid, which she reared well. It is very common for them to take the male at three months, but they rarely conceive before the age of four months, and the males are not capable of engendering at less than six months old. As a matter of course, the race deteriorates very much where such premature production is allowed; and I have seen a flock dwindle down from a good size to little bigger than rabbits, from a continuation of this bad practice. A very fine breed of goats is brought from Patna and Benares, and among these many are pied in a very uncommon way. They are spotted with brown and fallow, black and gray, and black and white, but the most remarkable appearance consists in the shape of the spots, which are often all circular. These have a something of that convexity of forehead noticed in the first breed I mentioned, but the dewlap is almost entirely wanting. Their horns are generally short, and sometimes bend forward, and at others curl back just encircling the ears, and these are invariably lopped. The last variety I shall mention is from the island of Socotra, and destitute of horns. They are long and low, and generally have very large teats: I have seen some considerably thicker than an ordinary man's wrist. They are very good milkers, and disposed to fatten easily. I fear I have tired you with details which are perhaps stale to you, or if not, possessing little interest.

"With respect to the marks on the spine and shoulders, and occasionally the legs of ponies, I see that they occur much in the same degree as in England; but they are decidedly most prevalent in those of a dun and mouse colour, both which hues are common among the Javanese and Burmese ponies. I have had additional opportunity of verifying the fact that geldings stand their work as well as entire horses here, both by my own experience, and the testimony of persons of much judgement and observation. Mules are used here almost exclusively for plantation work, and we have them of various breeds. The finest cargo I ever saw came from Boston, U.S. They were almost all from high-bred mares, and many of them showed as much blood as thorough-bred horses, and they were as active as deer. I do not remember whether I mentioned them to you in my last; but, if I did not, I shall be very happy to give you a description of the various breeds of mules and asses employed in this colony. About three years ago the murrain cut off about nine-tenths of our horned cattle. In the herds attacked, not above one per cent. escaped, and they were generally old ones. A few months since it broke out again, and has cut off several fine herds without leaving a single head. It is said, I believe with truth, that it arose from the removal of a dung-heap in which some had been buried three years ago. It is stated that pigs are subject to it, but that it is much less fatal among them than with oxen, but I am not at all satisfied of the identity of the disease. It is also asserted that goats, sheep and deer are liable to its attacks, but having examined several goats said to have died of it when it was so prevalent here, I found no case in which the murrain was the cause of death, there being other evident causes.

"I do not know if you are aware that ipecacuanha, of which we have a wild variety very plentiful here, is a deadly and speedy poison to ruminating animals. It often happens that foreign cows, goats and sheep perish from eating it, but the natives very rarely touch it. A few leaves of it are sufficient to kill a goat in four or five hours." * * *

A Comparison between Sterna Cantiaca, *Gm., of Europe, and* Sterna acuflavida, *nobis, hitherto considered identical with* S. Cantiaca, *and a description of a new species of Wren.* By Dr. Cabot.

The following measurements from adult, full-plumaged specimens were given:

American.	Millimetres.	European.
Bill along ridge	49	57
,, ,, gape	64	75
From the nostril to the point of the bill	36	41
Length of nostril	6	9
Length of lower mandible along the centre (measuring to the feathers)	41	47
Length of do. do. along the side, do. do.	51	62
Width of bill at commencement of feathers	8	7½
Depth of do. do. do.	11¼	12½
Length of wing from flexure	290	317
Length of tail to tips of lateral feathers	136	149
Length of tarsus	25	28
Middle toe without the claw	18	21
Middle claw	7½	9
Inner toe with claw	17	20
Outer do. do.	21	26
Thumb	6½	8½

Besides these differences in the measurement of parts not subject to change from improper stuffing, &c., we find that the colouring differs in some very important particulars. In the American bird the yellow is strictly confined to the tip of the bill, and the line of union of the yellow and black is perpendicular and unbroken, whereas in the European bird the yellow runs up to the inner edge of the symphysis on the under side of the lower mandible, and almost as far on the upper edge; and on the upper mandible, also, it extends both on the edges and on the ridge much higher than in the American bird. The primaries are much darker in the American bird than in the European, and the white line which runs along the inner edges and forms their tips in the European bird, disappears in the American before it gets within half an inch of the tip; besides being much narrower. There are also some important differences in form. The projecting point at the symphysis on the under side of the lower mandible is more marked in the American than in the European bird. The claws of the European bird are larger and much more arched than those of the American. The bill of the European bird is much narrower in proportion than the American, and is more bent.

The specimen of *S. acuflavida* in his collection was procured at Tancah, on the coast of Yucatan, on the 25th of April, 1842, and is mentioned in the appendix of Mr. Stephens's Incidents of Travel in Yucatan, under the name of *S. Boysii*.

Troglodytes albinucha, a new species of Wren.

	Millimetres.
Total length	140
Length of wing from flexure	58
,, tail	51
,, head and bill	38
,, bill along the ridge	17
,, bill along the gape	22
Width of bill at feathers	$3\frac{1}{2}$
Depth ,, ,,	$3\frac{3}{4}$
Length of tarsus	20
,, middle toe with the claw	22
,, inner toe	15
,, outer toe	16
,, thumb	17

The bill is bent from the base to the tip. The claws are much curved and very sharp. The head, back, and upper sides of the wings and tail, brown; a line of white, with black or dark brown intermixed, passes over the eye, and meets with a similar line, which passes under it, and they form a patch on the sides of the neck extending round to the nape. Chin, throat and breast white; flanks and abdomen light yellowish brown, darkest near vent. On the rump are some white and dark brown or black spots intermixed with the brown of the rest of the back. Under tail-coverts, the outermost, and outer webs of next three tail-feathers, and outer edges of first and second primaries, barred with white or yellowish white and dark brown or black. There are many black bars running across upper side of wings and upper tail-coverts. The four middle tail-feathers are brown, with many black spots. The upper mandible is dark horn-colour; the under mandible is the same at its tip, but is almost white on the under side and at base. The fourth and fifth primaries are longest and the first is shortest.

The specimen from which the description was taken was the only one observed, and was procured near Yalahao, in Yucatan, April 6th, 1842.—*Proc. Bost. Soc. Nat. Hist. Nov.* 17, 1847, p. 257.

Description of a new species of Volute. By W. J. Broderip, Esq., F.R.S. etc.

Voluta signifer. *Vol. testâ ovato-fusiformi, longitudinaliter creberrimè lineatâ, subflavâ, signis spadiceo-brunneis irregularibus, interruptis vittatâ; spirâ mediocri, subtumidâ, apice subacuto-mammillari, glabro; anfractibus 3, ultimo longè maximo, subventricoso; labro acuto; columellâ quadriplicatâ, plicis magnis.*

Long. $3\frac{5}{8}$, lat. $1\frac{5}{8}$ poll.

Hab. In Oceano Orientali?

Two bands of detached, reddish-brown, irregular, interrupted spots wreathe the spiral whorls, and three such bands, with a trace of a fourth, adorn the body-whorl. There is a wide interval between the upper two of the bands of the body-whorl, and the third and trace of the fourth on the same whorl. An irregular linear dash of the same colour connects the three uppermost of these bands longitudinally and centrally. Indeed the colour seems disposed generally to run from the upper to the lower band of each pair. The terminal notch is very deep and is surmounted by an unusually strong elevated ridge.

The specimen is faded and rubbed, but in form is nearly perfect. When in fine condition *V. signifer* must be one of the most elegant of the beautiful family to which it belongs.

Mr. Cuming obtained this Volute in the present year, from the cabinet of Dr. Dalen of Rotterdam, by whom it was liberally presented to him, although Dr. Dalen had no other example of the shell. I never saw the species before, and as far as my experience goes, this is the only specimen known.—*Proc. Zool. Soc., Dec.* 12, 1847.

Extract from a Letter addressed, in June 1848, *by* Dr. Augustus A. Gould*, *of Boston, United States, to* Wm. Thompson, Esq., *Belfast.*

"I wish there was some depôt established in the two countries through which small packages and pamphlets might at all times be received and forwarded. Though we have now weekly intercourse with England, it is scarcely once a year that we can get a pamphlet or little package transmitted safely. If such a thing can be done on your side, we will arrange something on this side. A box might be forwarded once a month, into which all our naturalists might place everything they wished to send, and thus all be sent to one address for distribution†. The same thing being done on both sides, very great trouble, expense and uncertainty would be avoided."

* The author of a work on the 'Invertebrata of Massachusetts,' &c., and conjointly with Professor Agassiz of a small work lately published entitled 'Principles of Zoology.'

† We fear that the great difficulty would be in the distribution of the various packages, &c. on their arrival, and in reimbursing any one who should undertake this office. Pamphlets are not unfrequently directed at a venture to persons who decline to receive or pay for them. No agency would be so fit for the purpose as the Post-office, if the governments of the two countries would agree upon suitable arrangements in the interests of literature and science.—Ed.

METEOROLOGICAL OBSERVATIONS FOR SEPT. 1848.

Chiswick.—September 1. Clear and fine. 2. Overcast and fine. 3. Slight fog: very fine. 4, 5. Slight fog: sultry: clear: rain. 6. Cloudy: clear at night. 7. Overcast. 8. Overcast: fine. 9. Very fine. 10. Cloudy and fine: overcast: rain. 11. Very clear: fine: clear. 12. Fine. 13. Slight fog: fine. 14. Partially overcast: dusky clouds: fine. 15. Clear: fine: clear. 16. Slight fog: very fine: clear. 17. Slight fog: fine: light clouds. 18. Very fine. 19. Foggy: cloudy: clear. 20. Clear: exceedingly fine: clear. 21. Slight fog: very fine, with hot sun. 22. Fine: slight haze: clear. 23. Foggy: heavy rain: clear. 24. Foggy and drizzly: overcast. 25. Fine. 26. Rain. 27. Overcast. 28. Heavy rain. 29. Rain. 30. Cloudy.

Mean temperature of the month	56°·34
Mean temperature of Sept. 1847	53 ·40
Mean temperature of Sept. for the last twenty years	52 ·80
Average amount of rain in Sept.	2·68 inches.

Boston.—Sept. 1—4. Fine. 5. Fine: rain P.M. 6, 7. Fine. 8. Cloudy. 9. Fine. 10. Rain: rain A.M. and P.M. 11—21. Fine. 22. Cloudy. 23. Fine. 24. Rain: rain early A.M.: rain A.M. and P.M.* 25, 26. Cloudy. 27. Rain. 28. Cloudy. 29. Rain. 30. Rain: rain early A.M.

Remarkable rainy days at Boston, Lincolnshire:—

	inches.
1837.	
August 17	2·34
October 25	1·06
1839.	
June 15	1·28
July 31	0·96
1841.	
June 25	1·08
July 6	1·27
1842.	
January 27	1·08
July 1	1·38
September 24	1·15
1843.	
June 5	1·10
August 10	1·22
November 1	0·95
1844.	
February 26	1·16
1846.	
October 29	1·0
December 22	0·89 melted snow.
1847.	
May 29	1·75
October 24	0·97
1848.	
September 24	2·34

Applegarth Manse, Dumfries-shire.—Sept. 1—4. Fine harvest day. 5. Fair A.M.: rain P.M. 6. Showery: cleared. 7. Fair, but stormy. 8. Showery. 9. Damp, though no rain. 10. Fine A.M.: showers P.M. 11. Beautiful harvest day. 12. Beautiful harvest day: after frosty evening. 13. Beautiful harvest day, though getting cloudy. 14. Beautiful harvest day: fine. 15. Beautiful harvest day: dull. 16. Heavy dew: thunder. 17. Heavy dew: clear and sharp. 18. Fine harvest day. 19. Fine harvest day, but looking dull. 20. Cloudy: rain P.M. 21. Sunny and warm. 22. Still and cloudy: threatening. 23. Fiery wind: sultry. 24. Dull A.M.: rain P.M. 25. Fair, but blustering. 26, 27. Fair: cloudy. 28. Fair and clear. 29. Slight drizzle: cleared. 30. Drizzly day.

Mean temperature of the month	53°·1
Mean temperature of Sept. 1847	50 ·9
Mean temperature of Sept. for twenty-five years	53 ·2
Mean rain in Sept. for twenty years	3·13 inches.

Sandwick Manse, Orkney.—Sept. 1. Showers: damp. 2. Damp: rain. 3. Showers: damp. 4. Cloudy: clear: aurora. 5. Cloudy: clear. 6. Bright: clear. 7, 8. Showers: clear: aurora. 9, 10. Showers. 11. Sleet: showers. 12. Clear: showers. 13. Showers. 14. Clear. 15. Clear: cloudy. 16. Cloudy. 17. Bright: clear: aurora. 18. Cloudy: fine. 19. Cloudy: fine: cloudy. 20. Drops: clear. 21. Fine: clear: fine. 22. Bright: cloudy. 23. Fog: cloudy. 24. Hazy: cloudy. 25. Bright: cloudy. 26, 27. Fine: cloudy. 28. Cloudy. 29, 30. Cloudy: drizzle: aurora.

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* Not so great a rain since 17th August 1837.

Meteorological Observations made by Mr. Thompson *at the Garden of the Horticultural Society at* Chiswick, *near London; by* Mr. Veall, *at* Boston; *by the* Rev. W. Dunbar, *at Applegarth Manse,* Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse,* Orkney.

Days of Month.	Barometer.							Thermometer.								Wind.				Rain.			
	Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		Orkney, Sandwick.		Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.
1848. Sept.	Max.	Min.		9 a.m.	9 p.m.	9¼ a.m.	8½ p.m.	Max.	Min.		Max.	Min.	9¼ a.m.	8½ p.m.								
1.	30·284	30·140	29·70	30·08	30·10	29·91	29·95	66	42	54	60	39	55½	55	n.	nw.	w.	w.	......	......	......	·04
2.	30·352	30·340	29·81	30·18	30·19	30·03	29·96	70	45	61	61	51	55	55	nw.	calm	w.	w.	......	......	......	·10
3.	30·362	30·254	29·80	30·20	30·12	30·01	29·95	75	46	62	59	51½	56	55	w.	w.	w.	sw.	......	......	......	·20
4.	30·174	29·929	29·64	30·00	29·86	29·85	29·83	80	47	64	66	52	57	50	sw.	calm	sw.	calm	......	......	......	......
☽ 5.	29·835	29·754	29·28	29·64	29·51	29·62	29·50	83	57	68	68½	46	58	56	s.	calm	s.	se.	·10	......	......	......
6.	29·984	29·791	29·20	29·47	29·70	29·30	29·40	68	43	62	63	53½	57	54	sw.	w.	sw.	sw.	·01	·40	......	......
7.	30·055	30·036	29·47	29·70	29·70	29·43	29·62	64	55	61	...	55	54	50	sw.	w.	w.	w.	......	......	......	·40
8.	30·085	29·864	29·43	......	29·50	29·50	29·40	66	49	60	63	...	56	52	sw.	sw.	sw.	calm	......	......	0·20	·11
9.	29·919	29·829	29·38	29·60	29·51	29·30	29·33	67	54	58	57½	47½	56	50	sw.	w.	sw.	w.	......	......	......	·11
10.	29·740	29·594	29·17	29·55	29·69	29·51	29·69	69	43	59	58	47	48	45	sw.	w.	nne.	nw.	·33	·12	......	·06
11.	30·228	29·937	29·44	29·90	30·11	29·93	30·10	60	36	48	56½	38	43	41	nw.	n.	ne.	nw.	......	·76	......	·18
12.	30·312	30·272	29·78	30·20	30·20	30·20	30·18	58	31	49·5	57	32	45	49	ne.	nnw.	nne.	wnw.	......	......	......	·09
○ 13.	30·280	30·210	29·84	30·19	30·09	30·00	29·94	64	37	50	55½	35½	50½	49	n.	n.	w.	w.	......	......	......	·12
14.	30·300	30·219	29·71	30·11	30·18	30·11	30·23	63	37	55	59	47	50	49	nw.	nw.	wnw.	w.	......	......	......	·04
15.	30·409	30·359	29·90	30·25	30·24	30·21	30·15	64	32	51	60½	37½	52½	54	ne.	nnw.	w.	s.	......	......	......	......
16.	30·433	30·377	29·86	30·20	30·19	30·09	29·95	69	34	56	61½	53½	59	55	s.	wsw.	sw.	ssw.	......	......	0·00	......
17.	30·361	30·280	29·80	30·20	30·22	30·10	30·14	71	39	56	62	52	54	51½	nw.	calm	wsw.	wnw.	......	......	......	......
18.	30·260	30·122	29·73	30·20	30·06	30·16	30·01	68	36	55	60	35	54	50	nw.	calm	ne.–s.	sse.	......	......	......	·03
☾ 19.	29·989	29·792	29·55	29·78	29·56	29·68	29·51	68	37	52·5	61	38	53½	54½	sw.	calm	s.–se.	sse.	......	......	......	......
20.	29·768	29·617	29·29	29·52	29·63	29·47	29·60	77	37	57	60½	51½	54½	50½	s.	calm	s.	sw.	......	......	......	·04
21.	29·798	29·764	29·32	29·73	29·73	29·78	29·86	75	44	58·5	62½	45	52	52	se.	s.	s.-sse.	se.	·03	......	......	......
22.	29·795	29·767	29·30	29·71	29·78	29·90	29·85	75	52	62	65	49½	55½	54	e.	calm	e.	se.	......	......	......	......
23.	29·664	29·531	29·23	29·63	29·40	29·66	29·53	65	51	62	68½	51	55½	54	sw.	e.	e.	sse.	·22	......	0·20	......
24.	29·341	29·326	28·86	29·33	29·14	29·59	29·74	67	53	59	60½	54	55	54	sw.	calm	ene.	ese.	......	·82	......	......
25.	29·476	29·381	28·99	29·48	29·61	29·82	29·86	69	55	61	58	48½	54½	53	se.	calm	e.	e.	·10	1·52	......	·04
26.	29·650	29·514	29·16	29·61	29·71	29·88	29·94	62	54	59	59	49	55	49	e.	e.	ne.	e.	·24	......	......	......
● 27.	29·702	29·666	29·20	29·75	29·81	29·96	30·05	64	52	57·5	55½	48½	51	49	ne.	ne.	nne.	e.	·01	·06	......	......
28.	29·738	29·723	29·29	29·89	29·90	30·17	30·16	58	54	58	56	49	51	48	ne.	calm	nne.	ne.	·80	......	......	......
29.	29·677	29·669	29·23	29·80	29·70	30·01	29·97	58	51	56·5	54	47½	50	53	n.	calm	nnw.	ese.	·27	·10	......	......
30.	29·790	29·691	29·26	29·68	29·51	29·91	29·73	64	51	58	58	52½	54	51½	sw.	calm	nnw.	ese.	·09	·83	0·10	......
Mean.	29·992	29·891	29·45	29·847	29·750	29·836	29·837	67·56	45·13	57·6	60·2	46·7	53·40	51·10					2·20	4·61	0·50	1·56

THE ANNALS

AND

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[SECOND SERIES.]

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XXXVIII.—*On the Amber Beds of East Prussia.* By Dr. K. Thomas*. Communicated by the Rev. M. J. Berkeley, M.A., F.L.S.

The lignite (Braunkohle, Bovey-coal) which occurs on the East-Prussian shore of the Baltic has, in consequence of Dr. Albrecht's recent discovery of the value of the strata, attracted lately more general attention. This induces me to speak of a subject, which is no longer invested with a merely scientific interest, less with a view to question its mineral value, which may I hope prove highly remunerative, than to direct the interest which has been excited to a point, which hitherto has received too little attention in these districts. It is at present a generally received notion, that the surface of East Prussia and the neighbouring provinces was formed of the confused fragments of formations which were torn from their original position by the last deluge which determined the modern condition of the continent. A district of this nature can have merely a subordinate interest for the geologist, and the miner will scarcely search there for the more precious or other metals, or for the fuel which the bounteous hand of nature so frequently deposits in their neighbourhood. Once only about the middle of the last century the salt-springs, which occur in the jurisdiction of Pregel, gave occasion to a tolerably complete investigation under the conduct of the Prussian minister Von Heinitz, from which it appeared that no further mining exploits could reasonably be undertaken in this district; but thus much at least was established, that the north-western point of Samland, on which the lighthouse of Brusterort is now situated, belongs to the tertiary strata, which stand forth there in a remarkable manner like an island, from

* From the Number for April 1847 of Die Ostpreussischen Provincialblätter.

the diluvial mass of the plain which extends from the Carpathian mountains. As such it is represented in the older geological maps of Germany. A threefold deposit of blue clay and white sand characterizes the formation; whether the occurrence of marine remains of an extinct world, which could scarcely have escaped the eye of an attentive observer, would have established its tertiary character, may in the absence of proper information be the rather neglected, since it is not my object to write a learned treatise. Little attention has been paid to them, and in the most recent work* which has touched expressly on the geological relations of the amber districts, they have been altogether neglected, and in fact, like the lignite which occurs near the amber, regarded merely as its accidental attendants.

Fossil wood, both perfectly petrified and in a peculiar state of decomposition from exposure to the weather, is so frequent on this coast, that it cannot have escaped observation. The continual changes to which the coast is exposed, from the influence of atmospheric variations, often bring to light enormous trunks of trees, which the common people had long regarded as the trunks of the amber-tree, before the learned declared that they were the stems of palm-trees, and in consequence determined the position of Paradise to be on the coast of East Prussia. Some years since a fir-branch with well-preserved cones was said to have been found in the Hubenik amber-tracts, together with palm-nuts, for which the fossil fruit of a kind of walnut was mistaken; this however, to the regret of the scientific, has so completely vanished, that its existence might almost be considered a fable. I was therefore the more surprised when, in the summer of 1829, I found two well-preserved fossil fir-cones in the hills along the coast at Rauschen, which the rain had washed out of their natural position. Although they were regarded, by those of my neighbours whose opinion was asked, as recent fir-cones, which may have been derived from the forests which formerly clothed the shores, I was myself, in consequence of their peculiar appearance, far from convinced of this, and I applied with fresh zeal to the investigation of the locality when I returned after many years' absence. Continued researches were soon rewarded with a collection of fossil cones, which for number and beautiful state of preservation would have graced any collection. I convinced myself besides most clearly, that the line of coast from Lapöhn beyond Rauschen, Georgswald and Warnik almost to Grosskuhren consists of regularly alternate beds of blue clay and white sand running parallel with the surface of the sea,

* Die im Bernstein befindlichen organischen Reste der Vorwelt herausgegeb. von Dr. George Carl Berendt, in Com. d. Nicolaischen Buchhdlg. Berlin, 1845.

of which the former contains nest-like patches of lignite. This peculiar disposition of the lignite seemed to preclude all hope of profitable works, especially as the absence of every trace of it in those parts of the district of Samland with which I was well acquainted indicated a rapid descent of the strata towards the south. The occurrence too of alum was remarked, and the active process of the efflorescence of clay containing sulphuric acid and salts of iron which nature carries on on the precipitous coast, where the pyrites which occurs in the beds of clay is exposed to the action of the weather. But the present depressed price of alum affords no encouragement to any new works, especially as they must be commenced, if at all, on a large scale.

The scientific interest however arising from this newly-discovered deposit of fossil vegetable remains is far greater than their importance in an industrial point of view. The almost horizontal position of the coal-bearing beds, and the high state of preservation of many of the vegetable remains, confirm the supposition that their original locality cannot be far distant. Amber was long since recognized as the resin of a Conifer, and Coniferæ, judging from the remains now extant, must have formed the principal part of the adjacent flora, and many pieces of fossil wood occur, which when moderately heated give out a decided smell of amber. Nor ought it to be matter of surprise that the coal-bearing beds but seldom contain amber, if we reflect, that in all probability these beds owe their formation to some alluvial process, and if so, that the masses of amber from their different specific gravity would find a different resting-place. It is well known that the principal amber-beds, which under the name of Amber-earth crop out to the right and left of the coal-bearing strata above the level of the sea, sink so deep at the places under which the coal-loam extends, that they cannot be worked profitably. As will be shown in the sequel, this amber-earth forms an actual member of the tertiary amber-formation of which these coal-bearing beds may be considered as the alluvium. These cliffs, rising a hundred feet or more above the level of the sea, seldom suffer much from the waves, since they are protected by the natural trending of the coast-line, which runs far into land, from the swell produced by continued north winds. The flat shore at the Kranzer inlet is very much affected. The steep coast on the contrary, commencing at Lapöhn, suffers from the rains which annually wash down what the frost of winter has loosened. As the sea constantly plays on the fallen fragments, the cliffs remain much in the same condition, with the exception of their annual decrease. This waste, which is at about the rate of three feet every year, and will in sixty years throw down the Brusterort lighthouse unless artificially sustained, must act with peculiar energy to the destruction of the western shore of Samland, where it is matter of history, that a tract of land* a mile broad has disappeared near the ruins of Adalberts chapel, which now stands close to the sea. If then we suppose that in yet earlier times the tract which is now covered by the East Sea, was towards the north not so closed to the present Frozen Ocean, that the currents of the Atlantic could not penetrate, it appears not improbable that a still more rapid destruction of land may have then taken place. What remains cannot be regarded as the shore of a retreating sea, but rather as a great expansion of a formation, of which a part, up to the present north coast of Samland, is exposed to view by a partial elevation of the land. The small plots of land which, under the name of the low grounds (Nehrungen), separate the mouths of the streams of this district, the Weichsel, the Pregel and the Memel, as great inland lakes from the sea, appear to me to be regarded improperly as mere dunes; they intimate rather, by their coast projecting into the sea, the course of those fragments of the formation which could not pass off, and allow us to recognise in the basin of water left behind them, their sinking towards the south and east. The moving sand, which is the sport of the winds on their summit, is scarcely to be regarded as the rejectamenta of the sea, but rather as an actual element of the formation, like the loose sand on the north coast of Samland, which arises from its torn-up strata.

But it is time to return to the lignite which accompanies those strata. The small degree of interest which these objects excited on the spot, and the consequent impossibility of finding any information there as to their true import, induced me to send the whole of the fossil vegetable remains to Professor Göppert of Breslau, who has the most intimate acquaintance with the fossil flora. I neglected not to send written notes of the observations which I had made as to the circumstances under which they occurred. He submitted them to a thorough examination, the results of which were communicated to the work of Berendt above quoted. He gave his decided opinion, that of the fragments of Conifers, two, belonging to *Pinites sylvestris* and *Pinites Pumilio*, remind one so exactly of the now existing forms, that they cannot be distinguished from them; the others, which formed far the greater portion of the collection, gave rise to the species *Pinites Thomasianus* and *Pinites brachylepis*, forms which do not now exist. The perfect agreement of all these remains in their fossil appearance and origin left no doubt as to their being really fossils. But the question, whether the flora to which they owe their origin is connected with the occurrence of amber-resin,

* I do not myself answer for the accuracy of this statement.—Dr. Th.

was decidedly negatived, since all these remains, as well as the great masses of coniferous wood, which are found near them in a fossil state, when carefully heated, developed no odour of amber. The circumstance that I found some fragments of wood which exhibited this odour could not prevent the separation of that flora from the amber, inasmuch as a notion has been developed respecting the occurrence of the lignite and fossil wood which accompany the amber, according to which remains of the true amber-fir decidedly differing from those forms may occur casually amongst them. In contradiction to the view which arose necessarily from a strict examination of the coast of Samland, the present occurrence of amber and lignite in general was referred to those causes in consequence of which the land in which they lie must be regarded as the alluvial product of some recent epoch in the formation of the world. It was supposed, that before the present epoch, at the period subsequent to the formation of chalk, when the molosse* was precipitated, and contemporaneously with it the Galician salt-beds were formed, an island to the north of the present Samland, covered with amber-forests, was protruded from the sea, and in the course of many myriads of years, under the influence of very active vegetative powers, the immense masses of amber were produced which for centuries have with equal abundance afforded a never-failing mine. When this amber-forest yielded to the catastrophe through which the figure of the continents and the forms of the organisms of the animal and vegetable kingdom originating on them were stamped with new characters, the primary resting-place of the amber must have been formed in and about that forest, and have been sunk with it into the bed of the East Sea, yet not so deep that it could not be exposed by subsequent catastrophes. If these consisted of powerful waves, and by the help of partial elevations and depressions different portions came successively into the sphere of operation, it could not fail that masses of amber would be washed out of them and be imbedded again in secondary beds, in a way which could be effected only by moving bodies of water. They were either washed out on the neighbouring shores which were undergoing great changes, and mixed with other rejectamenta of the sea must have formed the veins of amber answering to what are called the coast-seams (Küstensäumer) and the nests of amber corresponding with the casual hollows, or in consequence of stronger currents have been strewed in seeming confusion at a great distance from their birth-place, so that their principal deposits are arranged in lines, which, converging to one point, indicate the position of the original amber-forest.

* The exact equivalent of this term is doubtful. See Lyell, Geol. vol. iv. p. 140.

This view so immediately follows from the conviction of the alluvial nature of the district, a fact recognized in the name by which it is known, that it can be met only by new facts, except we have recourse to mere vague abstractions. The amber might thus be washed together, not only with the lignite to which it bears no relation, but amber-wood might also have been brought to the same place; and should this occur accidentally in the neighbourhood of other carbonized remains of plants, it would not lead to the conclusion, that these also belong to the amber-formation.

It can scarcely be doubted that mighty waters have acted on the southern shore of the Baltic. Whether the change which the surface must have undergone may have arisen principally from an influx or efflux of matter, is a question the answer to which is surrounded by very great difficulties. The blocks of granite, which in such immense numbers cover many tracts of the coast, cannot well be regarded as an argument for the influx. A stream of water capable of rolling such masses hundreds of miles over the hills and valleys of its bed would have bared the plain of Europe to its very ribs of rock, and had it brought matter for new deposits of such enormous size, those blocks of granite would at any rate have been the lowest. They lie however in the most wonderful manner on the most recent surface of the ground, a plain proof, as it should seem, that they were not moved on the ground by those waves, but being inclosed in masses of ice floated with them, and so were deposited on the surface on the melting of the ice. If they owe their present position to such a phænomenon, this is not contrary to the supposition that the diluvial stream in general has not affected the continent by destroying and washing out, any more than the admission that the rows of hills which now traverse it owe their origin to the influx of matter necessarily attending that deluge. For if the ground presented an unequal resistance to the rushing diluvial stream, whirlpools must have been formed, which, the stronger and more numerous they were, must have caused by their opposition relatively quiet tracts, as is plainly enough indicated by the hills which still remain, and by their peculiar form. We must admit that these alluvial heaps were first formed when the diluvial waves had for the most part completed their work of destruction, and in consequence of the necessarily decreasing energy of their motion gave a compensating deposit to the ground, which perhaps bore a very small proportion to the masses which were washed away from it. The question is not now as to the always progressing decrease of the land which was mentioned above, but refers to a much more important change of the surface by which the tract, many miles in breadth, was affected, which many thousands of years since may have stretched northward into the East Sea.

I am speaking indeed of the small tract only of the Samlandic coast of the East Sea, with which I believe that I am sufficiently well acquainted to venture to make the assertion, that there can be no question as regards it of any remarkable diluvial deposit, or more recent alluvial formation. In many places, as for instance near Rauschen, this coat of tertiary soil is altogether wanting, and the winds sport with a snow-white sand which streams forth from the apertures of a thin clay, which is frequently black with fragments of lignite.

The masses, which rise to the height of a hundred feet or more out of the sea, are no diluvial refuse whose component parts are only accidentally thrown together; they are no remains of the coast of a constantly retreating sea, but a peculiar formation of a former epoch of the earth, driven from its original position by circumstances which have nothing to do with the phænomena of the deluge, owing rather their present state to a partial and probably not very remarkable upheaving of the soil.

If we follow the seemingly horizontal strata of sand and coal-bearing clay, which reach from Lapöhn to Warnik, and which are clearly an alluvial product belonging to that formation, we find between Warnik and Grosskuhren a peculiar sand-formation rising from the surface of the sea, and inclining at an angle of about 15 degrees to the west. It is formed of distinct parallel layers whose limits are defined by strong deposits of red ochre. These beds are frequently cut through in a vertical direction by tubular bodies, which remind one forcibly of the stems of Encrinites. Cup-shaped and reniform concretions of clay, red ochre and flint follow the parallel divisions, and in these and near them are found numerous marine fossil remains, which in part by their position indicate those beds as their original place of abode, and as the former bed of the sea. The frequently beautifully preserved shells of these beings, which are sometimes changed into tender ochre, sometimes into silicate of iron as hard as steel, have in their mineralogical structure no resemblance either to the petrifactions which belong to the limestone of the Jura, and which are not quite unknown to these districts, nor to those of the chalk, which, though especially existent here, are but rarely met with. The marine remains belonging peculiarly to the amber-formation are Ostracites, Echinites, Spatangi and other productions, whose forms seem to have been sufficiently preserved to facilitate a closer distinction of the species, and hence to determine the position of the amber-formation in the geological members of the Carpathian plain. But this member of that chain seems to have pretensions to the name of amber-formation, for under this sand-bank, consisting of parallel layers and about twenty feet thick, extend in a similar direction the strata of mottled and blue amber-earth, streaks of sandy loam about two feet thick, which in consequence of their great abundance of amber are everywhere explored, where they rise sufficiently high above the surface of the sea. Under them is found the bed called Schluff, which is distinguished from the amber-beds merely by the absence of amber. Amber however is not wanting in the muscle-bearing bed of sand which lies above it, by whose concretions it is often surrounded as by a matrix, but always much worn by the atmosphere. In the subjacent loam-beds, which may be regarded as the primary amber-strata, it is mostly in a state little differing from its original condition. The dull surface which covers with a thicker or thinner layer the shining resin within, exists in pieces of copal and pine-resin, and cannot be ascribed to any action of the weather, or have been produced by the agency of decomposing substances which have acted for thousands of years. The dull bark investing amber, copal and other resins in their natural condition is a partial alteration which they undergo from the influence of the atmospheric oxygen soon after their production, and, except where something hinders the progress of this decomposition, it proceeds till the original structure is entirely deranged. Such is the case in the superficial strata of our present soil, in which the amber accidentally present is always highly decomposed, and such also in those beds of sand which form the capping of the primary amber-beds. As regards the occurrence of fossil vegetable remains in these strata, they are very scarce in the muscle-bearing sand. Carbonized wood is somewhat more frequent in the amber-beds, at present entirely coniferous, and probably of the same structure as in the beds near Rauschen. But while this coal belongs to the class of earthy lignite, the carbonized ligneous remains of the amber-beds exhibit rather the condition of anthracite. Extraneous marine remains seem not to be entirely wanting in these amber-bearing beds. Sharks' teeth especially have been dug at times from the amber-pits, known under the name of birds' beaks; and impressions of Echinites, now unfortunately lost, were collected by me in the Schluff of the amber-pits at Little Kuhren. Another specific character as it should seem of these strata is their surprising abundance in sulphurous salts, as recognized by the strong taste of ink and the efflorescence of those portions which have been long exposed to the atmosphere.

This member of muscle-bearing sand, spotted and blue amber-earth and Schluff extends at the above-mentioned angle of elevation under the villages of Great and Little Kuhren, where it rises from forty to sixty feet above the surface of the sea, and to the profit of the miner exposes the amber-beds. The western extremity of this formation behind Little Kuhren is covered by the Wachbuden hills and the Brusterort Point, both probably diluvial structures. It crops out again from this superincumbent mass, so that the shore of Samland stretching from the north to the south exhibits a no less interesting profile of this formation. At Rosenorth the strata dip rapidly to the south, and are withdrawn from further observation. But at the same time this identical formation rises abruptly from the bottom of the sea to the south, so that the divided sections of the strata are covered merely by a bed of diluvial loam about ten feet thick. This circumstance, taken in conjunction with the sudden dipping of the first division, seems to make it inadmissible to consider the one bed merely as a continuation of the other, while on the other hand the perfect parallelism in the constituent parts of the new bed forbids us to consider it as anything else than the horizontally-deposited bed of the sea. A third, similarly constituted and still more recent member of the amber-formation stretches in the immediate neighbourhood almost horizontally in the coast-hills near Dirschkeim, and raises its amber-beds, which are not very productive, more than forty feet above the level of the sea. The immense bed of sand which covers these is firm white sand, in which the ochre is apparently not so frequent. A perfect examination of this more recent member of the amber-formation has at present not been made, though enough has been done to establish its existence beyond the basin of the East Sea; for it was known long since that beds of amber lie beneath its waves, as indeed appears from the abundance thrown up on the coast. With equal probability it is supposed that these original beds in consequence of a partial elevation of the soil, whose central point is to be sought for near the north-western point of Samland, were brought sufficiently near to the immediate action of the present sea to make those districts the principal source from which amber is derived. It is probable from the bountiful produce of the coast that the richest beds of amber lie in the deep strata of this formation. A storm of but moderate length and strength on the first day of the present year threw up within a very short space 800 pounds of amber. As little however can be determined on this head as on the masses of this formation, which may have been washed away by the diluvial waves to the southern part of the plain at the foot of the Carpathian or Sudetic mountains. The occurrence of amber in these parts cannot be explained till more perfect geological investigations shall have shown the impossibility of the existence there of primary amber-beds. I have seen too little of Sicilian amber to decide whether it is a distinct variety from that of East Prussia. The small specimens which I have observed in the rich collection of Privy Councillor Hagen seem to indicate such a difference.

If then we allow the existence of an amber-formation which contains primary beds of amber of a greater antiquity than the secondary deposits scattered here and there, it would not therefore follow, that the lignite which is found in its neighbourhood must be regarded as a constituent part of this formation, and the more so, since the clay-beds which contain it cannot be so considered. They simply fill a depression in its neighbourhood, and we can merely conclude from the nature of the materials used in filling it as to their age, since not even the perfect absence of the characteristic blocks of granite clearly proves, that their origin is not referable to the diluvial formation. Since the smell of amber now and then exhibited by a piece of wood from these beds is considered as an insufficient proof that the mass of vegetable remains which occur there belongs to the amber flora, it seems difficult to discover any other proof. The change of vegetable fibre however by nitro-sulphuric acid into an explosive substance shows its possibility. A piece of this wood which exhibited no smell of amber was subjected to this treatment, and though it gave no useful explosive matter, it yielded as a secondary substance a sort of resin which reminded one strongly of the artificial musk produced from amber by nitric acid. In consequence of this observation, I induced Dr. Reich to submit a number of fragments of wood from the locality above-mentioned, which seemed to belong to different Coniferæ, to examination, with a view to ascertain whether they contained any succinic acid: the results surpassed all expectation. Of fourteen specimens, thirteen exhibited beyond all doubt the presence of this acid, which may reasonably be assumed as coming from the resinous constituents of the wood; the fourteenth, which belonged to *Taxites Aykii*, gave a crystallizable acid different from the other, which unhappily, by reason of the very small quantity of the wood examined, would not admit of further investigation. But not only these fragments of wood showed in this way their relation with amber, but the remains of fossil cones from the same beds gave a similar result, amongst which indeed no particular selection could be made, but they exhibited on the most careful trial no smell of amber. They, as well as the lignite which did not exhibit the well-known structure of the wood of conifers, yielded on destructive destillation fluids, in which the presence of crystalline succinic acid could be ascertained by the microscope and by chemical reagents. If then the occurrence of succinic acid except from amber is so problematical, that amber may be considered as its only source, we must admit also that coniferous woods which contain it belonged not only to the amber flora, but that they were that portion of it which actually yielded it. The great variety in amber makes it not improbable that many amber-bearing conifers existed in the flora, and it is very conceivable that others coexisted which yielded no amber. Since the fragments submitted to examination were by no means especially chosen for this purpose, but were merely as perfect an assortment as circumstances allowed of the species of wood which occurred in the locality, it seems to follow, that the principal mass of the trees, to which the lignite owes its origin, is to be considered as belonging to the class of amber-yielding trees.

This result is certainly not without practical importance. For though the in general insignificant nests of lignite which are found in the beds of clay on the coast of Samland encourage no great hope of a remunerative harvest, yet its connection with such large quantities of amber makes it not improbable that still larger masses of this useful fossil will be found in other places of the South Baltic continent. It is not probable that the wreck of the amber-forest, as far as regards its timber, should have been reduced to these few remains; it is possible that the more important beds of lignite which must have originated from them may have been floated away by the diluvial waves on the destruction of the land, but even in this case strata of coal may still be found. In this respect every fact is important which gives a solution of the presence of lignite in these parts, should it but tend to direct greater attention to the subject. At present the number of these facts is very small. On occasion of boring for water near Balga, a bed of lignite was pierced at a depth of sixty feet beneath white sand, which by the structure of its coal and the fir-cones which came to view appeared to be perfectly identical with the coal-beds near Rauschen. Herr Rupson, who conducted the work and is to continue it, will certainly not omit to pay particular attention to this circumstance and to communicate the results of his labour. I believe a second trace of lignite has been found at Sarkau, on the sea side of the low ground, where a black bank of mould, which I took for lignite, and which seems mixed with very isolated coarse grains of sand, rises to the height of the sea-level. A third problematic trace of lignite as I believe is found in a bed of peat to the south of Heiligenbeil; about four feet deep a mass of lignite is deposited in undulated heaps. Did not an immense bed of undecomposed peat exist beneath it, it might be considered as the usual produce of turf-formation; but it appears to me probable, that the remains of a bed of lignite torn to pieces by waters are there deposited. Many beds of turf indeed, which like that at Balga and near Koppershagen present immediately on the surface a very compact kind of fuel, which in texture reminds one forcibly of lignite, deserve further attention, especially as regards the fossil woods which are contained in them. I consider it not impossible that beds of lignite may be concealed under the form of such peat-beds, which on this supposition might, by proper draining and contrivances, yield a very valuable kind of fuel at an easy price. There has also been some rumour of traces of lignite in the construction of canals and railroads, which are too rare with us. It is to be wished that those persons who can make inquiries, and do not mind the trouble of stating the result of their labours, would choose some better medium of communication than perishable newspapers, where their communications can scarcely be found when wanted. The provincial reports will doubtless gladly promote inquiries of such general provincial interest.

XXXIX.—*On three species of Mould detected by* Dr. Thomas *in the Amber of East Prussia.* By the Rev. M. J. Berkeley, M.A., F.L.S.

[With two Plates.]

In the spring of the present year I received from Dr. Karl Thomas of Königsberg, who is perhaps better known as a metaphysician than as a naturalist, part of a large collection of sections of amber from East Prussia which consists of several hundred individuals. A large portion of the specimens transmitted contained unequivocal specimens of moulds, in most cases in the condition of mere mycelium, but in one or two instances in beautiful fructification and in a very high state of preservation. Of these he kindly sent some very beautiful and correct sketches, of which I have availed myself in the present communication.

The actual occurrence of fungi in a fossil state has hitherto been very problematical. In the extensive collection of fruits from Sheppey Island which formed the foundation for Mr. Bowerbank's work, I believe no undoubted instance of any parasitic fungus occurred, though *Sphæriæ* and other fungi of a hard texture might reasonably have been expected in such a situation, and especially in so recent a formation. Dr. Brown has observed occasionally appearances in the cells of fossil wood which he has been inclined to refer to mycelium, though as I understand with no very decided opinion on the matter.

Dr. Göppert has figured, on a fossil fern belonging to the older coal-measures, what he considers a fungus under the name of *Excipulites Neesii*. I have not seen this figure, but the circumstances under which the vegetable remains which gave origin to the beds of coal must have existed, would not be such as would be likely to preserve any fungus allied to the genus *Excipula*. I do not find any notice of the occurrence of fungi in any shape in the magnificent work of Dr. Corda on fossil remains of vegetables.

In the work of Dr. Göppert and Dr. Berendt on organic remains in amber, there are figures of one or two supposed fungi, but none of them very satisfactorily made out, and as regards one at least it is quite certain that it has no relation to the genus *Peziza*.

I think then that it cannot be without interest, as well to botanists as geologists, to publish one or two undoubted fungi from amber, the structure of which is as clearly visible as in the specimens of minute algæ so beautifully prepared by Mr. Thwaites. I had the pleasure of comparing them with Dr. Thomas's drawings in company with that gentleman, and also with Mr. Broome and Dr. Carpenter, and all were highly delighted with their accuracy and the admirable state of preservation of the moulds. There were other species in the collection, but in a far less satisfactory state. I have therefore thought it better to omit them. I have however admitted one species which appears very interesting, but of which unfortunately the principal specimen showing the fruit has been lost, so that it was not possible to verify the structure; and certain appearances somewhat analogous in another piece of amber induced some doubt as to the fructification, the spore-like bodies being in that case undoubtedly globules of air.

The occurrence of these fungi was first noticed at the sitting of the Berlin Academy, Nov. 16, 1847, at which time also was announced the occurrence of *Diatomaceæ*, as recorded in this Journal, 2nd series, vol. i. p. 397.

The three species may be characterized as follows.

1. *Penicillium curtipes*, n. s. Candidum; hyphasmate parco; floccis abbreviatis; ramulis fertilibus diffusis demum divisis, sporis ellipticis. Coll. Thom. no. 573.

Hyphasma sparing, loosely branched and mostly at right angles, giving off extremely short flocci, consisting of from three to four articulations which are slightly constricted at the dissepiments, and divided above into two or three threads which are again loosely branched; lower articulations oblong-elliptic, larger, the upper ones gradually smaller, but always elliptic and quite smooth.

This species, which is most admirably preserved, is most nearly allied to *Penicillium sparsum*, Lk. (*Aspergillus penicillatus*, Grev., *Monilia penicillata*, Fr.), but differs in its shorter stems and more diffuse tufts of fructifying threads. It is to be observed that Fries's characters of the genus *Penicillium* appear to be taken either from Nees von Esenbeck's figure or from Dr. Greville's plate of *P. glaucum* and *P. sparsum,* both of which are incorrect, the true structure of the genus being that which has been repeatedly figured by Corda, and which exactly accords with the pretty species before us, as it does with *Aspergillus penicillatus,* Grev.

PLATE XI. fig. 1. *Penicillium curtipes,* magnified 600 diameters.

Brachycladium, n. g.

Receptaculum stipitiforme e fibris intricatis constipatum sursum attenuatum sive laceratum, ramis brevibus fertilibus simplicibus hic illic sparsis, sporis ellipticis sessilibus vel brevissime pedicellatis.

2. *Brachycladium Thomasinum,* n. s. Coll. Thom. no. 535.

Receptacle stem-like, cylindrical, sometimes fasciculate, pointed and attenuated above or irregularly lacerated, consisting of closely packed intricate threads, the apices of some of which become free and project from the stem generally at a more or less acute angle, and almost always simple, inarticulate, bearing from four to five elliptic spores, which are either sessile or furnished with an extremely short peduncle.

This species was, in the original communication to the Berlin Academy, referred to the genus *Botrytis*; but taking that genus in the widest sense, it cannot comprise the present species, distinguished by its compound stem. Its nearest ally perhaps is the genus *Corethropis,* figured by Corda in the first plate of his 'Prachtflora,' which is to *Penicillium* what the present genus is to *Botrytis.* I have an American mould which bears a similar relation to *Aspergillus.* The fossil flora therefore in this case fills up a type which at present has not been discovered on the globe as now constituted.

PLATE XI. fig. 2. *a.* Portions of *Brachycladium Thomasinum,* magnified 600 diameters, from a drawing by Dr. Thomas; *b.* portions more highly magnified, to show the structure of the receptacle and its apex.

3. *Streptothrix spiralis,* n. s. Floccis omnibus spiraliter convolutis ramosis fasciculatis; sporis ellipticis. Coll. Thom. no. 438.

Consisting of long tufted but somewhat diffuse fibres which are branched once or twice, more or less spirally undulated, and bearing elliptic spores either immediately or at the tips of extremely short ramuli.

This curious mould, which, from the loss of the fructifying specimen, I am not enabled to examine more closely, has so much resemblance to *Streptothrix,* that I have little hesitation in placing it provisionally at least in that genus. *Streblocaulium* *atrovirens*, Chevallier, is another species of the same genus, and I have either that or a third from South Carolina. All the three, it should be observed, have a more closely tufted habit than the fossil species. Dr. Thomas's plant is possibly figured by Berendt, tab. 6. fig. 73.

PLATE XII. *Streptothrix spiralis*, n. s., magnified 600 diameters: fig. 1. barren; fig. 2. fertile.

XL.—*On the present state of our knowledge of the Ornithology of Madagascar.* By Dr. G. HARTLAUB of Bremen*.

IT has long been known to zoologists that the island of Madagascar is the site and centre of a very peculiar animal population. Isidore Geoffroy St. Hilaire was inclined to regard it, in respect of its fauna, as a "fourth continent"; and Hombron, in the first volume of the zoological portion of Dumont d'Urville's Expedition to the South Pole, indicates it as one of the creational centres of the African plateau. The distinctness of the Madagascar fauna from that of the African continent is so remarkably great, that of the forty-seven or forty-eight mammalian species which are known to live in a wild state in Madagascar, only one or perhaps two (*Sus larvatus* and *Pteropus rubricollis*?) occur also in Africa. Indeed by far the greater number of them belong to genera which are met with in no other region of the earth's surface. According to Schlegel's researches, the Ophidians of this great island appear to be equally peculiar, inasmuch as it is only the forms of the west coast which exhibit some affinity to those of the opposite shores of Africa. Lastly, the insect-fauna of Madagascar seems, according to Klug and Boisduval, to be rich in original and remarkable forms, although in this department the cases of identity with African species are more frequent, as appears, for instance, from the list of insects of the neighbourhood of Port Natal, &c., appended to Delegorgue's 'Voyage dans l'Afrique Australe.' It is indeed not improbable that a more complete knowledge of the zoology of the East-African regions of Mozambique and Sofala will establish still further relations of affinity between the continental fauna of Africa and the insular one of Madagascar; especially if ever the west coast of this island (which is 350 miles long and is still in great measure a *terra incognita*) shall become more accessible. Our knowledge of the Madagascar fauna, slight and fragmentary as it is, is almost exclusively due to the undaunted and unwearied zeal of the French naturalists, whose field of

* Translated by H. E. Strickland from D'Alton and Burmeister's 'Zeitung für Zoologie, Zootomie und Palæozoologie,' No. 19, May 6, 1848.

operation however did not in general extend far beyond the narrow limits of two or three French possessions on the east coast. And in truth everything combines to impede, or rather to make almost impossible, for a long time to come, any material extension of this knowledge. A sad experience (to adopt the words of a recent author, Eugene de Froberville) has taught us that a fearful scourge rules over the sea-coast of Madagascar, and that the European who thirsts for knowledge has but slight hope of escaping the fatal attacks of the coast-fever, which makes the island equally inaccessible to the peaceable researches of science and to the invasions of war. Beyond this pestiferous coast-line, the traveller has to encounter a suspicious and bloodthirsty government which takes every means to resist his progress. All efforts to overcome these constant and powerful obstacles have hitherto been ineffectual; travellers the most highly endowed in mind and body have been defeated by them, and as Froberville well observes, the Marsden or Raffles of Madagascar is as yet unborn.

In the hope of conferring a service upon ornithologists, we here endeavour to collect together all that is known on the very peculiar and interesting bird-fauna of the greatest island of East Africa. The oldest information on the birds of Madagascar occurs in Flacourt's 'Histoire de la grande isle Madagascar,' published at Paris in 1661. The 40th chapter of this, in many respects valuable, work contains a list of nearly 60 species of birds which inhabit that island. Unfortunately however we learn little more of them than their Madagascar names. Some of them are indeed described in a manner which, though short, is recognizable, others however not at all, or in a way which makes all identification impossible. Among the very small figures in the copper plates may be recognized certain South African species, as the Cape penguin, and, very evidently, *Grus pavonia.* Under the head of "Night Birds" Bats are included. We believe we are able to identify with certainty about 16 species of Flacourt's list, and we can only estimate its scientific value at a very low rate. Our next source of imformation is on the contrary one of high merit. Brisson describes in his 'Ornithologie' 38 birds from Madagascar, and with that well-known completeness and accuracy which was peculiar to him above all the zoological writers of his day. The greater number of these species were sent by the learned traveller Poivre to Reaumur's collection; a portion of these are still extant in the National Museum of the *Jardin des Plantes,* another portion have apparently been lost, and of some species our knowledge is wholly confined to the Brissonian description. This is the case, among others, with the *Merula madagascariensis aurea,* with *Luscinia madagascariensis,* and others, whose exact generic position remains equally undecided. —Sonnerat, in his 'Voyage à l'Inde orientale,' describes five species of Madgascar birds, one of which, *Ploceus nelicourvi*, is mentioned by no later voyager.—In the 'Proceedings of the Committee of Science and Correspondence of the Zoological Society' for 1830 and 1831 are several extracts from the Reports of the 'Société d'Histoire naturelle de l'Ile Maurice,' especially by the Secretary of this Society, Jules Desjardins. They contain among other things the systematic names of some birds of Madagascar, but apparently leave the determination of them in doubt; for to enumerate *Corvus dauricus* among the winged inhabitants of that island, sounds almost as incredible as if any one were to assure us that *Struthio camelus* lives on the sandy plains of Brandenburg. The occurrence of "*Cuculus canorus*" is also very improbable, and still more so that of the European quail, "*Tetrao coturnix*."

The famous traveller Dr. Andrew Smith has described several birds of Madagascar in the 'South African Quarterly Journal,' as well as in his 'South African Zoology,' a work as yet unfinished, and not to be had from the booksellers, though the author has communicated some copies of it to his friends. These birds came to his hands during his long residence at Cape-town, chiefly through the means of the well-known "*naturaliste-voyageur*" Jules Verreaux. On his authority we have introduced *Strix hirsuta* into our catalogue.—In the 3rd volume of the 'Mémoires de la Société d'Histoire naturelle de Strasbourg,' Victor Sganzin, an officer stationed in the French settlements of St. Marie and Tintingue on the east coast, has published a treatise on the Birds and Mammals there observed, which is in many respects important and interesting. He gives a list of the French and Madagascar names of about 70 species, adds short, and unfortunately very insufficient, descriptions, and communicates many valuable remarks on their mode of life. We do not deny the utility of this work, although we have been able to extract but little for our present object, as Sganzin in compiling it seems to have been wholly deprived of the requisite literary materials. He refers almost exclusively to Buffon, and endeavours, often with little success, to recognize his birds in the descriptions of that author. The species which he introduces as new must nevertheless be regarded as only nominal, and must be excluded from systematic catalogues, for neither their generic position nor their specific individuality can be established with any certainty from the descriptions which are appended.—At the meeting of the Paris Academy of Sciences on April 9, 1838, I. Geoffroy St. Hilaire read the descriptions of three new and remarkable genera of birds from Madagascar, *Oriolia Bernieri*, *Mesites variegata*, and *Philepitta sericea*. He had previously described two other new species from thence, *Parra albinucha* (1832) and *Falculia palliata* (1836). The first publication of the very anomalous genus *Euryceros* is due to Lesson, and that of the genus *Brachypteracias*, containing several species, to Lafresnaye, who has done so much for exotic ornithology. Very recently Pucheran, "*aide-naturaliste*" at the Paris Museum, seems to have undertaken the study of the Madagascar birds as his especial pursuit. Through the collections of the undaunted travellers Bernier, Goudot, Rousseau, &c., new rarities continually accrue from thence to the French metropolis, and they are made known to the ornithological public by means of Pucheran's speedy publication of them in the 'Revue Zoologique,' or in Desmurs's 'Iconographie.' From what has preceded, it is evident that the National collection of the *Jardin des Plantes* at Paris is the only one where Madagascar birds can be studied in considerable number and variety. In 1840 we found a very rich series of them in the collection of the duke of Rivoli, now, alas! sold and dispersed. Some of these went to England, others to North America. The sale-catalogue of this precious collection, although compiled without much criticism and without assigning the authority for the names, forms one of the sources of our ensuing list, which, from its form, it could not have done, if this collection had not, by repeated visits and numerous notes taken on the spot, become a lasting possession of our memory.

We will now endeavour to enumerate, as follows, the birds which have been hitherto made known as inhabiting Madagascar.

1. *Haliaëtos vociferoides*, Desm. Rev. Zool. viii. p. 176; Id. Iconogr. Ornith. pl. 7. Possibly "*Aigle brun nuancé de fauve*," Sganz. *l. c.* p. 21.

2. *Accipiter madagascariensis*, Verreaux; Smith, Afr. Zool. p. 154; List of Specim. Brit. Mus. 1. p. 35.

3. *Accipiter Francesii*, Smith, Afr. Zool. p. 152; List of Specim. Brit. Mus. 1. p. 36.—Nisus Francesii, *Kaup, Isis*, 1847, p. 173.

4. *Melierax canorus* (Thunb.).—Faucon chanteur, *Levaill.* Falco canorus, *Thunb. Dissertat. Ups.* 1799. F. musicus, *Daud.* 1800. Astur cantans, *Kaup, Isis*, 1847, p. 173. Epervier chanteur, *Sganz. l. c.* p. 19; *Denh. Clappert. Trav. Centr. Afr.* p. 195.

5. *Polyboroides radiatus* (Scop.).—Autour gris à ventre rayé de Madag., *Sonner. Voy. Ind.* p. 181. t. 103. Falco madagascariensis, *Gm.* P. typicus, *Smith, South Afr. Quart. Journ.* i. p. 106; *id. Afric. Zool.* p. 149; *id. Illustr. South Afr. Zool.* pl. 81, 82. Faucon gris à ventre blanc, *Sganz. l. c.* p. 19 (Firas); *Rüpp. Uebers.* p. 12.

Lesson refers Sganzin's "*Firas*," we believe erroneously, to Buffon's "*Tanas*" (*Falco piscator*, Gm. Levaill. pl. 28), Echo du Monde Sav. 1843, p. 588.

6. *Pernis madagascariensis*, A. Smith, Afr. Zool. p. 168.

7. *Tinnunculus punctatus* (Cuv.), Gr. List of Specim. p. 29; A. Smith, Afr. Zool. p. 166; Kaup, Isis, 1847, p. 54. Also in Bourbon.

8. *Athene hirsuta* (Temm.), according to Smith, Afr. Zool. p. 168.

9. *Ephialtes manadensis* (Quoy et Gaim.), according to Bernier in Paris. Mus. 1840.

10. *Strix flammea*, L., Desjard. Proceed. Zool. Soc. 1831, p. 45.—Effraie de Madag., *Sganz.* p. 22. (Vourondoul.)

What is *Strix madagascariensis*, Catal. Mus. Rivoli, p. 3?

11. *Caprimulgus madagascariensis*, Sganz. *l. c.* p. 28. (Tataro.)

12. *Cypselus unicolor*, Catal. Mus. Rivoli, p. 18.

13. *Eurystomus madagascariensis* (auct.).—Rollier de Madag., *Buff.* E. violaceus, *Vieill.*; *Denh. Clappert. Trav. Centr. Afr.* p. 196 (?); *Sganz. l. c.* p. 29.

14. *Brachypteracias leptosomus* (Less.), 1832.—Colaris leptosomus, *Less. Illustr. de Zool.* pl. 20; *Lafresn. Mag. de Zool.* 1834, pl. 31. Chloropygia leptos., *Swains. Classific.* ii. p. 333. Le Pic, *Sganz. l. c.* p. 35. (Sasang.)

What is *B. collaris*, Pucher. Rev. Zool. ix. p. 199?

15. *Atelornis pittoides* (Lafr.), Pucher. Rev. Zool. ix. p. 200.—Brachypteracias pittoides, *Lafresn. Magas. de Zool.* 1834, pl. 32; *Desm. Icon. Ornith.* Le Pic à tête bleue, *Sganz. l. c.* p. 34. (Sapacot.)

16. *Atelornis squamigera* (Lafr.), Pucher. Rev. Zool. ix. p. 193.—Brachypteracias squamigera, *Lafr. Rev. Zool.* 1838, p. 224; *Desm. Iconogr. Ornith.* pl. 39.

17. *Halcyon gularis*, Kuhl.—Ispida madagascariensis cærulea, *Briss. Orn.* iv. p. 496. pl. 38. fig. 2; *Pl. enl.* 332. H. ruficollis, *Swains.* Alcedo melanoptera, *Temm. Tabl. méthod.*

Hugh Cuming collected this species in great numbers in the Philippines. It is also met with in South India, and Mr. Strickland is disposed to regard Brisson's statement of the locality as erroneous, especially as Poivre, who sent the bird, also made collections in the Philippine Islands. (Annals and Mag. of Nat. Hist. xiii. p. 14.)

18. *Halcyon rufulus*, Lafresn. Rev. Zool. i. p. 224.

19. *Alcedo madagascariensis*, L.—Ispida madag., *Briss. Orn.* iv. p. 509. pl. 38. fig. 1; *Pl. enl.* 778. fig. 1. Martin pêcheur roux, *Sganz. l. c.* p. 31.

20. *Alcedo vintsioides*, Lafresn. Guér. Mag. de Zool. 1836, pl. 74; Catal. Mus. Rivol. p. 23. Martin pêcheur bleu, *Sganz. ib.*

21. *Merops superciliosus*, L.—Apiaster madagascariensis, *Briss. Orn.* iv. p. 545. pl. 42. fig. 1; *Pl. enl.* 259. Grand Guépier, *Sganz. l. c.* p. 30; *Rüpp. Uebers.* p. 23.

22. *Merops viridis*, L.—Apiaster madag. torquatus, *Briss.* iv. p. 549. pl. 42. fig. 2; *Pl. enl.* 740; *Rüpp. Uebers.* p. 24.

23. *Fregilupus capensis* (Gm.), Less.—La Huppe noire et blanche du Cap d. B. E., *Buff. Pl. enl.* 697. Upupa capensis, *Gm.*, *Lath.* U. varia, *Bodd.* U. madagascariensis, *Shaw.* Tinouch, *Flacourt, Madag.* p. 166. Mus. Paris., Lugdun. Bowdich records the *Upupa capensis* as occurring at Porto Santo; but this is decidedly erroneous.—*Excursions in Madeira and Porto Santo*, p. 93.

24. *Falculia palliata*, I. Geoffr. St. Hilaire, Mag. de Zoologie, 1836, pl. 49. Mus. Paris., Brit., Brem. &c.

25. *Promerops caudacutus*, Vieill.—Le Promerar, *Levaill. Prom. et Guép.* pl. 8 et 9. Epimachus obscurus, *Wagl.* To be found in no collection.

26. *Nectarinia angaladiana* (Shaw).—Certhia madag. viridis, *Briss. Orn.* iii. p. 641. pl. 33. fig. 4 and 5; *Pl. enl.* 575. fig. 2; *Less. Man.* ii. p. 25. Cinnyris madagascariensis, *Q. et Gaim. Astrol.* t. 5. fig. 3.

27. *Nectarinia madagascariensis* (Lath.).—N. Souimanga, *Gm.* Certhia madag. violacea, *Briss. l. c.* p. 368. pl. 32. fig. 2 and 3. Soumangha, *Flacourt, Madag.* p. 166; *Less. Man.* ii. p. 24; *Vieill. Ois. dor.* pl. 18.

28. *Zosterops madagascariensis* (auct.).—Ficedula madag. minor, *Briss. Orn.* iii. p. 498. pl. 28. fig. 2. Le Cheric, *Buff.*; *Levaill. Afr.* pl. 132; *Sganz. l. c.* p. 27; *Rüpp. Uebers.* p. 57.

29. *Zosterops* (?) *borbonicus* (Lath.).—Ficedula borbonica, *Briss. Orn.* iii. p. 510. pl. 28. fig. 3. Petit Simon de Bourbon, *Buff.*, *Sganz. l. c.* p. 28.

30. *Zosterops olivaceus*, nob.—Certhia madag. olivacea, *Briss. Orn.* iii. p. 625. pl. 33. fig. 1; *Pl. enl.* 575. fig. 1. Certhia olivacea, *auct.*

31. *Saxicola sibylla*, auct.—Rubetra madagasc., *Briss. Orn.* iii. p. 439. pl. 24. fig. 4. Le Flitert, *Buff.*, *Sganz. l. c.* p. 27.

32. *Saxicola albospecularis* (Lafresn.), Magas. de Zool. 1836, Ois. pl. 64, 65.—Merle noir, *Sganz. Ois.* p. 26. Mus. Rivoli.

33. *Sylvia* (?) *madagascariensis*, auct.—Luscinia madag., *Briss. Orn.* iii. p. 401. pl. 22. fig. 1. In no collection.

34. *Motacilla flaviventris*, Catal. Mus. Rivoli, p. 9. Flacourt also mentions a wagtail in Madagascar: *Salaleanacondrats*, "*Oiseau qui remue toujours la queue.*" Hist. de Mad. p. 165.

35. *Turdus* (?) *sauijala*, Gm.—Merula madag. aurea, *Briss. Orn.* ii. p. 247. t. 24. fig. 2; *Pl. enl.* 539. fig. 2. Phyllornis jala (*Bodd.*), *Gray, Gen. of Birds.*

This remarkable bird with a short Pitta-like tail is not found in any collection. The colour reminds one of *Anthochæra phrygia.* It is certainly not a *Phyllornis.*

36. *Turdus ourovang*, auct.—Merula madag. cinerea, *Briss.* ii. p. 291. pl. 25. fig. 2. Hypsipetes ourovang, *Cat. Mus. Rivoli*, p. 6; *Sganz. l. c.* p. 26.

37. *Philepitta sericea*, I. Geoffr. St. Hilaire, Mag. de Zool. 1839, Ois. pl. 8; Desm. Iconogr. Ornith. pl. 32.

38. *Philepitta Geoffroyi*, Desm. Icon. Orn. pl. 33. (Goudot.)

39. *Artamia leucocephala* (L.), Lafresn. Dict. univ. ii. p. 166.—Lanius madag. major viridis, *Briss. Orn.* ii. p. 193. pl. 19. fig. 2; *Pl. enl.* 374. Mus. Paris.

40. *Artamia rufa* (L.), Lafr. ibid.—Lanius madag. rufus, *Briss. Orn.* ii. p. 178. pl. 18. fig. 4; *Pl. enl.* 298. fig. 2; *Sganz. l. c.* p. 23. Schetba rufa, *Less.* Mus. Paris.

41. *Artamia viridis* (auct.), Lafr. ib.—Lanius madag. minor viri-

dis, *Briss.* ii. p. 195. pl. 15. fig. 3; *Pl. enl.* 32. fig. 2; *Sganz. l. c.* p. 23. Mus. Paris, &c.

42. *Oriolia Bernieri*, Geoffr. St. Hilaire, Mag. de Zool. 1839, Ois. pl. 4; id. Rev. Zool. i. p. 50.

43. *Muscicapa* (?) *madagascariensis*, auct.—Ficedula madag. major, *Briss. Orn.* iii. p. 482. t. 24. fig. 2. Le Vira ombé de Mad., *Sonner. Voy. Ind.* i. p. 198. To be found, as far as known, in no collection.

44. *Muscipeta holosericea*, Temm.—Muscicapa madag. longicauda, *Briss.* ii. p. 424. pl. 40. fig. 1; *Pl. enl.* 248. fig. 1; *Levaill. Afr.* t. 147. M. rufa, *Swains. West. Afr.* ii. p. 60; *Sganz. l. c.* p. 24.

45. *Muscipeta mutata* (L.).—Muscicapa albicilla longicauda, and varia longicauda, *Briss.* ii. 427. pl. 40. fig. 2 and 3; *Pl. enl.* 428. fig. 2; *Levaill. Afr.* t. 148. M. bicolor, *Swains. West. Afr.* ii. p. 60; Sichetra, *Flacourt, Madag.* p. 166.

46. *Muscipeta borbonica* (Gm.).—Muscicapa borbon. cristata, *Briss.* ii. p. 420. pl. 39. fig. 5; *Pl. enl.* 573. fig. 1.

47. *Muscipeta pretiosa* (Less.).—Tchitrea pretiosa, *Less. Déscr. de Mammif. et d'Ois. récemm. découv.* p. 324. "Habite l'île de Mayotte et se trouve à Nossibé."

48. *Ceblepyris cana*, Licht.—Muscicapa mad. cinerea major, *Briss.* ii. 389. pl. 37. fig. 1; *Pl. enl.* 541; *Rüpp. Monogr. sp.* 6. C. madagascariensis, *Catal. Mus. Rivoli*, p. 5.

49. *Edolius forficatus* (L.).—Muscicapa mad. nigra major cristata, *Briss. Orn.* ii. 388. pl. 37. fig. 4; *Pl. enl.* 189.

50. *Lanius madagascariensis*, L.—L. madag. minor, *Briss. Orn.* ii. p. 164. pl. 16. fig. 1 and 2; *Pl. enl.* 299. Mus. Paris.

51. *Laniarius bicolor* (L.), Gray.—Lanius madag. cæruleus, *Briss.* ii. p. 197. pl. 16. fig. 3; *Pl. enl.* 298. fig. 1; *d'Orb. Dict. univ. Ois. fig.* Mus. Par. Lugd.

52. *Vanga curvirostris* (Gm.), Vieill.—Collurio madag., *Briss. Orn.* ii. p. 191. pl. 19. fig. 1; *Pl. enl.* 228.

53. *Corvus albicollis*, Lath.—Coach, *Flac. Madag.* p. 166. Corbeau de Madagascar, *Sganz. l. c.* p. 29. "Corvus dauricus," *Desjard. Proceed. Zool. Soc.* 1831, p. 45.

54. *Saroglossa* (?) *madagascariensis* (auct.), Gray.—Merula madag., *Briss. Orn.* ii. p. 274. pl. 25. fig. 1; *Pl. enl.* 557. fig. 1; *Catal. Mus. Rivoli*, p. 16; *Sganz. l. c.* p. 26. Turdus madagascarius, *Herm. Tab. Affin. Anim.* p. 210.

55. *Ploceus madagascariensis* (auct.), Gr.—Cardinalis mad., *Briss.* iii. p 112. pl. 6. fig. 2. Le Fondi, *Buff.* Foulimene, *Flac. Madag.* p. 164; *Sganz. l. c.* p. 28. Also in Ile de France, *Milbert.*

56. *Ploceus nelicourvi* (Scop.), Sonner. Voy. Ind. pl. 22.—Loxia pensilis, *Gmel.*

57. *Spermophaga margaritata*, Strickl. Ann. and Mag. xiii. p. 418. pl. 10. Desm. Iconogr. Ornith. livr. xi. pl. 64. *Fringilla Verreauxii*, Pr. d'Essling, MS. The specimen which served as a model to Desmurs's beautiful plate was procured by Jules Verreaux in 1832, in a wood near Cape Town. It afterwards came into the collection of the Duc de Rivoli, and is now, with the other treasures of that noble museum, in the possession of Dr. Thomas Wilson of Philadelphia. The

fact that this species has not again occurred in the well-explored district of the Cape, leads Desmurs to the conclusion that the specimen procured by Verreaux had escaped from confinement, and that Mr. Strickland's statement of its Madagascar habitat deserves all credit; a conclusion to which we assent *.

58. *Pyrrhula nana,* Pucher. Rev. Zool. viii. p. 52; id. Guér. Mag. de Zool. 1845, Ois. pl. 58.

59. *Euryceros Prevostii,* Less. Cent. Zool. pl. 74; id. Illustr. de Zool. pl. 13; id. Bullet. des Sc. nat. xxv. p. 243. Siket-bé, *Sganz. l. c.* p. 31.

60. *Coracopsis nigra* (L.), Wagl.—Psittacus madag. niger, *Briss.* iv. p. 317; *Levaill. Perr.* t. 82. Vaza, *Flac. Mad.* p. 164. Ps. vaza, *Shaw.*

61. *Coracopsis mascarina* (Briss.), Wagl.—Ps. mascarinus, *Briss.* iv. 315; *Pl. enl.* 35.

62. *Psittacula cana* (auct.).—Psittacula madagasc., *Briss. Orn.* iv. p. 394. pl. 30. fig. 2; *Pl. enl.* 791. fig. 2. Saravoza, *Flac. Madag.* p. 163. Psittacus poliocar, *Forst. ed. Licht.* p. 399.

In Richard Schomburgk's 'Reisen in British Guiana' it is stated at p. 421, part 2, "The falling of small husks from a colossal Mimosa betrayed to us the presence of a party of parrots at the top. A shot from one of our attendants brought down two specimens, in which, to my astonishment, I recognized the elegant *Psittacus madagascariensis,* Lath., which was hitherto only supposed to inhabit Madagascar. According to the report of the Indians this delicate bird only comes periodically to the vicinity of Kuamuta, and soon disappears again." We will add nothing to this remarkable statement except a modest ? Should it prove authentic, a point which the expected ornithological Appendix by Cabanis, to R. Schomburgk's Journey, will explain,—this unaccountable fact will stand alone in the history of the geographical distribution of the *Psittacidæ.*

63. *Leptosomus afer* (Gm.), Vieill.—Cuculus madagasc. major, *Briss. Orn.* iv. p. 160. pl. 15. fig. 1 and 2. Le Vouroudriou, *Buff. Pl. enl.* 587. Cuculus discolor, *Herm. Tab. Affin. Anim.* p. 186. L. crombus, *Less. Compl. à Buff.* vi. p. 418.

64. *Centropus melanorhynchus* (Bodd.), Gr.—Cuculus madagascariensis, *Briss. Orn.* iv. 138. pl. 13. fig. 2. C. tolu, *auct.*; *Pl. enl.* 295. fig. 1.

65. *Coua gigas* (Bodd.), Gr.—Coucou verdâtre de Madagascar, *Buff. Pl. enl.* 815. Cuculus madagascariensis, *Gm.* Coccyzus virescens, *Vieill.*

66. *Coua cristata* (L.).—Cuculus madag. cristatus, *Briss.* iv. p. 149. pl. 12. fig. 2; *Pl. enl.* 589; *Levaill. Afr.* pl. 207 Conlicou, *Sganz. l. c.* p. 31.

67. *Coua cærulea* (L.).—Cuculus madag. cæruleus, *Briss.* iv. p. 156. pl. 13. fig. 1; *Pl. enl.* 295. fig. 2.

* This bird was brought, with others, from the Cape, by a lady who assured me that this particular specimen came from Madagascar, and that it was very rare.—Translator.

68. *Coua Delalandi* (Temm.), Pl. enl. 440; Ackermann, Note sur le Coua (*Famac-acora, Casseur d'escargots*), Rev. Zool. iv. p. 209.

69. *Coua Serriana*, Pucher. Rev. Zool. viii. p. 51; Guér. Mag. de Zool. 1845, Ois. pl. 55.

70. *Coua Reynaudii*, Pucher. Rev. Zool. viii. p. 51; Guér. Mag. de Zool. 1845, Ois. pl. 56. Mus. Rivoli.

71. *Coua ruficeps*, Gray, Gen. of Birds, part 29. fig. pulch.

72. "*Cuculus canorus*," L. "Common in Madagascar." J. Desjard. Proceed. Zoolog. Soc. 1832, pp. 111 and 115.

73. *Columba madagascariensis*, Gm., Levaill. Afr. pl. 266.—C. phœnicura, *Wagl.* Palumbus madag. cæruleus, *Briss.* i. p. 140. pl. 14. fig. 1. Fanou-manghe, *Flac. Madag.* p. 163; *Sganz. l. c.* p. 39.

74. *Columba picturata*, Temm. Pl. col. 242.—"Delalande l'a trouvé à Madagascar," *Less. Compl. à Buff.* viii. p. 50.

75. *Alectrœnas Franciæ* (Gm.), Gr.; Levaill. Afr. pl. 276.

76. *Treron australis* (auct.).—Columba viridis madag., *Briss.* i. p. 142. pl. 14. fig. 2; *Pl. enl.* iii.; *Temm. Pig.* t. 3. Vinago nudirostris, *Swains.*

77. *Turtur malaccensis* (auct.).—Columba striata, *auct.* Petite Tourterelle, *Sganz. l. c.* p. 40.

78. *Mesites variegata*, I. Geoffr. St. Hilaire, Rev. Zool. i. p. 50; id. Guér. Mag. de Zool. 1839, pl. 5 and 6; Desm. Iconogr. Ornith. pl. 51. Mus. Paris., Vienn.

79. *Mesites unicolor*, Desm. Rev. Zool. viii. p. 176; id. Iconogr. Ornith. pl. 52.

80. *Numida mitrata*, Pall.—Acanga, *Flac. Madag.* p. 163; *Sganz. l. c.* p. 37.

81. *Perdix madagascariensis*, Scop.—Grande Caille de Mad., *Sonner. Voy. Ind.* p. 169. pl. 98. P. striata, *Gm. Lath.*; *Tabl. encycl. et méthod. Orn.* pl. 92. fig. 2. Mus. Paris., Edin.

82. *Coturnix grisea* (Gm., Lath.), Bonnat. Encycl. méthod. p. 220; Temm. Pig. et Gall. iii. p. 523.—La Caille brun de Madagascar, *Sonn. Voy. Ind.* ii. p. 171. In no collection.

83. *Ithaginis madagascariensis* (Sc.).—Le Perdrix rouge de Mad., *Sonner. Voy. Ind.* ii. 169. Tetrao spadiceus, *Gm.*; *Gray, Hardw. Illustr. Ind. Zool.* ii. pl. 18; *Catal. Mus. Rivoli*, p. 30. Four specimens from Madagascar.

84. *Turnix nigricollis* (Gm.).—Coturnix madagasc., *Briss. Orn.* i. p. 252. pl. 24. fig. 2; *List of Specim. Birds Brit. Mus.* p. 48; *Sganz. l. c.* p. 38.

85. *Francolinus madagascariensis* (auct.).—Le Francolin de l'île de France, *Sonner. Voy. Ind.* p. 166. pl. 97. F. perlatus, *Steph.*; *Vieill. Galer.* pl. 213; *Sganz. l. c.* p. 37.

86. *Pterocles personatus*, Gould, Zool. of H.M.S. Sulphur, Birds, pl. 30. p. 49; id. Proceed. Zool. Soc. 1843, p. 15. "Abundant in the scrubby groves of *Pandanus* skirting a portion of Majambo Bay."

87. *Glareola Geoffroyi*, Pucher. Rev. Zool. viii. p. 51; Guér. Mag. de Zool. 1845, pl. 57.—G. ocularis, *Catal. Mus. Rivoli*, p. 36.

88. *Numenius madagascariensis*, Briss. Orn. v. p. 321. pl. 28; Pl.

enl. 198; Licht. Doubl. p. 75; List of Specim. Brit. Mus. p. 93.—Courlis gris, *Sganz. l. c.* p. 44. Also in Mauritius according to Desjardins, Proceed. Zool. Soc. i. p. 45.

89. *Anastomus lamelligerus*, Temm.; List of Specim. Brit. Mus. p. 89; Rüpp. System. Uebers. p. 121.

90. *Ibis cristata*, auct.—Courlis huppé de Madag., *Buff. Pl. enl.* 841; *id. Ois.* viii.; *Sganz. l. c.* p. 44. Bostrychia cristata, *Reichb.*

91. *Rhynchæa capensis* (L.).—Becassine de Madag., *Buff. Pl. enl.* 922; *Desjard. Proceed. Zool. Soc.* 1831, pl. 45; *Sganz. l. c.* p. 43.

92. *Gallinago Bernieri*, Pucher. Rev. Zool. viii. p. 279. Is it the "*Becassine*," Sganz. l. c. p. 43? (Ravarave.)

93. *Parra albinucha*, Is. Geoffr. St. Hilaire, Mag. de Zool. 1832, pl. 6; id. Étud. zoolog. fascic. i. pl. 6.—P. atricollis, *Swains. Anim. in Menag.* p. 334.

94. *Platalea Telfairii*, Vig. Proceed. Zool. Soc. 1831, pl. 41; ib. 1832, p. 111.—Vourougondrou, *Flac. Madag.* p. 164; *Sganz. l. c.* p. 46; *Malh. Rôle des Ois. chez les Anciens, &c.* p. 13; also in Mauritius, Catal. Chath. Collect. p. 42.

95. *Ardea alba*, L., Desjard. Proceed. 1832, p. 111. Is it "*Heron Blanc*," Sganz. p. 41?; Encyclop. méthod. p. 1110.

96. *Ardea bubulcus*, Sav.—Vourougondrou, *Flac. Madag.* p. 164; *Delegorg. Voy. Afr. aust.* i. p. 334. "Heron de Madagascar," *Poiret, Voy. en Numid. Deutsch. Uebers.* 351; *Rüpp. Syst. Uebers.* p. 121.

97. *Ardea garzetta*, L., Jules Desjard. Proceed. 1832, p. 111; Lath. Gen. Hist. ix. p. 88.

Sganzin's "*Heron bleu*" may be the *Ardea gularis*, Bosk, which also occurs in Abyssinia and Mozambique.

98. *Scopus umbretta*, L.—Scopus, *Briss.* v. p. 505; *Desjard. Proceed. Zool. Soc.* 1831, p. 45; *Tuckey, Voy. Zaire*, p. 407; *Denh. Clappert. Centr. Afr.* p. 202; *Rüpp. Syst. Uebers.* p. 121; *H. Boie, Briefe aus Ostind.* p. 61; *Deleg. Voy. Afr. aust.* i. 516. Ardea fusca, *Forst. ed. Licht.* p. 47; *Bowdich, Excurs. Mad.* p. 230.

99. *Rallus madagascariensis*, A. Smith, South Afr. Quart. Journ. i. p. 80. Biensis typicus, *Pucher. Rev. Zool.* viii. p. 51; *Desm. Iconogr. ornith.* pl. 24. Is it also *R. madagascariensis*, Desjard. Proceed. 1831, p. 45?

100. *Rallus (Eulabeornis) Cuvieri*, Pucher. Rev. Zool. viii. p. 279.—R. gularis, *Cuv.*, *Less.*; *Guér. Iconogr. Ois.* pl. 58. fig. 1. Râle de Madag., *Sganz. l. c.* p. 46. Mus. Paris. Also in Mauritius.

101. *Gallinula kioloides*, Pucher. Rev. Zool. viii. p. 279.

102. *Porphyrio madagascariensis*, Gm.—Taleva, *Flac. Madag.* p. 164. Taleve de Madag., *Buff. Pl. enl.* 810. P. smaragnotos, *Temm.*; *Sganz. l. c.* p. 44. Fulica porphyrio, *Forst. ed. Licht.* p. 49.

103. *Fulica chloropus*, L., Desjard. Proceed. Zool. Soc. 1831, p. 45; Sganz. *l. c.* p. 45.

104. *Fulica cristata*, Gm.—Haretac, *Flac. Madag.* p. 164. Grande Foulgue à crête, *Buff.*; *Lath. Gen. Hist.* x. pl. 165; *Desjard. Proceed.* 1831, p. 45; *Sganz. l. c.* p. 46; *Rüpp. System. Uebers.* p. 128; *Barthélemy, Rev. Zool.* iv. p. 307; *Malh. Faune ornith. Sicile*, p. 198.

105. *Phœnicopterus antiquorum*, Temm.—Sambé, *Flac. Madag.* p. 164. Flamant, *Sganz. l. c.* p. 47.

106. *Nettapus auritus* (Bodd.), Pl. enl. 770.—Anas madagascariensis, *Gm.*; *Sganz.* p. 48. Also in Western Africa, Catal. Birds Brit. Mus. iii. p. 128. (Rendall.)

107. *Sarkidiornis regia* (Mol.), Eyton.—Anas melanotos, *Penn.*; *Pl. enl.* 937. Rossangue, *Flac. Madag.* p. 164. "Canard à bosse," *Sganz.* p. 49; *Denh. Clapp. Centr. Afr.* p. 204; *Delegorg. Voy. Afr. aust.* ii. p. 531; *Rüpp. Syst. Uebers.* p. 136.

Whether this species, which lives in Madagascar, be not rather the *S. africana*, Eyt., remains undecided. We know in fact very little of the ducks of that country. Flacourt names "four *sarcelles*," Desjardins, "four species *of the genus Anas*," and the Abbé Rochon mentions six species of ducks. Sganzin has only three.

108. *Podiceps minor*, L., Desjard. Proceed. Zool. Soc. 1831, p. 45. A passage in Du Maine, *Voy. à la terre d'Ancaye*, Deutsch. Uebers. Spreng. Bibl. Reis. 46. p. 75, alludes to the occurrence of a second species of *Podiceps*: "Here we procured a bird not so large as a teal with black pointed beak, clear brown head and body, black collar and white belly; the feet seem to go out behind and are divided into little '*palettes pour nager.*'"

109. *Larus ridibundus*, Leisl. (?)—"Petite Mouette cendrée," *Buff.*, *Sganz. l. c.* p. 49.

110. *Phaëton phœnicurus*, L.

111. *Phaëton flavirostris*, Br.

112. *Procellaria capensis*, L.

113. *Sula piscatrix*, L.

What is *Pelecanus madagascariensis*, Fisch., National Mus. at Paris, i. p. 192?

Although, from our slight acquaintance with the interior of Madagascar, the species here enumerated probably form only a minority of the entire ornithology of this great island, yet their number appears to us to be sufficiently large to guide us to certain geographical and zoological results. These tend altogether to confirm that great peculiarity of character in the Madagascar fauna which is also indicated by the other animal classes. Not less than 68 of the 113 species above-mentioned have never yet been discovered either in the African continent or in any other region of the earth. They belong exclusively to the island, and include a number of remarkable forms, distinguished by their colour and structure. The genera *Euryceros, Falculia, Mesites, Oriolia, Leptosomus, Coua, Philepitta, Brachypteracias, Atelornis, Coracopsis* and *Biensis* are confined to Madagascar; two others, *Fregilupus* and *Alectrœnas*, extend also to the Mascarene islands, which are proportionably poor in birds. Of eight African genera, that is to say, such as are peculiar to the African continent, Madagascar, as far as known, possesses four, viz. *Scopus, Numida, Polyboroides*, and *Melierax*. The first of these, *Scopus umbretta*, has a very extensive geographical distribution; Adanson observed it in Senegal, Bowdich on the Gambia, Boie and others at the Cape, Delegorgue at Port Natal, Tuckey at the Zaire, Denham and Clapperton in Central Africa, and Rüppell in Sennaar and Abyssinia; it is said also to have been met with in southern Arabia. The genus *Numida* is extended over all Africa, though the habitat of certain species, such as *Numida vulturina*, is very restricted; the species which occurs in Madagascar lives also in South Africa, and is altogether the most widely extended. The beautiful falconine genus *Polyboroides* has been observed in very distant localities of Africa; it is not rare throughout S. Africa, occurs, according to Rüppell, in Schoa, and the museum at Bremen contains a fine female specimen from the Gambia. According to Andrew Smith, the Madagascar specimens of this bird were somewhat smaller, and altogether paler-coloured than the continental ones. Lastly, the singing falcon, *Melierax canorus*, has a rather less extended distribution; its occurrence in Madagascar is asserted by Sganzin.

On the other hand, the following genera, which are truly African, and in part highly characteristic, are wanting in this island: *Gypogeranus, Helotarsus, Musophaga, Corythaix, Chizærhis, Pogonias, Trachyphonus, Barbatula, Lamprotornis* (*Juida*, Gr.), *Malaconotus, Drymoica, Colius* and *Buphaga*. The inexplicable anomaly of the absence of vultures and woodpeckers in the fauna of Australia and of the Papuan islands, recurs in a remarkable manner in Madagascar, where, hitherto at least, no bird of these two families has been observed; for Sganzin's *Pic* and *Pic à tête bleue* are species of *Brachypteracias*. The genera *Francolinus, Pterocles, Ploceus, Cursorius, Otis, Chalcites, Laniarius*, &c., which are distributed in numerous species throughout Africa, present in Madagascar either but one representative, or none at all, which last is the case with the four genera last named; the gaily-coloured *Lanius madagascariensis cæruleus* of Brisson, which Gray refers to *Laniarius*, is very isolated in its coloration and form of beak, and shares its peculiarity with other Madagascar birds, so that it cannot be placed with certainty in any of the modern genera. The family of the hornbills (*Bucerotidæ*) is exhibited in Madagascar by means of a dwarf form, *Euryceros Prevosti*, first described by Lesson.

The following species are met with both in Africa and Madagascar:—

Polyboroides typicus, Melierax canorus, Corvus albicollis, Zosterops madagascariensis, Treron australis, Numida mitrata, Numenius madagascariensis, Anastomus lamelligerus, Scopus umbretta, Rhynchæa capensis, Ardea bubulcus, Porphyrio madagascariensis, Nettapus auritus, and *Sarkidiorn isregia.* Also *Merops* *viridis* and *superciliosus* are stated by several zoologists, Rüppell for instance, to inhabit the African continent; but whether correctly, that is, whether continental specimens were recognized as identical after a close comparison with those of Madagascar, is somewhat questionable. The number of species which inhabit both Madagascar and the Mascarene islands, is, so far as we know, only small. As such may perhaps be mentioned, *Tinnunculus punctatus, Fregilupus capensis, Zosterops borbonicus, Saxicola sibylla, Muscipeta borbonica, Ploceus madagascariensis, Psittacula cana, Columba picturata, Alectrænas franciæ, Francolinus madagascariensis, Numenius madagascariensis, Platalea Telfairi,* and *Rallus Cuvieri.* Of birds more widely extended in the Old World, whose occurrence in Madagascar is asserted by single witnesses, but is not yet sufficiently demonstrated, there are, *Strix flammea, Cuculus canorus, Ardea alba* and *garzetta, Fulica chloropus* and *cristata, Phœnicopterus antiquorum, Podiceps minor,* and *Larus ridibundus* (??).

The affinity assumed by I. Geoffroy St. Hilaire and others, between the Madagascar and the Indo-Australian fauna, is especially confirmed by the fact that the genus *Artamia* (*Artamus*) is represented in that island by several remarkably-coloured species; as well as by the common occurrence of certain species in India and Madagascar, provided always that the statements to that effect be established. We found *Strix manadensis* under that name in the Paris Museum, but with an attached label "*Madagasc.* Bernier" (1840). Whether *Ithaginis madagascariensis,* a bird widely diffused in India, really occurs in that island also, remains altogether undetermined. We may add also, that Gray includes the *Merula madagascariensis* of Brisson (we know not whether from his own observation) as a second species of Hodgson's genus *Saroglossa* [more properly *Psaroglossa*;—Transl.], whose type is the well-known *Lamprotornis spilopterus,* Vig., from the Himalaya. It is earnestly to be wished that future naturalist-travellers would pay especial attention to the great Struthious bird *Vouron-patra,* mentioned by Flacourt, the rediscovery of which, in connexion with the fact that Bourbon, Mauritius, and Rodriguez had each their own species of *Didus,* would be of the highest geographico-zoological interest. Flacourt's account bears no mark of the fabulous about it, and certainly deserves all possible attention.

The geographico-zoological results of our superficial knowledge of the birds of Madagascar may be summed up in the following propositions:—

1. The ornithological fauna of Madagascar is indeed rich in peculiar genera and species which do not occur elsewhere, yet

this is not true of the whole mass, as is the case with the Mammalia.

2. It has a tendency to exhibit the African model, but shows a greater conformity to the fauna of the Mascarene islands.

3. It bears clear and characteristic traces of an affinity with the Indo-Australian fauna. (Black parrots occur only in New Holland and New Guinea, besides Madagascar.)

4. The number of handsome and bright-coloured species, among the birds of Madagascar, is remarkably small, considering the tropical position of the island.

XLI.—*Description of a new British* Limnæa. By Joshua Alder, Esq.

[With a Plate.]

The European freshwater mollusca of the pulmoniferous order are so few in number, and, for the most part, so well known and generally diffused, that it is only by a happy chance we meet with a new species to record. It gives me pleasure therefore to be able to add to the British list an undescribed *Limnæa* lately discovered by my friend Mr. Robert Burnett of Newcastle, in Loch Skene, Dumfries-shire.

Limnæa Burnetti. Pl. XI. fig. 1.

Shell ovate, gibbous, obtuse, of a bright yellowish horn-colour, rather glossy and semitransparent, delicately and pretty regularly striated. Spire involuted and placed obliquely: the first and second whorls are slightly sunk in the apex, the third rising a little above them so as to be visible in profile: the body-whorl is large, much-inflated, and occupies nearly the whole of the shell. Aperture large and ovate; the outer lip thin, generally very regularly arched, but sometimes a little constricted in the middle; rounded at the base, and not expanded at the margin; inner lip reflected on the columella and forming a subumbilicus: the columella is only very slightly twisted; and the body-whorl, which is more than usually rounded, projects a little into the aperture above. The spire is not visible from the under side. Length of the largest specimens three-quarters of an inch, breadth rather more than half an inch. The usual size is about one-third less.

Animal of the usual form of the genus, but a little broader than in *L. peregra*. It is dark olive-coloured, spotted with opake-yellow. The cloak is nearly black, with a few paler spots.

From its involuted spire, small specimens of this species might be taken for the *Amphipeplea involuta* of Thompson; but it may be distinguished from that shell by its being stronger and more ventricose, and especially by its having the whorls placed more to one side, giving it somewhat the form of a *Nerita*. When full-grown it is more than three times the size of *A. involuta*.

It differs from all the varieties of *Limnæa peregra* in having the spire involuted and placed rather more obliquely, in the more gibbous and ampullaceous form of the shell, and in being more regularly striated. The animal, too, is much darker, and not so distinctly marbled on the cloak.

A shell found by Capt. Brown in Loch Leven, and described and figured in his 'Illustrations of Recent British Conchology' under the name of *Amphipeplea lacustris*, appears to resemble this species in form, but it is stated to have the spire with two small volutions, the superior one blunt at the apex, from which we must conclude that the spire is exserted: the shell is also stated to be 'extremely thin, pellucid and shining;'—characters which agree much better with *Amphipeplea glutinosa* than with our shell. The *Gulnaria lacustris* of Leach, to which Capt. Brown refers his species, is quite distinct from the one now described.

Mr. Burnett first detected this new *Limnæa* in the stomachs of trout caught in Loch Skene, and on a second visit to that wild locality, so tempting to the angler, he succeeded in obtaining many fine living examples, for the larger portion of which I am indebted to his liberality. Some of the older individuals are a good deal eroded and perforated, showing that they have other enemies besides the trout.

XLII.—*On some new Mesozoic Radiata.* By Frederick M'Coy, M.G.S. & N.H.S.D. &c.

Amorphozoa.

Plocoscyphia laxa (M'Coy).

Sp. Char. Hemispherical masses about 2 or 3 inches in diameter, formed of short, wide, irregularly contorted and lobed cups, varying from half to 1 inch in diameter, the walls about 2 lines thick, of a rather coarse irregular spongy texture.

On comparison with the figure of Goldfuss, and with authentic specimens from the Essen chalk of his *Achilleum morchella*, which now forms the type of the genus *Plocoscyphia* of Reuss, I find the present species distinguished by its much larger, more deeply and widely separated cups, their much thicker walls, and very much more open lacunose structure. The contortion of the edges of the cups gives a superficial resemblance to some *Lobophylliæ.*

Not uncommon in the greensand of Lyme Regis.

(*Col.* University of Cambridge.)

Jerea pastinaca (M'Coy).

Sp. Char. Very elongate-conic, subcylindrical, gradually tapering towards the base (the extreme apex sometimes abruptly narrowed), free end obtusely subtruncate with rounded margin, but not contracted in diameter; mouths of the vertical excretory tubes rather less than a line in diameter, chiefly confined to a circular area in the middle about half the diameter of the individual, leaving an external margin about one-fourth the diameter of a dense reticulated substance having a slightly radiated structure in the cross section and destitute of the large tubes. Average length 6 inches, diameter 2 inches, or larger.

This species resembles a carrot or parsnip in size and shape, whence the specific name; it is distinguished from the *Siphonia pistillum* (Gold.) and *Jerea pistilliformis* (Lamx.), besides its peculiar form, by the vertical tubes being confined to the central part of the cylindrical mass, while in the terminal disc or transverse section of those species they are seen to open almost uniformly through every part; they are also much more numerous and rather smaller than in the present fossil.

Very common in the greensand of the Vale of Pewsey, Wilts.

(*Col.* University of Cambridge.)

Manon Reussii (M'Coy).

Sp. Char. A large, auriform, foliaceous expansion, averaging rather more than half an inch thick and from 3 to 5 inches in diameter; undulato-concave above and irregularly convex below; the pedicle of attachment small, excentric towards the side where the margins are inrolled; edge obtusely rounded, of a fine lacunose or spongy texture; upper and under surfaces with thickly scattered, prominent, wart-like mouths of excretory ducts a line in diameter, averaging twice their diameter apart on the upper surface, more crowded and irregular on the lower; intervening spaces of a more dense and uniform porous structure than the margins.

Besides the difference of form and size, this is distinguished from the *Spongia marginata* (Phil., Geol. of Yorkshire) and *M. Phillipsii* (Reuss, Versteinerungen der böhmischen Kreideformation) by having the large excretory pores on the outer as well as on the upper surface; the character is constant and strongly marked.

Common in the chalk of some parts of Yorkshire.

(*Col.* University of Cambridge.)

Manon foliaceum (M'Coy).

Sp. Char. A large, flat, or slightly concave, thin foliaceous expansion (averaging 7 or 8 inches in diameter and quarter of an inch thick) of a very dense, minutely porous structure; margin rounded; upper surface with numerous very prominent ostiolæ, averaging twice their diameter apart, rather less than a line in diameter, perpendicular to the surface near the base, but becoming obliquely elongated towards the margin like adpressed tubuli; under surface marked with concentric waves of growth without ostiolæ.

This singularly thin expanded species has no resemblance to any other I am acquainted with.

From the coralline oolite of Malton.

(*Col.* University of Cambridge.)

ZOOPHYTA.

(*Zoantharia.*)

Dentipora glomerata (M'Coy).

Sp. Char. Corallum forming irregular globose masses 2 or 3 inches in diameter, of a very dense granular structure, in which are distributed the circular cells, 1 line in diameter, and their own diameter apart; the stars have a small depressed centre, from which ten thick, equal lamellæ radiate to the circumference, where between each pair a minute rudimentary marginal lamella is usually seen.

Common in the coralline oolite of Malton.

(*Col.* University of Cambridge.)

Stylopora solida (M'Coy).

Sp. Char. Corallum forming spheroidal masses about 1 inch in diameter, on the surface of which circular cells open, 1 line in diameter with slightly prominent margins; a minute central style or axis from which six strong equal lamellæ radiate to the walls, where in some specimens a minute rudimentary marginal lamella may be seen between each pair; the cells vary from once to twice their diameter apart, the intervening substance very compact, with a minute obsolete superficial granulation.

The remoteness of the cells from each other separates this constantly from specimens I have examined of the *Astræa sexradiata* (Gold.) which agree with his figure in having them half their diameter apart, without perceptible variation, while from the *A. tumularis* (Michel.) it differs in its smaller and less prominent cells as well as form of the mass.

Not uncommon in the inferior oolites of Dundry.

(*Col.* University of Cambridge.)

Astræa (Lamk.).

From the unfavourable mode of petrifaction of the oolitic *Astrææ*, I am unable to seize their subgeneric characters with the precision I could wish—their specific characters are easy enough—I have therefore provisionally been obliged to leave them all under the old genus *Astræa* for the present, being unable satisfactorily to define their differences from the recent group.

Astræa tenuistriata (M'Coy).

Sp. Char. Corallum forming irregular flattened masses, of shallow polygonal cells, very unequal in size and shape (most usual diameter about 5 lines); centre obscurely granular, radiating lamellæ very slender, close, minutely crenulated, alternately larger and several shorter (number varies with the size of the star, but always about twelve in a space of two lines at the margin).

In the very irregular size and shape of the stars and the great number and delicacy of the lamellæ, this agrees with the *A. confluens* (Gold.), from which it differs in the flatness of the cells, and in wanting the remarkable confluent character of that species, the young cells developing their boundary ridges almost on their first appearance.

Common in the inferior oolite of Dundry.

(*Col.* University of Cambridge.)

Astræa explanulata (M'Coy).

Sp. Char. Corallum forming flat expansions, of nearly equal, subrhomboidal, shallow cells, averaging 2 lines in diameter; radiating lamellæ from twenty-six to thirty, thick, very obscurely punctured or crenulated, about every third one reaching to the impressed central point; interstices very obtusely angular.

In the flat form of growth assumed by the masses, and in the equality, shallowness and tetragonal form of most of the cells, this strongly resembles the *A. explanata* (Gold.) of the Natheim oolite; but on comparison with authentic specimens of this latter, I find the cells of our species average only half the diameter of that, the radiating lamellæ are little more than half the number, are much thicker and almost perfectly smooth. In number and thickness of the lamellæ it more nearly approaches the common *A. helianthoides* (Gold.), but differs in their comparative smoothness and the more equal size and quadrate form of the cells, &c.

Common in the inferior oolite of Dundry and Bath.

(*Col.* University of Cambridge.)

Astræa helianthella (M'Coy).

Sp. Char. Corallum forming large depressed turbinate masses (generally from 2 to 5 inches in diameter and 9 lines to 2 inches high) with faint concentric wrinkles below, crossed by very minute radiating striæ; upper surface flat, covered with small, subequal, polygonal cells (diameter, or from centre to centre, varying from $1\frac{1}{2}$ to 2 lines) with rounded boundaries and very deeply excavated centres; lamellæ about thirty-eight, eight or nine of which reach the centre, of moderate, nearly equal thickness, slightly rugged.

This fine species is abundant in the lower oolite, and seems to be constantly distinguished from the *A. helianthoides* (Gold.) of the coralline oolite by its smaller and more equal cells, more numerous lamellæ and flatness of the masses, particularly of the stelliferous surface.

Common in the inferior oolite of Dundry.

(*Col.* University of Cambridge.)

Siderastræa agariciaformis (M'Coy).

Sp. Char. Corallum forming large foliaceous expansions; cells about $1\frac{1}{2}$ line in diameter, arranged in rows, the cells of each row half their diameter apart, the rows nearly twice their diameter apart; the cells are radiated by about twelve lamellæ from a depressed cellulose centre; they increase in number towards the margin, and the greater number take a straight course in two opposite directions to unite with the nearest star of the adjoining row on each side (giving the corallum the appearance of being strongly striated in one direction as in *Agaricia*).

This coral is very like the lower part (natural size) of Goldfuss's figure of his *Astræa flexuosa* from the cretaceous rocks of St. Peter's Mountain. It is most usual to find the *lower* side exposed by a sort of rough section, in which the cells project like the so-called genus *Montastræa*. In the section the small connecting vesicular plates are seen.

Common in the coral rag of Upware, near Cambridge.

(*Col.* University of Cambridge.)

Meandrina vermicularis (M'Coy).

Sp. Char. Corallum forming depressed rounded masses 3 or 4 inches in diameter; upper surface covered with vermicular contorted ridges about half a line in diameter, from 1 to 2 lines apart, and about 1 line high, variously connected at intervals, their sides very finely and regularly striated by the minute lamellæ (about eight or nine in the space of one line), and a single row of little stars in the valleys between each pair of ridges.

The extreme slenderness of the ridges and their strong contortion give this coral the appearance of a mass of little marine worms, and separate it easily from all known species; it far exceeding the *M. venustula* (Mich.) and *M. Lotharinga* (Mich.) in those respects, and I know no other species to which it makes any approach.

Rare in the inferior oolite of Leckhampton.

(*Col.* University of Cambridge.)

Montlivaultia (Lamx.).

I have satisfied myself, from the examination of a large suite of both foreign and British species, that the *Montlivaultiæ* of Lamouroux are identical in generic character with those corals to which Münster, Goldfuss, Esper, Blainville, &c. have restricted the name *Anthophyllum* of Schweigger, the different ages of the *A. decipiens* (Gold.) for instance demonstrating the identity of the groups in a single species. This renders the synonymy of the genus *Anthophyllum* more clear and definite than it has been. That genus was originally established by Schweigger in his 'Beobachtungen, &c. Anat. phys. Untersuchungen über Corallen' (tab. 6), and defined as agreeing with *Turbinolia*, except in being fixed and having the margin of the cells dilated; he divided it into five groups: the 1st, "*cylindri turbinati subsolitarii,*" since formed into the genus *Cyathina* (Ehr.); 2nd, "*cylindri turbinati in ramos connexi,*" being, from the species referred to, equivalent to the later genus *Cladocora* (Ehr.); 3rd, "*cylindri turbinati, e basi stirpis divergentes, versus basin concreti,*" might I think be united to his 5th group, which is similarly defined except that the tubes are "*lamellis calcareis horizontalibus juncti,*" a difference which disappears on examining specimens of the species he refers to as examples of the groups; the 4th group, founded on the *C. calycularis,* is referred by Ehrenberg to his *Caryophyllia.* It is unfortunate that the characters of this group as originally given are not applicable to any natural genus. Ehrenberg in his 'Beiträge zur Kenntniss der Corallenthiere des rothen Meeres' having formed the 1st group into one genus, the 2nd and

4th into another, has retained the name *Anthophyllum* for the remainder (*Caryophyllia fastigiata*, &c.), while, as above mentioned, nearly all the continental palæontologists have been in the habit of using it for the very different, turbinated corals which now occupy us, and which agree with the general definition of Schweigger, though probably not contemplated by him at the time. In the young state those corals are attached by a broad base, which soon becomes carious and hollow as the coral grows, undermining its base even to the thin external wall, which at last gives way, and the corallum thus becomes a free cone with a naked, obtusely rounded apex: some species grow so little vertically, that the separation from the carious hollow old base is effected in a nearly horizontal plane, so that the adult free corallum is scarcely distinguishable from *Cyclolites*, being circular, thin, flat, the upper and lower surfaces nearly parallel and both radiated: whether the form be flat or conical, the terminal star is never excavated into a cup, by which the species may be known from *Turbinolia* and *Cyathina*, as well as by the obtuseness of the margin (the lamellæ extending over it), the thin easily lost outer wall, and the lamellæ being very thick and simply meeting in the centre without a cellulose axis.

Montlivaultia gregaria (M'Coy).

Sp. Char. Corallum forming turbinate masses (about 3 inches wide and nearly 2 inches high) of few individuals which terminate on the upper surface as prominent, disconnected, circular, slightly concave or convex discs with obtusely rounded margins, generally $1\frac{1}{2}$ inch in diameter, with about eighty thick radiating lamellæ, many of which reach the centre, the rest being irregularly smaller; connecting vesicular plates very delicate; external wall covering the lamellæ very thin, rarely preserved.

The individuals of which the turbinate masses are composed are identical in generic character with the ordinary *Montlivaultiæ*, as the term is here used; but no other species that I know has this gregarious mode of growth, nor will any other genus contain the species.

Common in the inferior oolite of Dundry and Cheltenham.

(*Col.* University of Cambridge.)

Dendrophyllia plicata (M'Coy).

Sp. Char. Corallum of approximately straight stems from $1\frac{1}{2}$ to 2 lines in diameter, giving off at an angle of about 60° branch-like cells averaging 3 lines long and slightly less in diameter than the stem, arranged spirally at short irregular distances;

surface with fine longitudinal punctured striæ (about seven in the space of one line); for rather more than a line from the edge of each cell, every alternate superficial ridge becomes narrowed and depressed, the intervening ones suddenly acquiring a greater thickness and prominence, giving a plicated appearance to the ends of the branches; cellular axis and alternating lamellæ of the star as in the allied species of the genus.

This species most resembles the *Lithodendron* (*Dendrophyllia*) *granulosa* (Münst.) of the Abtenau tertiary beds, of which Goldfuss has given a tolerably good figure in his 'Petrefacten,' but the stem is smaller, not flexuous nor marked with annular constrictions; it is also much more finely striated, and is remarkable for the peculiar plication produced by the unequal projection of the alternate ridges towards the mouths of the cells.

Coralline oolite, Steeple Ashton.

(*Col.* University of Cambridge.)

Chrysaora similis (M'Coy).

Sp. Char. Corallum forming depressed rounded masses (usually about half an inch in diameter); upper convex surface with numerous small conical projections, generally rather less than a line apart, from which small, irregularly branching ridges radiate; the projecting points and ridges seem nearly solid and smooth, the intervening spaces coarsely punctured by the closely-placed openings of the minute cells.

This is so closely allied to the *Ceriopora* (*Chrysaora*) *venosa* (Gold.) of the Essen greensand that I scarcely can define their difference; the figures of Goldfuss of this latter species are both $2\frac{1}{2}$ diameters larger than nature, but making this allowance the character of the surface is nearly the same in both; the present oolitic coral seems however to be constantly smaller and more delicate in all its parts, and forms smaller and more depressed masses.

Great oolite. Not uncommon at Minchinhampton.

(*Col.* University of Cambridge.)

Echinodermata.

Crinoidea.

Bourgueticrinus cylindricus (M'Coy).

Sp. Char. *Column* elliptical; *body* cylindrical, scarcely exceeding the stem in diameter, composed of four upper columnar joints of equal diameter, but the two upper thinner than the third, the fourth nearly double the thickness of the third, round in its upper half, abruptly compressed and elliptical in the lower half; on the upper columnar joint rest five pentagonal *pelvic plates* nearly equalling it in depth; between the upper lateral angles of these are five exceedingly small, pentagonal *first radial plates* not half the depth of the pelvic plates. Length of body to base of fourth columnar joint $9\frac{1}{2}$ lines, diameter $3\frac{1}{2}$ lines: articulating surface of columnar joints perfectly smooth, having a thickened external rim and a mesial transverse articular ridge perforated in the middle by a minute alimentary opening.

This is so strongly marked in all its characters that a comparison with other species is scarcely necessary: the "straight encrinite" of Parkinson (*B. æqualis*, D'Orb.) is easily distinguished by the above characters.

The nearest approach to it that I have seen is the so-called *Eugeniacrinites Hagenowii* (Gold.), figured by Dr. Hagenow in his memoir on the "Rügenschen Kreide-Versteinerungen" in Leonhard and Bronn's 'Jahrbuch' for 1840. The latter fossil, though I think probably referable to the present genus, is distinguished as a species by the great depth of the two upper joints of the dilated column.

Rare in the upper chalk, Norwich.

(*Col.* University of Cambridge.)

Bourgueticrinus Milleri (M'Coy).

There are two species confounded in England under the name *Apiocrinus ellipticus* of Miller, by whom they are both figured without distinction; one with the first radial plates, about double the depth of the pelvic plate which most of his figures illustrate, is the one recognized by nearly all continental writers as this species, and as such is figured as the type of the present genus by D'Orbigny; to it therefore the name *B. ellipticus* should be retained. The other (fig. 1 of Miller's work) has the first radial and pelvic plates about equal in depth, with the same club-like figure; this, which is more rare, but constant in its characters, I beg to distinguish by the above name.

Upper chalk, Norwich.

(*Col.* University of Cambridge, &c.)

Bourgueticrinus oöliticus (M'Coy).

Sp. Char. *Column* much-compressed, of thin elliptical joints angulated and obscurely tuberculated round the middle of their outer edge; articular surface having a strong transverse ridge, with a central boss perforated by the small alimentary canal, external margin broad, central oval hollow, deep: long diameter 6 lines.

Among mesozoic crinoids the present genus is well characterized by its column, and as this is a large well-marked species, I have not hesitated to characterize it from the portion known on account of the interest attaching to its geological locality, the genus being hitherto only found in the upper chalk.

Rare in the Bradford clay at Bradford.

(*Col.* University of Cambridge.)

Apiocrinus exutus (M'Coy).

Sp. Char. Cup ovate (less ventricose in the middle than the *A. Parkinsoni,* Schlot., and more so than the *A. elegans,* Def.); about six of the upper columnar joints widen to form the base of the cup and increase greatly in thickness; on the upper columnar joint rest five pentagonal *pelvic plates,* alternating above which are five quadrangular *basal radial plates* (first costals of Miller), on each of which the cuneiform axillary radial joint (*scapula*) rests, the intermediate plate being wanting; on these rest two semiradial plates or *arms*; diameter at upper columnar joint 1 inch 6 lines; width of radial plates 9 lines, depth of each in middle 3 lines, depth of pelvic plates in the middle 4 lines, depth of upper columnar joint 4½ lines; columnar articulation very finely radiated.

The comparative slenderness of its form and thickness of the upper columnar joints make it intermediate in those points between the *A. Parkinsoni* (Schlot.) and *A. elegans* (Def.), while it is distinguished from all of the genus by the want of the intermediary radial joints (or second costæ) in each row.

Rare in the Bradford clay, Bradford.

(*Col.* University of Cambridge.)

Pentacrinus dichotomus (M'Coy).

Sp. Char. Column, auxiliary side-arms, *pelvic* and *costal joints* as in the *P. Britannicus* (Schlot.), but the entire animal smaller and more slender, and the *auxiliary side-arms* proportionally wider; each of the five scapulæ supports two slender *arms* of nine or ten joints each, the last joint cuneiform, and supporting *two slender hands of equal thickness,* the inner usually of thirteen, and the outer of sixteen joints, each hand *regularly dichotomizing into a few very slender fingers of perfectly equal thickness*; auxiliary side-arms very thin, but equalling the arms in width. Length of body and fingers 1½ to 2 inches.

This delicate little species has a very singular aspect, and differs from its congeners in the hands not continuing as thick main branches, giving off comparatively thin fingers from one side, but both hands and fingers dichotomizing into perfectly equal branches.

I have examined portions of eight heads, some nearly perfect, with their columns and side-arms, on a slab of lias shale from Whitby.

(*Col.* University of Cambridge.)

Pentacrinus Goldfussi (M'Coy).

Sp. Char. Column pentagonal, joints alternately thicker and thinner, or three thin between each pair of thicker joints, articulating by five oval, prominent, finely crenated ridges, the intervening spaces much depressed; *auxiliary side-arms* large, flattened, of elliptical joints, five arising from every thick columnar joint (one from each side), the long axis being attached vertically; pelvic joints large, cuneiform; *first costals* heptagonal, twice as wide as long, flattened (not produced into a cone downwards), each having a prominent tubercle in the centre, adhering laterally by only a short portion of its margin; *second costals* horseshoe-shaped; *scapulæ* cuneiform, as long as wide; from which two arms arise, of eight or nine joints, the last being cuneiform and supporting two hands, the inner of nine and the outer of fourteen or fifteen joints, the last cuneiform and giving off a lateral finger, and after fourteen or fifteen joints more another (total number of fingers unknown, but small).

In the great number, size, and mode of insertion of the auxiliary side-arms this agrees with the *P. Britannicus* (Schlot.), (*P. Briareus*, Mill.), but differs in its small size, broad oval pentapetalous markings of the columnar joints, and from that and all allied species it strongly differs in the first costals not being prolonged into a cone down the sides of the column.

There are clearly two species confounded by Goldfuss under the name *P. scalaris*, one of which, figured on the 60th plate of his 'Petrefacten,' is much allied to this; the other figures on pl. 52 of the same work differ considerably, but agree with numerous authentic specimens I have seen of that species from the German oolites, and also with some from our lower oolite at Dundry; the latter is therefore the most proper type of his species.

Marlstone, Gloucestershire.

(*Col.* University of Cambridge.)

(*Asteroïda**.)

Goniaster (*Goniodiscus*) *rectilineus* (M'Coy).

Sp. Char. Sides straight or nearly so; on the dorsal surface each side has eight finely granulated, moderately convex marginal ossicles, of which the two end or "ocular" plates are triangular and the four intermediate ones are quadrate, *all of one length*, the width of each equal to half its length; the ossicles of the oral side are similar except the triangular plate at each end, which is there replaced by three smaller ones; plates of the disc small, polygonal and minutely granulated. Width of each side 1 inch 3 lines; length of marginal ossicles 3 lines.

The straightness of the sides, and all the marginal ossicles (except the eye-plates) being of one size, so that the inner and outer boundaries of each row form two straight, parallel lines, distinguish this species, which is, I think, only likely to be confounded with the *G. regularis* (Park. sp.); I have good specimens of this latter now before me, and it is distinguished from the present species by having the margin of the sides *convex* outwardly, and the middle marginal plates being considerably the largest, the others decreasing rapidly in size towards the angles, so that the row of plates instead of being rectilinear and parallel-sided is clearly elliptical: this character is represented in Parkinson's figure, but not to the extent to which it is seen in nature, from the inner ends of the ossicles in his specimen being manifestly a little broken.

Upper chalk of Norwich (two specimens).
(*Col.* University of Cambridge.)

Asterias (*Astropecten*) *recta* (M'Coy).

Sp. Char. Rays five, straight, length from the base about three times the width of the disc, widest at the base, tapering gradually to the apex, with straight sides; rows of lateral plates averaging one-third the width of each ray (occupying rather less at the base and rather more at the apex); they average $1\frac{1}{2}$ line long and 3 lines wide, the long diameter or width diminishing gradually from the base to the apex; angles be-

* Prof. Forbes having recently published in the 'Memoirs of the Geol. Survey of Great Britain' short descriptions of a number of new chalk star-fishes, I trespassed on his good-nature so far as to send the notes and rough sketches of mine for identification. The one above described is distinct from any of his, but he suggests that the straightness of the sides may result from the suppression of one of them:—the specimen I first sketched may have been four-sided, for the two angles preserved are pretty nearly of 90°, but the second specimen has portions of its five sides preserved, and has all the above characters.

tween the rays acute; disc and middle of the rays closely covered with blunt tubercles about $\frac{3}{4}$ths of a line in diameter. Each ray about $5\frac{1}{2}$ inches long and 1 inch wide at base.

This species is distinguished from the *A. Aalensis* (Münst.) and the *A. arenicola* (Gold.) by the very long, rigid, straight-sided rays, there being no dilatation beyond the base as in those species, as well as its greater size, perfect specimens being upwards of a foot in diameter, while the others are little more than half that. The *Astropecten Orion* (Forb.) seems much allied, but is a smaller species with longer rays, the interradial angles obtuse, and the lateral plates square and much fewer in number. The starfish figured from the same locality as this in Charlesworth's 'London Geol. Journal,' no. 3. pl. 17, as the *A. arenicola* of Goldfuss, agrees with the present species in every particular save the dilatation of the rays beyond the base; this character exists clearly in the species of Goldfuss, which however is perfectly distinct by its shorter rays and other characters. I suspected that in the English fossil alluded to, this appearance might have been a fault of the artist; Forbes however has I presume seen the species, as he describes it (Mem. Geol. Survey, vol. ii. part 2. p. 477) in accordance with this figure, also referring it to Goldfuss's species, but without referring to the figure of that author, which is most accurate.

Not uncommon in the calcareous grit of Filey Brig, Yorkshire coast.

(*Col.* University of Cambridge: three specimens.)

(*Echinida.*)

Echinus petallatus (M'Coy).

Sp. Char. Conoidal (diameter $1\frac{1}{2}$ inch, height 1 inch 2 lines), base slightly contracted, obscurely ten-lobed; ambulacral areæ half the width of the interambulacral, three oblique pairs of pores in each row; the ambulacral and interambulacral spaces have each an elliptical, petal-like, concave, smooth space extending from the vertex nearly to the base, each space being one-third the width of its respective area; the upper two-thirds of the ambulacral areæ have but one row of large tubercles on each side, surrounded by a circle of very minute granules; towards the base where the smooth central space stops there are four rows of large tubercles; the upper third of the interambulacral spaces has but two rows of large tubercles with their circle of small granules, but they gradually increase towards the base, and at the end of the smooth space there are about eight rows.

This is allied to the *E. gyratus* (Ag.), but is distinguished by having the elliptical smooth spaces in *both* the interambulacral and ambulacral areas; the present is also a larger and more conical species.

Not very uncommon in the coralline oolite of Calne, Wiltshire. (*Col.* University of Cambridge.)

Echinus diademata (M'Coy).

Sp. Char. Conoidal (diameter of one specimen 10 lines, height 6 lines), base abruptly flattened, subpentagonal from the prominence of the ambulacra, which are slightly convex and one-half the width of the interambulacra; interambulacra having a concave, smooth, narrow space in the middle of their upper portion, the middle of each half bears one row of about twelve large primary tubercles, their wide smooth disc surrounded by a circle of minute granules, numerous granules being scattered in the intervening spaces; only two or three very small secondary tubercles on the outside of the base of the primary rows; ambulacra with two rows of large primary tubercles each, with many small, irregularly placed intervening granules; three oblique pairs of pores in each row; ovarian and ocular plates as in the genus generally.

The two rows of large tubercles in each area, with the very minute intervening granules, distinguish this species from its congeners. It is most closely allied to the *E. fallax* and *E. serialis* (Ag.), but is well distinguished by the almost complete absence of secondary tubercles as well as the greater size of the primary ones, and the more pentagonal form of the disc, in which it approaches the *E. excavatus* (Gold.), from which it equally differs by the above characters.

Occurs in the coral rag of Malton and in the great oolite of Minchinhampton.

(*Col.* University of Cambridge.)

Arbacia inflata (M'Coy).

Sp. Char. Oblate-spheroidal (diameter 6 lines, height $4\frac{1}{2}$ lines), margin of the base tumid, rounded; ambulacra flat, depressed, slightly less than half the width of the interambulacra, the pores forming very narrow rows of one pair each, the space between the lines of pores with four to six very unequal, irregular rows of small granules; interambulacral spaces tumid, with a slightly impressed, narrow, smooth line down the middle of each; each interambulacral space contains about sixteen rows of minute tubercles, of which the two middle rows, or that bordering on each side the sutural line, are largest; under the lens the tubercles are distinctly arranged in transverse rows, eight on each interambulacral plate, touching each other without intervening granules, but between one plate and the next above or below (or between the rows) there are a few minute granules, generally arranged in one or at most two irregular rows.

Distinguished from the *A. pilos* (Ag.) by its more depressed, inflated form, rounded margin of the base, the outer* row of ambulacral tubercles not being largest, and the greater number of tubercles in both areæ, as well as the central smooth line of the interambulacra; the *A. granulosa* (Münst. sp.) is much more depressed, has the ambulacra wider and more convex, the interambulacra more deeply divided, and a much greater number of tubercles in the transverse rows, which latter are separated by very numerous crowded granules.

Not uncommon in the upper greensand of Cambridge.

(*Col.* University of Cambridge.)

Acrosalenia rarispina (M'Coy).

Sp. Char. Spheroidal, depressed; ambulacra flat, slightly flexuous, with two rows of tubercles which towards the base are large, mammillated and perforated; interambulacra three times the width of the ambulacral spaces, primary tubercles very prominent, nearly twice their diameter apart, placed alternately, but scarcely more than two tubercles in each vertical row; each tubercle surrounded by a ring of blunt granules, and between one tubercle and another numerous similar granules are scattered.

I think the position of the anus and the plates of the vertex agree with that division of the genus to which the *A. aspera* belongs, but a little adhering siliceous matrix in each of the specimens before me prevents my being quite certain. The ambulacra being a little undulated also approximates it to the *A. aspera*, but it is a much rarer species, and easily distinguished by the singularly small number and great distance of the primary tubercles, and the quantity of intervening granulation. Diameter 4 lines, height $3\frac{1}{2}$ lines; sometimes larger.

Rare in the great oolite of Minchinhampton.

(*Col.* University of Cambridge.)

Hemicidaris confluens (M'Coy).

Sp. Char. Depressed (average diameter 9 lines, height 5 lines); ambulacra undulating, upper third narrow, gradually widening to the mouth; the upper portion bears very minute crowded tubercles, which gradually increase in the wide por-

* By "outer" I here mean, adjoining the ambulacra, without intending to deny that the mesial line may be the true exterior.

tion, forming two alternating rows of moderately large, perforated, crenulated primary tubercles with many intervening blunt granules; interambulacral spaces twice as wide as the ambulacral, with two rows of very large primary tubercles, only four to five in a row, the smooth bases of which are vertically confluent (not separated by rows of granules), two vertical rows of small granules between the tubercles.

The only species this can be confounded with is the *H. Thurmani* (Ag.), which it resembles in its depressed form and very few large tubercles, and in the small size of the tubercles on the interambulacral spaces, but in this species the ambulacra widen more and the primary tubercles on them are larger; while each of the primary interambulacral tubercles in that species is separated from the next above and below by several rows of granules, while they are confluent, so to speak, in the present.

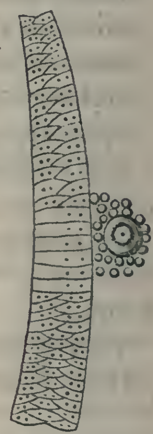
Rare in the great oolite of Minchinhampton.

(*Col.* University of Cambridge.)

Diplopodia (M'Coy), n. g.

Gen. Char. Depressed, subpentagonal from the projection of the ambulacral spaces; two rows of primary tubercles both on the ambulacral and interambulacral spaces; ambulacral rows of two pairs of pores in the upper half, of one pair in the middle and becoming again compound, of two or sometimes three pairs of pores towards the mouth.

This genus is distinguished from *Diadema*, to which it is most allied, and *Pedina*, by the former having uniformly one pair of pores in a row, and the latter having uniformly three pairs of pores in a row. The following species and the *D. subangulare* (Ag.) are the types of the genus, which is only known in the oolites.


Ambulacrum of *Diplopodia*.

Diplopodia pentagona (M'Coy).

Sp. Char. Pentagonal, depressed, having an average diameter of 9 lines, with a height of 4 lines; interambulacral spaces one-third wider than the ambulacral at middle; two distinct rows of primary tubercles in each interambulacral space, surrounded by few small granules, and having on the outer side near the mouth five or six secondary tubercles one-third the size of the primary, forming a short single irregular row scarcely reaching the middle; ambulacral spaces with two rows of primary tubercles nearly equalling those of the interambulacra in size, having a few crowded granules between the rows but no secondary tubercles; there are only five or six pairs of ambulacral pores disposed in the single part of the row, rather below the middle, above which the pairs of pores are in regular double rows, each pair being separated by a diagonal line; below the single part of the ambulacra the pairs are in irregular double series increasing to three rows near the mouth.

This differs from the *Diadema* (*Diplopodia*) *subangulare* (Ag.) in its more depressed and distinctly pentagonal form, in the very short single portion of the ambulacra, there being nineteen or twenty pairs of pores in a single vertical row in the middle of that species, and in the deficiency of secondary tubercles along the margin of the interambulacra.

Not uncommon in the great oolite of Minchinhampton.

(*Col.* University of Cambridge.)

Discoidea marginalis (M'Coy).

Sp. Char. Nearly circular, depressed (length and width 1 inch, height 6 lines), margin obtusely rounded; mouth one-third the diameter of the disc; anus small, pyriform, marginal extending as much above as below, its own width distant from the mouth; about six rows of primary granules in the ambulacral and fourteen in the interambulacral spaces.

The only other oolitic *Discoidea* I know with a marginal anus is the *D. hemisphærica* (Ag.), from which this differs in having the anus even more remote from the mouth, the mouth larger, the granules more numerous and smaller, and above all by the form being even more depressed than that of the *D. depressa* (Linn. sp.).

Very abundant in the inferior oolite of Bridport.

(*Col.* University of Cambridge.)

Pygaster sublævis (M'Coy).

Sp. Char. Orbicular, margin of the posterior interambulacral space more convex than the others; much depressed (length 2 inches 4 lines, width 2 inches 6 lines, depth 10 lines); vertex central; anal furrow deep parallel-sided, becoming gradually fainter towards the posterior margin; surface of oral disc undulated by the gentle convexity of the interambulacral spaces and the depression of the ambulacra; mouth only about one-seventh of the diameter, rather nearer the anterior than the posterior margin; granulation on the dorsal aspect so fine that the surface seems smooth or nearly so to the naked eye, abruptly increasing in size on the oral disc and margin, where however four of the primary tubercles only occupy the space of one line; in a transverse row there are nine or ten in an ambulacral and upwards of fifty in an interambulacral space.

In its depression, the shape of its anal sulcus, and the undulation of its base and small mouth, this species resembles a *Clypeus*, but the structure of its ambulacra, &c. is strictly that of this genus. Its nearly smooth surface, resulting from the very small size and prodigious number of the primary tubercles, distinguishes it from its congeners.

Common in the inferior oolite of Leckhampton.

(*Col.* University of Cambridge.)

Pygaster brevifrons (M'Coy).

Sp. Char. Subpentagonal, much elevated (length 3 inches 2 lines, width 3 inches 3 lines, height 1 inch 8 lines); posterior margin slightly less convex than the others; anus large, pyriform, close to the vertex, which is nearer to the anterior than to the posterior margin, so that in the profile the anterior side is considerably shorter and more steeply inclined than the posterior; mouth small, deeply impressed; primary tubercles large, scattered.

This species in size and form of the base resembles the *P. umbrella* (Lamk. sp.) (*Clypeus semisulcatus*, Phil.), but is more elevated; and while in the profile of that species the *posterior* side is much the shortest and most highly inclined, the proportions of the present fossil are precisely reversed, a character which also separates it from the other known species. The tuberculation is as large, but more scattered than that of the *P. patelliformis* (Ag.).

Not uncommon in the inferior oolite of Dundry.

(*Col.* University of Cambridge.)

Dysaster symmetricus (M'Coy).

Sp. Char. Regularly oval (length 10 lines, width $8\frac{1}{2}$ lines, depth $6\frac{1}{2}$ lines), anterior and posterior ends equal in size and convexity, neither of them sinuate; uniformly gibbous, except a small subangular prominence at the apex of the anterior ambulacrum, and the middle of the base which is slightly concave, the margin of the base being obtusely rounded except in front of the mouth where it is concave—it is most tumid at the opposite end; mouth small, rather more than one-third of the length from the anterior end; anus high on the posterior face, the shell beneath is not sinuate, evenly convex; ambulacra of moderate and nearly equal width, the posterior pair meet just over the anus, the anterior one does not quite reach to the other two, the point of convergence of which is two-fifths the length of the shell distant from that of the posterior pair.

The symmetry of the two ends separates this species at a glance from its congeners.

Not uncommon in the inferior oolite of Bridport.

(*Col.* University of Cambridge.)

Dysaster subringens (M'Coy).

Sp. Char. Nearly orbicular, faintly subpentagonal by the projection of the interambulacra, depressed, but the height rather more than half the length (length 1 inch 1 line, width the same, height 7 lines); dorsal surface evenly convex; oral surface radiatingly undulated by the shallow concavity of the ambulacral spaces, and the gentle gibbosity of the interambulacra, the posterior one most prominent; each interambulacral plate seems on the oral face nodulous in its middle, forming two obsolete rows of nodules on each ridge; mouth nearly central; anus a little above the posterior margin; three anterior ambulacra meeting at the centre of dorsal surface, very narrow, gradually enlarging towards the margin, posterior pair double the width of the anterior ones, short, curved, meeting immediately over the anus.

If carefully observed, this can only be confounded with the *D. ringens* (Ag.) of the Swiss oolites, but it is at once distinguished by its greater gibbosity (in which it exceeds the allied *D. Voltzii*) and in the less prominence of the ridges on the under side, which however exceed those of the latter species; the disproportionate narrowness of the three anterior ambulacra, as in the *D. ringens*, separates it from the *D. Voltzii* and *D. Eudesii* (Ag.).

Not uncommon in the inferior oolite of Dundry and Leckhampton.

(*Col.* University of Cambridge.)

Nucleolites planulatus (M'Coy).

Sp. Char. Rotundato-subquadrate, length and width equal, much-depressed, upper surface flattened, margin obtusely rounded (length and width 1 inch 3 lines, depth 6 lines); ambulacra wide, the pores of each pair in the petalloid part connected by a long distinct furrow; anal sulcus deep, extending from the vertex to the anal margin which it slightly indents; granulation very minute.

This species from its great depression need only be compared with the *N. planatus* (Römer, Versteinerungen des norddeutsch. Oolithengebirge), but it is wider than that species and the upper surface flatter, and I find on comparing specimens of the two species that the present is completely distinguished by its wide ambulacra and the very distinct sulcus connecting the pores of each pair; the ambulacra of the former species being narrow and the pores unconnected.

Common in the coralline oolite of Malton.

Rare in the great oolite of Minchinhampton.

(*Col.* University of Cambridge.)

Nucleolites pyramidalis (M'Coy).

Sp. Char. Base obtusely cordate or rotundato-quadrate, width equalling or slightly exceeding the length, much elevated to a nearly conical apex which is slightly nearer the anterior than the posterior end (length and width 1 inch 2 lines, height 8 lines); a deep narrow sulcus extends from the vertex to the posterior margin; petalloid ambulacra of moderate width, the pores of each pair united by a strong sulcus; upper surface not very tumid, but rather pyramidal, of four slightly flattened sides; profile, anterior end slightly convex, posterior face longer, forming a steeply inclined plane from the pointed vertex to the rounded posterior margin; granulation of surface very minute and close.

This resembles the *N. clunicularis* (Smith sp., *Clypeus lobatus*, Flem.) in the long, deep, narrow posterior sulcus, extending quite from the vertex; but is wider and more quadrate, the base having exactly the form of the *N. scutatus* (Lamk.); from the latter it differs in the strong sulcus uniting the pores as in most of the genus, and from both species it is distinguished by its pointed elevated apex and the straight declivity of the posterior side.

Common in the cornbrash near Weymouth.

(*Col.* University of Cambridge.)

Nucleolites æqualis (M'Coy).

Sp. Char. Subquadrate, very much depressed (length 9 lines, width 8½ lines, height 4 lines), evenly convex above, very concave beneath; vertex central; anal fissure deep, wide, and sharp-edged, extending from the vertex to the margin, which however is scarcely indented; ambulacra very broad, petalloid part with the pores of each pair connected by a deep sulcus; the two anterior interambulacral spaces are each at the margin only the width of an ambulacral space less than the width of the lateral interambulacral spaces.

This species is much depressed, but not flattened above; the ambulacra equal or even slightly exceed those of the *N. latifrons* (Ag.) in width; but the species is distinguished from all of the genus by the near equality in size of the interambulacral spaces, the two anterior ones, usually so small, being only the width of one of the ambulacra less than the lateral ones in width.

Great oolite near Minchinhampton.

Inferior oolite near Castle Ashby.

(*Col.* University of Cambridge.)

Clypeus excentricus (M'Coy).

Sp. Char. Orbicular, depressed (length and width each 3 inches 11 lines, height 1 inch 2 lines), posterior end slightly produced and sinuate; anal sulcus deep; vertex nearly one-fourth of the length nearer the posterior than the anterior end; mouth small, a little excentric towards the anterior end; ambulacra very wide; granulation as in the *C. patella*.

This species differs from the *C. sinuatus* (Park.) by the vertex being so much nearer one end than the other, and from the *C. patella* by its much greater depression.

Abundant in the inferior oolite of Leckhampton.

(*Col.* University of Cambridge.)

Clypeus altus (M'Coy).

Sp. Char. Subhemispherical, base nearly circular, posterior interambulacral space slightly produced in the middle and subtruncate; length and width equal (each about 1 inch 9 lines), height half the width; upper surface evenly convex; oral disc strongly undulated towards the margin by the convexity of the interambulacral spaces and the depression of the ambulacra; vertex central, with a very narrow, deep anal sulcus extending from thence to the margin where it is slightly dilated and spoon-shaped; mouth small, a little in front of the middle, indented by the five tumid ends of the interambulacra; ambulacra narrow, upper two-thirds of their dorsal portion petalloid, lower third and oral portion of parallel rows of unconnected pores.

In form and undulation of the base this resembles the *C. Hugi* (Ag.), but is distinguished by the narrow anal sulcus extending quite to the vertex, instead of being confined to the margin; the deflected lip-like projection of the posterior interambulacral space is very remarkable.

Common in the inferior oolite of Bridport.

(*Col.* University of Cambridge.)

Exclusive of the above new species, I have, since the publication of Mr. Morris's Catalogue of British Fossils, recognised the following Mesozoic Radiata not included in it, examples of all of which are in the Geological Collection of the University of Cambridge.

AMORPHOZOA.

OCELLARIA.

angustata (Reuss sp.). *Scyphia* id., Verstein böhm. Kr. Chalk, Cambridge (drift).
pedunculata (Reuss sp.). *Scyphia* id., Verstein. böhm. Kr. Chalk, Cambridge (drift).

SCYPHIA.

Bronnii (Münst.), Goldfuss, Petrefacten. Great Oolite, Minchinhampton.
cylindrica (Gold.), Petrefacten. Coralline Oolite, Malton.
heteromorpha (Reuss), Verstein. böhm. Kr. Greensand, Lyme Regis.

SPONGIA?

helveloides (Lamx.), Exp. Méth. Pol. Great Oolite, Minchinhampton.

ZOOPHYTA.

AGARICIA.

elegans (Michel.), Icon. Zooph. Inferior Oolite, Dundry.

ASTRÆA.

confluens (Gold.), Petrefacten. Great Oolite, Minchinhampton.
gracilis (Münst.), Goldfuss, Petrefacten. Great Oolite, Minchinhampton.
helianthoides (Gold.), Petrefacten. Coralline Oolite, Steeple Ashton.
limitata (Lamx.), MSS. Michelin, Icon. Zooph. Inferior Oolite, Leckhampton.
reticulata (Gold.), Petrefacten. Great Oolite, Minchinhampton.
varians (Röm.), Verst. norddeut. Oolithen-Gebirges. Coralline Oolite, Malton; Upware. Great Oolite, Minchinhampton.

CERIOPORA.

dumetosa (Lamx. sp.). *Millepora* id., Exp. Méthod. Polyp. Great Oolite, Minchinhampton.
fibrosa * (Münst.), MS. name in his collection. Great Oolite, Minchinhampton.
globosa (Michel.), Iconog. Zooph. Inferior Oolite, Leckhampton.
grandipora (Münst.), MS. name in his continental collection. Great Oolite, Minchinhampton.
mutabilis (Münst.), MS. name in his continental collection. Great Oolite, Minchinhampton.
pustulosa (Michel.), Iconog. Zooph. Great Oolite, Minchinhampton.

CHÆTETES.

capilliformis? var. † (Michel.), Iconog. Zooph.

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* This is the oolitic, slender, nearly equal-pored variety of the *C. dichotoma* (Gold.), Petrefacten, tab. 10. fig. 9 *d*, *e*, *f*.

† A variety, perhaps, of this species occurs in the inferior oolite of Dundry, with coarser tubes, forming depressed masses, about an inch thick, with very distinct parallel lines of diaphragms at various distances—if distinct it might be named *C. Michelini.*

CRICOPORA.
annulosa (Michel.), Iconog. Zooph. { Great Oolite, Minchinhampton. Inferior Oolite, Leckhampton.
Tessonis (Michel.), Iconog. Zooph. Great Oolite, Minchinhampton.

DIASTOPORA.
Eudesiana (M.-Edw.), Ann. des Sc. Nat. 2nd series, vol. ix.
Great Oolite, Minchinhampton.

GEMMASTRÆA.
limbata (Gold. sp.). *Astræa* id., Petrefacten.
Great Oolite, Minchinhampton.

GONIOPORA.
racemosa (Michel. sp.). *Alveopora* id., Iconog. Zooph.
Great Oolite, Minchinhampton.

HETEROPORA.
ramosa (Michel.), Iconog. Zooph. { Great Oolite, Minchinhampton. Inferior Oolite, Leckhampton.

LITHODENDRON.
? *astreatum* (Münst.), MS. name in his continental collection.
Inferior Oolite, Dundry.
dichotomum (Gold.), Petrefacten. Coralline Oolite, Steeple Ashton.
Edwardsii (Michel.), var. Icon. Zooph. Coralline Oolite, Malton.

LOBOPHYLLIA.
trichotoma (Münst. sp.). *Lithodendron* id., Goldfuss, Petrefacten.
Coralline Oolite, Steeple Ashton.

MONTLIVAULTIA.
decipiens (Gold. sp.). *Anthophyllum* id., Petrefacten.
Oxford Clay, St. Ives; Inferior Oolite, Dundry.
dilatata (Michel. sp.). *Caryophyllia* id., Icon. Zooph.
Coralline Oolite, Malton.
Moreausiaca (Michel. sp.). *Caryophyllia* id., Icon. Zooph.
Coralline Oolite, Malton.
obconica (Münst. sp.). *Anthophyllum* id., Goldfuss, Petrefacten.
Coralline Oolite, Malton.

SIDERASTRÆA.
cadomensis (Michel. sp.). *Astræa* id., Iconog. Zooph.
Inferior Oolite, Leckhampton.
Defrancii (Michel. sp.). *Astræa* id., Iconog. Zooph.
Inferior Oolite, Dundry.
incrustata (Michel. sp.). *Alveopora* id., Iconog. Zooph.
Great Oolite, Minchinhampton.
Lamourouxi (Le Sauvage sp.). *Thamnasteria* id., Michelin, Icon. Zooph.
Great Oolite, Minchinhampton.
meandrinoides (Michel. sp.). *Pavonia* id., Iconog. Zooph.
Coralline Oolite, Steeple Ashton.
microsolena (Michel. sp.). *Alveopora* id., Iconog. Zooph.
Great Oolite, Minchinhampton.
rotata (Gold. sp.) var. *Agaricia* id., Petrefacten.
Coralline Oolite, Malton.

TEREBELLARIA.
antilope (Lamx.), Exp. Méth. Polyp. Coralline Oolite, Malton.

ECHINODERMATA.

ACROSALENIA.
aspera (Ag.), Cat. Syst. { Great Oolite, Minchinhampton. Inferior Oolite, Dundry.
spinosa (Ag.), Echinoderm. Suiss. Great Oolite, Minchinhampton.

APIOCRINUS.
elegans (Defrance sp., *Astropoda* id.), D'Orbigny, Monog. des Crin. Bradford Clay, Bradford.

CIDARIS.
trigonocantha (Ag.), Echinod. Suiss. Kimmeridge Clay, Weymouth.

DIADEMA.
æquale (Ag.), Echinod. Suiss. Coralline Oolite, Steeple Ashton.
ornatum (Gold. sp.). *Cidaris* id., Petref. Greensand, Blackdown.
Rhodani (Ag.), Echinod. Suiss. Greensand, Blackdown.
rotulare (Ag.), Echinod. Suiss. Durdle Door, Dorset.

DYSASTER.
Avellana (Ag.), Desor. Monog. des Dysaster. Inferior Oolite, Bridport.
Eudesii (Ag.), Desor. Monog. des Dysaster. Inferior Oolite, Dundry; Bridport.

DISCOIDEA.
*minima** (Ag.), Desor. Mon. des Galer. Upper Greensand, Cambridge.
rotula (Ag.), Echinoderm. Suiss. Upper Chalk, Norwich.

GALERITES.
castanea (Brong. sp.), Ag. Echin. Suiss. Chalk, Cambridge.
lævis (Ag.), Desor. Monog. des Galerit. Chalk, Dover.
globulus (Desor.), Monog. des Galerit. Chalk, Cambridge.

HEMICIDARIS.
stramonium (Ag.), Echinoderm. Suiss. Coralline Oolite, Calne, Wilts.

HYBOCLYPUS.
gibberulus (Ag.), Echinoderm. Suiss. Inferior Oolite, Dundry.

MICRASTER.
gibba (Lamk. sp.). *Spatangus* id., Goldfuss, Petrefacten. Chalk, Cambridge.

MILLERICRINUS.
echinatus (Schlot. sp.). *Encrinites* id., Nacht. z. Petref. Coralline Oolite, Malton.
Milleri (Schlot. sp.). *Encrinites* id., Nacht. z. Petref. Bradford Clay, Bradford.

NUCLEOLITES.
latiporus (Ag.), Echinoderm. Suiss. Great Oolite, Minchinhampton.
scutatus (Lamk.), Ag. Echinod. Suiss. Inferior Oolite, nr. Castle Ashby.

PEDINA.
rotata (Ag.), Echinod. Suiss. Great Oolite, Minchinhampton.

PENTACRINUS.
cingulatus (Münst.), Gold. Petrefacten. Bradford Clay, Bradford.
subteres (Münst.), Gold. Petrefacten. Bradford Clay, Bradford.
subsulcatus (Münst.), Gold. Petrefacten. Bradford Clay, Bradford.

PYGASTER.
umbrella (Ag.), Echinoderm. Suiss. Coralline Oolite, Malton.

TETRAGRAMMA.
Brongniarti (Ag.) var., Echinod. Suiss. Greensand, Blackdown.

* With the small anal plates preserved *in situ*.

XLIII.—*Descriptions of* Aphides. By Francis Walker, F.L.S.

[Continued from p. 203.]

49. *Aphis Ulmariæ*, Schrank.

Aphis Ulmariæ, Schrank, Faun. Boic. ii. 1. 111. 1221.
Aphis Onobrychis, Fonscol. Ann. Soc. Ent. x. 169. 9.
Aphis Pisi, Kalt. Mon. Pflan. i. 23. 11.
Aphis Lathyri, Sir Oswald Mosley, Gard. Chron. i. 684.

This species, the green Dolphin, is one of the largest of the group; it feeds on the following plants: *Spiræa Ulmaria, Genista anglica, Spartium Scoparium*, some other species of these genera and of *Cytisus, Colutea arborescens, Lathyrus odoratus, L. pratensis, Pisum sativum, P. arvense, Phaseolus vulgaris, P. multiflorus, Vicia Sepium, V. sativa, V. Faba, Ervum, Hedysarum, Onobrychis, Lotus corniculatus, L. uliginosus, Trifolium pratense, T. repens, T. filiforme, Ononis repens, O. hircina, Geum urbanum, Epilobium montanum, Capsella bursa-pastoris, Chærophyllum temulum, C. sylvestre*; the *Geum* and following species are inserted on the authority of Kaltenbach. It thus manifests a decided preference to leguminous plants, and may sometimes be found in greenhouses, where, as usual, it appears much earlier than in unsheltered situations. It feeds also on *Artemisia Absinthium* and on *Tanacetum vulgare*.

The viviparous wingless female. It is large, yellowish green, shining, slightly oval and convex, rather long and narrow, and having three green stripes along the back: the feelers are brown, green at the base, and nearly as long as the body: the eyes are dark brown: the mouth is pale green; its tip is brown: the nectaries are pale green, and nearly as long as one-fifth of the body; their tips are brown: the tip of the abdomen is long, and resembles a short tail. When young it is tinged with white, and has three vivid green stripes along the back: its feelers are yellow, with brown tips.

1st variety. Grass-green: the feelers are black, green at the base, and longer than the body: the eyes and the tip of the mouth are black: the nectaries are brown, green at the base, black at the tips, and as long as one-fourth of the body: the legs are very long; the thighs are green with reddish brown tips; the shanks are dull yellow; their tips and the feet are black.

2nd variety. Pale green.

3rd variety. Pale yellowish green: the nectaries are pale yellow; their tips are black: the thighs have pale red tips.

4th variety. The feelers are black except the base, which is yellow or green . the mouth is also green.

5th variety. Yellowish green with a lively green stripe on the back, and more rarely with one on each side.

6th variety. Grass-green : the feelers are pale yellow, green at the base and much shorter than the body ; the tips of the third and of the fourth joints and the whole of the latter joints are brown : the eyes are dark red : the mouth is pale yellow with a brown tip : the legs are pale green or pale yellowish green ; the thighs are pale green towards the base ; the knees, the feet and the tips of the shanks are brown.

7th variety. Pale green mottled with a darker colour : the feelers are pale yellow, and longer than the body ; the tips of their joints are brown.

8th variety. Body slightly covered with a white bloom or powder.

9th variety. Of a delicate rose-colour mottled with yellow : the head is yellow : the limbs are white ; their tips are black.

10th variety. Green mottled with red.

11th variety. With a purple tint.

The young one is flat and linear, and has a rim on each side of the body ; its colour varies from pale green to pale yellow or to pale red ; the tips of the limbs are brown.

12th variety. The body is pale yellowish green, and much more slender than in the other varieties ; the feelers are pale yellow, longer than the body ; the tips of their joints are black : the eyes are bright red : the mouth is pale yellow : the nectaries are pale green, and as long as one-fourth of the body, their tips are black : the tip of the abdomen is pale yellow : the legs are hairy, yellow, and very long ; the knees, the feet, and the tips of the shanks are black. On the tansy, and on the wormwood.

The viviparous winged female. When young it is pale or bright yellow, and has a dull green stripe along the back : the nectaries are as long as one-tenth of the body : the limbs except their tips are very pale. Sometimes the feelers of the pupa are black, pale yellow towards the base : its mouth is pale yellow with a black tip : the nectaries are almost black : the legs are pale yellow ; the knees, the feet, and the tips of the shanks are black : the rudimentary wings are pale green.

The wings are unfolded at the end of May, and the insect is then green : the chest is tinged with buff : the feelers are black, pale green towards the base : the fourth joint is much more than half the length of the third ; the fifth is shorter than the fourth ; the sixth is hardly half the length of the fifth ; the seventh is nearly thrice the length of the sixth : the wings are colourless, and longer than the body ; the wing-ribs, the rib-veins, and the wing-brands are pale green or pale yellow ; the other veins are dull yellow or brown, and their tips are very slightly clouded.

Variations in the wing-veins. The upper branch of the second fork is obsolete except at its tip where it joins the wing-border. The front is rather narrow, and has on each side of it a tubercle on which the feelers are seated; its tip is rather oblique: the first joint of the feelers is slightly curved, and is narrower and a little shorter than the tubercle which supports it; the second is more than half the length and the breadth of the first; the third is much narrower than the second; the fourth is a little shorter than the third; the fifth is a little shorter than the fourth; the sixth is rather more than one-third of the length of the fifth; the seventh is full as long as the third: the fore-chest is rather long, narrower in front, convex on each side: the nectaries decrease in thickness from the base to the tips: the legs are long and slender; the shanks and the second joint of the feet are curved. The space between the first and the second forks of the third wing-vein is variable as to length in this species.

The winged male. The body is black: the feelers are longer than the body: the eyes are dark red: the nectaries are nearly one-fourth of the length of the body: the legs are long; the base of the fore-thighs is yellow: the wing-ribs and the rib-veins are also yellow; the wing-brands are very pale brown; the other veins are brown.

1st var. Black: the fore-border, the hind-border, and the underside of the fore-chest are reddish brown: the abdomen has the same colour: its disc is black, and it has a row of black spots on each side: the mouth is dull yellow with a black tip: the nectaries are about one-fifth of the length of the body: the base of the thighs is pale yellow; the shanks except their tips are dark yellow.

2nd var. Brown: the sides of the chest and the abdomen are yellow; the latter has a broad brown stripe along the middle, and a row of black dots on each side: the mouth and the nectaries are yellow with black tips, and the latter are as long as one-fourth of the body: the legs are dull yellow; the knees, the feet, and the tips of the shanks are black.

50. *Aphis Rubi,* Kaltenbach.

Aphis Rubi, Kalt. Mon. Pflan. i. 24. 12.

This species feeds on *Rubus cæsius, R. fruticosus, R. corylifolius, R. discolor, R. Idæus, Geum urbanum,* and other species of that genus, and on *Epilobium montanum.* The young ones in the body of the wingless female sometimes amount to twenty and upwards, of various sizes.

The viviparous wingless female. Light green, oval, convex, shining, more or less tinged with yellow towards the head: the feelers are brown, pale green at the base, and a little longer than the body: the eyes are dark brown: the mouth is pale green; its tip is brown: the nectaries are dull green, and as long as one-fourth of the body; their tips are black: the tip of the abdomen is long, compressed and curved: the legs are pale green, long and slender; the knees, the feet, and the tips of the shanks are brown.

1st variety. Grass-green, spindle-shaped, with three darker stripes along the back: the feelers are yellow with black tips: the mouth is yellow; its tip and the eyes are black: the nectaries are pale yellow with black tips, and more than one-fourth of the length of the body: the legs are yellow; the feet and the tips of the shanks are black.

2nd variety. Pale red, powdered with white: the nectaries and the tip of the mouth are black: the legs are dull white; the thighs are sometimes green, their tips are brown; the feet and the tips of the shanks are black.

3rd variety. Like the preceding, but the nectaries are brown: the thighs are pale green with brown tips.

4th variety. Dark red.

5th variety. Red mottled with green.

6th variety. Green, slightly covered with a white bloom: the feelers are black, but become yellow towards the base.

7th variety. Green. 8th var. Lilac. 9th var. Rose-colour. 10th var. Deep red. 11th var. Body mottled with the above colours. 12th var. Black.

At the end of May it swarms on the bramble and there attains its largest size; the shoots are very much adorned with its bright and many-coloured groups, and the offspring assume the hues of their respective parents.

The middle of the forehead is slightly convex, and there is a tubercle at the base of each feeler: the feelers are nearly as long as or much longer than the body; the fourth joint is more than half the length of the third; the fifth is very nearly as long as the fourth; the sixth is much less than half the length of the fifth; the seventh is usually more than thrice the length of the sixth, but it varies from thrice to six times the length of that joint, and attains its greatest length in the winged insect: the nectaries are fully developed and slightly curved: the tip of the abdomen forms a short tube: the fore-legs are not much shorter than the hind-legs, and all the shanks are slightly curved.

13th variety. Inhabits the raspberry in October, is quite white, and its colour accords well with the underside of the leaf where it dwells: the body is long and narrow: the feelers are very much longer than the body: the tip of the mouth is red, as if dipped in raspberry-juice, and part of the stomach has the same colour, being visible through the almost transparent body when the insect is preserved in Canada balsam: the tips of the joints of the feelers, the feet, and the tips of the shanks are dark brown: the legs are very slender.

When feeding on *Geum urbanum*, the common Avens, it is usually more slender than when on the bramble, and the feelers are very much longer than the body. The unborn young ones sometimes amount to thirty in number, but are less numerous in the body of the winged female.

14th variety. The body is green: the head is yellow: the feelers are black, dull yellow at the base, and very much longer than the body: the eyes are red: the mouth is yellow with a black tip: the nectaries are pale green with brown tips, and longer than one-fourth of the body: the legs are pale yellow; the feet and the tips of the thighs and of the shanks are black.

15th variety. Green, powdered with white: the feelers are yellow, pale green at the base, black towards the tips: the mouth is pale yellow, its tip and the eyes are black: the nectaries are pale yellow with black tips, and as long as one-fourth of the body: the thighs are pale green with reddish brown tips; the shanks are yellow, their tips and the feet are black.

16th variety. The body is pale yellow with a green stripe along the back: the limbs are white: the feelers are as long as the body; the tips of the latter joints are black, as are also the eyes and the tip of the mouth: the nectaries have black tips, and are as long as one-sixth of the body: the tips of the feet are black.

The viviparous winged female. It is pale green: the head and the disc of the chest are buff: the disc of the breast is brown: there are buff bands across the abdomen, and a row of brown spots on each side of it: there is also a dark spot at the tip of the chest or on the base of the abdomen: the feelers are black, pale yellow at the base, and as long as the body: the eyes are red: the mouth is pale yellow with a brown tip: there is often a distinct dark line across the fore-chest: the nectaries are pale yellow, and nearly as long as one-fourth of the body; their tips are brown: the legs are pale yellow: the knees, the feet, and the tips of the shanks are brown: the wings are colourless and much longer than the body; the wing-ribs and the rib-veins are pale green; the wing-brands are pale brown; the veins are brown and strongly marked: the feelers are usually much longer than the body: the widening of the main vein begins a little before two-thirds of the length of the wing: the brand is irregularly spindle-shaped, and the fourth vein springs from beyond the middle of its hind-border: the third vein approaches very near its source in the main vein before it becomes obsolete; it is forked before one-third of its length, and again forked before or shortly after two-thirds of its length, but the length of the branches of the second fork is variable.

1st variety. This is pale and very small: the feelers are thicker than usual till the seventh joint, which is proportionably more slender, and is at least eight times the length of the sixth joint: the veins are very deficient, for in one wing the fourth vein is obsolete long before it reaches the border, and in the other wing the third vein has no second fork, and the lower branch of its first fork is very short, being obsolete before one-third of its way towards the border of the wing.

2nd var. The body is green: the disc of the chest and that of the breast are pale reddish brown: there is a row of black spots on each side of the abdomen: the feelers are a little shorter than the body: the mouth is pale green with a brown tip; the nectaries are black, and as long as one-fifth of the body: the thighs are pale green with black tips; the feet and the tips of the shanks are also black: the wing-ribs are yellow; the brands are brown.

3rd var. Like the preceding, but the disc of the chest and that of the breast are black.

4th var. The head and the chest are black: the fore-border and the hind-border of the fore-chest and the fore-breast are dull yellow: the abdomen is dull greenish yellow with short broken black bands on its disc, and a row of black dots on each side: the mouth is yellow, its tip and the nectaries are black: the legs are pale yellow; the feet, the tips of the shanks, and the thighs from the middle to the tips are black: the wing-ribs and the rib-veins are pale yellow; the brands are dull olive-colour.

5th var. The body is dull green: the head, the disc of the chest and that of the breast are brown: the feelers are pale green at the base, and a little longer than the body: the eyes are dark red: the mouth and the nectaries have black tips, and the latter are as long as one-fifth of the body: the legs are dull yellow; the knees, the feet, and the tips of the shanks are black: the wing-ribs and the rib-veins are pale yellow.

6th var. The body is grass-green: the disc of the chest and that of the breast are pale brown: the abdomen has a row of very small dark dots on each side: the feelers are brown, green at the base, and as long as the body: the eyes are dark brown: the nectaries are dull green, and between one-fourth and one-fifth of the length of the body.

7th var. While a pupa its colour is bright grass-green: the feelers are pale yellow with brown tips, and are nearly as long as the body: the disc of the chest is pale buff: the nectaries are pale yellow with brown tips: the thighs are pale green; the shanks are pale yellow; the feet are brown: the rudiments of the wings are yellowish white. In the winged insect the disc of the chest and that of the breast are streaked with brown: the feelers are pale yellow; the tips of the joints are brown: the nectaries are black: the wing-ribs and the rib-veins are pale yellow.

Variations in the wing-veins.—1st. The lower branch of the first fork is forked again at its tip. 2nd. The lower branch of the first fork is very short; the upper branch passes to the wing-border, but has no second fork.

The oviparous wingless female. The body is pale bright yellow, oval, convex and shining: the head is buff: the feelers are yellow, and much longer than the body; the tips of their joints are black: the eyes are dark red: the mouth is pale yellow with a black tip: the nectaries are yellow, darker at the base, and as long as one-fourth of the body; their tips are black: the legs are pale yellow; the knees are brown; the feet and the tips of the shanks are black.

1st var. Green: the feelers are black towards the tips and nearly as long as the body: the nectaries are nearly as long as one-fifth of the body: the knees are black.

2nd var. The body is yellowish green: the feelers are black, yellow at the base.

3rd var. The body is greenish yellow: the head is pale red: the eyes are black: the nectaries are dark yellow with black tips, and more than one-fifth of the length of the body.

4th var. The body is white with a very slight yellow tinge: the feelers are black, white towards the base, and longer than the body.

The winged male. This pairs with the oviparous female in the early part of November: it is brown: the fore-border, the hind-border, and the underside of the fore-chest are dark yellow: the feelers are black, and much longer than the body; the mouth is pale yellow with a black tip: the nectaries are black, and about one-fourth of the length of the body: the legs are yellow; the feet, the tips of the thighs and of the shanks, and the hind-thighs from the middle to the tips are black: the wings are very much longer than the body; the wing-ribs are pale yellow; the brands and the veins are brown.

1st var. The body is black: the fore-border and the hind-border of the fore-chest, the fore-breast, and the abdomen are red: the feelers are black, and much longer than the body: the nectaries are black.

51. *Aphis Urticæ*, Schrank.

Aphis Urticæ, Schrank, Faun. Boic. 106. 1186; Kalt. Mon. Pflan. i. 13. 4.

Urticifex, Amyot, Ann. Soc. Ent. 2me série, v. 475.

It feeds on *Urtica dioica, U. urens, Geranium Robertianum, Malva sylvestris, M. moschata,* and *Chelidonium majus.* On the nettle it is very abundant at intervals throughout the year, and multiplies in the winter when the weather is mild.

The viviparous wingless female. When very young it is almost white or pale yellow with a buff tinge towards the head, and having a large green spot at the base of each nectary: when full-grown it is green, oval, convex, smooth, sometimes shining, sometimes covered with white powder: the feelers are white, and more or less longer than the body; the tips of the joints and the whole of the latter joints are brown: the mouth is pale green with a brown tip, and reaches to the middle hips: the eyes are bright red: the nectaries are pale green with black tips, and from one-fourth to one-fifth of the length of the body: the legs are long and pale green; the thighs are paler than the shanks; the knees, the feet, and the tips of the shanks are brown.

1st var. The body is white with green bands across the back: the feelers are pale green; the tips of the joints are pale brown: the eyes are dull red: the mouth is pale yellow with a black tip: the nectaries are white with brown tips: the legs are white; the knees, the feet, and the tips of the shanks are pale brown.

2nd var. The body is pale green with three vivid green stripes along the back: the feelers are pale yellow; the tips of the joints are black: the eyes are brown: the legs are pale yellow; the knees, the feet, and the tips of the shanks are black.

3rd var. The body is greenish yellow. 4th var. Green: the head is nearly white. 5th var. Dark green. 6th var. Pale red. 7th var. Rose-colour. 8th var. Pink. 9th var. Dull dark red. 10th var. Gray. 11th var. Lilac. 12th var. Purple.

The young ones in the body amount to twenty and upwards, of various sizes.

The front of the head is straight and bristly: the first joint of the feelers is very slightly curved, the inner side being convex; it is longer and much narrower than the tubercle on which it is seated; the inner side of the tip of this tubercle forms nearly a right angle; the second is not half the length nor the breadth of the first; the third is much more slender than the second; the fourth is much shorter than the third; the fifth is much shorter than the fourth; the sixth is less than one-third of the fifth; the seventh is longer than the third: the fore-legs are not much shorter than the hind-legs, whose shanks are but very slightly curved.

The viviparous winged female. In this, as in the wingless female, there are many varieties of colour, but the head and the chest are usually pale red; their discs, and sometimes the whole of the former, are brown: the abdomen is green: the feelers are black;

the first and the second joints are dull reddish green, or pale red; the base of the third joint is almost white: the nectaries are pale yellow with brown tips: the wings are colourless; the wing-ribs are pale green, or almost white; the brands are dull yellow or pale brown; the veins are brown; the third vein is as usual obsolete at its source; it is slightly curved, and forms two very obtuse angles where it casts off its forks; the distance between these forks is variable; the first begins before one-third, the second before or after two-thirds of the length of the wing; the third and the fourth veins sometimes run very near together, but are usually more diverging.

52. *Aphis Vincæ*, n. s.

The structure of this species very much resembles that of *A. Urticæ*; it is rather smaller; the feelers, especially the seventh joint, are shorter; the tubercles at their base are less developed; the nectaries are also a little shorter. It is abundant on *Vinca major*, the greater periwinkle, in the month of May near London.

The viviparous wingless female. The body is pale green, oval, convex, smooth and shining: the feelers are very pale, longer than the body; the tips of the joints are brown; the fourth joint is shorter than the third; the fifth is shorter than the fourth; the sixth is less than one-third of the length of the fifth; the seventh is longer than the third: the eyes are dark brown: the mouth is pale yellow with a brown tip: the nectaries are pale green with brown tips, and about one-fifth or one-sixth of the length of the body: the legs are pale yellow, long and slender; the knees, the feet, and the tips of the shanks are brown.

The viviparous winged female. This much resembles the preceding form, but presents the usual difference in structure, and in the darker colour of the head, of the chest, of the breast, and of the feelers.

53. *Aphis Malvæ*, Sir Oswald Mosley.

Aphis Malvæ, Sir Oswald Mosley, Gard. Chron. i. 684.

A. Pelargonii, Kalt. Mon. Pflan. i. 21. 10.

This is a very common species, and feeds on a great variety of plants, either wild, or cultivated in gardens and in greenhouses; among these are *Pelargonium*, the cultivated species, *Malva sylvestris*, *Primula veris* and some cultivated species of that genus, *Aquilegia vulgaris*, *Bellis perennis*, *Rumex obtusifolius*, *Saxifraga siberica*, *Erodium Cicutarium*, *Geranium Robertianum*, *G. molle*, *G. pusillum*, *G. Phæum*.

The viviparous wingless female. When young it is dull green; the feelers, nectaries and legs are darker: the eyes are brown:

the feelers are more than half the length of the body, whose segments are short, transverse, and nearly equal in size: the nectaries are about one-sixth of the length of the body: its colour presents the following varieties:—

1st var. The head is almost brown.

2nd var. The body yellowish green.

3rd var. The body bluish green.

4th var. The body whose skin has been lately shed is light delicate green, inclining to white towards the head: the limbs are also white with the exception of the black tips of some of the joints of the feelers.

5th var. The body is deep green: the head is nearly yellow.

As the insect grows, its body discovers a paler and brighter green colour, and is less linear, and more convex, and shining, the sutures between the abdominal segments become less distinct, and the rim on each side of the abdomen is more conspicuous.

6th var. Yellow in front, deep green behind, having two rows of dark dots along the body: the feelers are pale yellow; their tips are brown: the tips of the nectaries are also brown: the feet and the tips of the thighs and of the shanks are black.

It also varies slightly in shape, and in the length of the feelers, which are a little longer or a little shorter than the body. The autumnal young are sometimes bright pale yellow, except the nectaries, the feet, and the tips of the feelers, which are black.

The viviparous winged female. It is green: the head, the disc of the chest, that of the breast, the feelers, the nectaries, the feet, and the tips of the thighs are black: the wings are colourless; the veins are brown.

54. *Aphis pallida*, n. s.

This species resembles *A. Urticæ* in structure, but is very distinct; its colour is paler, especially in the winged form; the first joints of the feelers and the tubercles on which they are seated are less developed: the wing-brands are almost white; the first and second veins are thicker and more distinct than the third vein.

It feeds on Calceolarias in greenhouses, on a *Villarsia* in hothouses, and on some other plants.

The viviparous wingless female. The body is pale straw-colour, shining, oval, and convex: there is a large pale green spot at the base of each nectary: the feelers are much longer than the body; the tips of their joints, the eyes, and the tip of the mouth are black: the nectaries are nearly as long as one-fourth of the body:

the legs are long; the knees are brown; the feet and the tips of the shanks are black.

55. *Aphis Fragariæ*, n. s.

The viviparous wingless female. The body is pale green, oval, and convex : the head is pale yellow : the feelers are also pale yellow, black towards the tips, and longer than the body : the eyes are dark red : the mouth is pale yellow with a black tip : the nectaries have the same colour and are as long as one-fifth of the body : the thighs are pale green ; the shanks are pale yellow ; the feet and the tips of the shanks are black. It much resembles the preceding species, but the tubercles at the base of the feelers are less developed; the feelers are longer than the body; the fourth joint is shorter than the third ; the fifth than the fourth ; the sixth is about one-third of the length of the fifth ; the seventh is as long as the third. In the beginning of the spring it is hatched from the eggs which are attached to the underside of the leaves of the strawberry (*Fragaria vesca*) ; sometimes six eggs and upwards are beneath one leaf.

The viviparous winged female. It much resembles the wingless female, but possesses the usual difference in structure, and in the darker colour of the chest, &c. : the wings are like those of the preceding species.—*Variation in the veins of the wing.* The lower branch of the second fork is obsolete except at its source.

The oviparous wingless female. This appears in November ; it is rather smaller and more slender than the viviparous female ; the abdomen is slightly produced at the tip, and the hind-shanks are dilated.

The winged male. It pairs with the oviparous female in the middle of November ; it much resembles the winged female, but the head, the chest, the feelers, the tips of the thighs, and the hind-thighs from the middle to the tips are darker.

[To be continued.]

XLIV.—*Algæ Orientales* :—*Descriptions of new Species belonging to the genus* Sargassum. By R. K. Greville, LL.D. &c.*

[Continued from p. 277.]

[With a Plate.]

Wightianæ.

7. *Sargassum lanceolatum* (nob.); caule angulato, ramosissimo; foliis lanceolatis, acutiusculis, minute dentatis; vesiculis sphæ-

* Read before the Botanical Society of Edinburgh, November 9, 1848.

ricis, petiolatis, petiolis brevibus, planis, dilatatis; receptaculis compressis, subcuneatis, racemosis, ad apicem late denticulatis.
Hab. in mari Peninsulæ Indiæ Orientalis; Wight.

Root I have not seen. *Stem* probably 1–2 feet long, angular, and nearly as thick as a crow-quill; in the portion which I possess, giving off branches at intervals of half an inch; these branches towards the base are 4–6 inches long, spreading, becoming gradually shorter upwards, so as to render the general outline pyramidal; all of them thickly clothed with ramuli about an inch in length, and bushy with leaves, vesicles and receptacles. *Leaves* shortly petiolate, about an inch long, very numerous, lanceolate or linear-lanceolate, somewhat acute, repando-denticulate, furnished with scattered pores and a strong nerve which disappears below the apex. *Vesicles* intermixed with the receptacles, about the size of hemp-seed, spherical, often slightly margined, supported on dilated foliaceous stalks seldom much more than a line in length, but occasionally on stalks a quarter of an inch long, more broadly foliaceous and nerved. *Receptacles* axillary, a line or a line and a half long, forming minute more or less divided clusters; they are linear-cuneate, subcylindrical at the base, compressed upwards, and furnished with broad, sharp teeth at the sides and apex. *Colour* very dark red-brown. *Substance* when dry somewhat firm, cartilaginous and opake.

This species has so great a resemblance at first sight to another, which I received from Dr. Wight, and which stands in the herbarium as my No. 7, that they were mixed together, and it was not until I examined them critically that they were perceived to be essentially distinct. Of the present species I only possess a solitary specimen, and that not an entire one, there being only about twelve inches of the upper extremity; at the same time it is in so satisfactory a state, that I venture with some confidence to regard it as undescribed.

8. *Sargassum acanthicarpum* (nob.); caule elongato, filiformi, subangulato, ramosissimo; foliis lineari-lanceolatis, uninervibus, profunde dentato-serratis; vesiculis subsphæricis, petiolatis, planis, dilatatis; receptaculis axillaribus, racemosis, compressis, lineari-cuneatis, grosse et acute dentatis.
Wight in herb. no. 4 & 6.
Hab. in mari Peninsulæ Indiæ Orientalis; Wight.

Entire plant near 2 feet long, with a slender graceful appearance. *Root* a small callous disc, from which arise one or more undivided somewhat angular stems, not thicker than a sparrow's quill. The branches begin to be given off in a horizontal manner immediately above the root, where they are 2 or 3 inches long, soon extending to 5 or 6 inches, and then gradually diminishing to the end, thus giving the whole a more or less oblong-acuminate outline. Towards the base, the branches appear to be frequently in pairs; two being given off near together, then after a longer space two more and so on, but this character is gradually lost, and the upper branches become irregularly alternate, at intervals of half an inch or more. These branches produce the fruit-bearing ramuli at intervals of a few lines; they are an inch or more in length next the stem, and diminish insensibly to the extremity of the branch. *Leaves*: those arising from the stem close to the root, ovate-oblong, subsessile; those on the branches about an inch in length, linear-lanceolate, becoming gradually shorter and narrower towards the extremity, deeply and irregularly dentato-serrate, furnished with minute pores and a narrow nerve which is very faint towards the apex. *Vesicles* numerous, from the size of a large pin's head to that of hemp-seed, subglobose, often slightly elliptical, on stalks a line or more in length; but these stalks have a frequent tendency to pass into leaves; in some specimens nearly all are foliaceous, and several lines long, the vesicles themselves being then more or less elliptical, winged, and often apiculate. *Receptacles* 1 or 2 lines long, linear-cuneate, compressed, sometimes subtriquetrous, bristling at the lateral and terminal margin with large, very acute teeth. Generally the raceme is composed of but few simple receptacles, but occasionally they are proliferous, as shown in the plate. The terminal receptacle is often large and the lateral or lower ones very small. *Colour* a dark reddish brown when dry; a rich yellow-brown in transmitted light. *Substance* somewhat membranaceous and translucent, but rigid in the dry state.

This species, to which I at one time attached the provisional name of *erinaceum*, is distinguished for its beautiful foliage and the very slender branches, which indeed are scarcely thicker than a hog's bristle. The light and graceful character of the whole plant is increased by the dentation of the leaves, which is sometimes so marked even to the naked eye, as to give them a laciniate character.

9. *Sargassum dumosum* (nob.); caule subplano, distiche ramoso; foliis lineari-lanceolatis, uninerviis, inferne præcipue attenuatis, superne plus minusve dentatis; vesiculis ellipticis, petiolatis, petiolis elongatis, dilatatis, foliaceis; receptaculis axillaribus, clavatis, subcompressis, dentatis, racemosis.

Hab. in mari Peninsulæ Indiæ Orientalis; Wight.

Root I have not seen, the only specimen in my possession being about a foot of the upper portion of the plant. In this, the *stem* (?) is about a line broad, flat or nearly so, and giving off branches 5 or 6 inches in length in a distichous manner, at intervals of half an inch to an inch. These branches produce others, which are more or less subdivided in their turn, so as to give the ramification generally a bushy fasciculate character. *Leaves* an inch long, somewhat more than a line broad, linear-lanceolate, acute, gradually attenuated from the middle to the petiole, very irregularly toothed, and that almost exclusively in the upper part, rarely subentire, furnished with pores and a slender nerve which disappears below the apex. *Vesicles* larger than the seed of *Lathyrus odoratus,* accompanying the receptacles, elliptical, often mucronate, supported on flat stalks nearly half an inch long, sometimes becoming even longer and decidedly foliaceous. *Receptacles* axillary, 1–2 lines long, club-, or linear-wedge-shaped, somewhat compressed, often incurved, toothed, especially at the outer margin and apex, and forming a rather lax sparingly divided raceme. *Colour* blackish brown in the dry state. *Substance* rigid.

The solitary specimen from which I have drawn up the above description was mixed with *Sargassum pyriforme,* Ag., to which it bears no inconsiderable resemblance in general habit, and especially in the form of the vesicles. Both the leaves and fructification, however, at once separate it from that plant. With *Sargassum Swartzii,* Ag., it has a nearer affinity, but is readily distinguished by the much shorter leaves and elongated, toothed receptacles.

EXPLANATION OF PLATE XIII.

Sargassum lanceolatum.

Fig. 1. Termination of a branch.
— 2. Leaf, vesicles and raceme, slightly magnified.
— 3. Vesicles.
— 4 & 5. Racemes, magnified; one of the receptacles terminating in a foliaceous expansion and vesicle.

Sargassum acanthicarpum.

Fig. 1. Termination of a branch.
— 2. A portion with receptacles, one of the leaves being converted into a vesicle.
— 3. Leaves from the base of the stem close to the root.
— 4. Vesicles.
— 5. Leaf and raceme.
— 6. Portion of a raceme, showing the proliferous state in which it is not unfrequently found. The two last magnified.

Sargassum dumosum.

Fig. 1. Portion of a branch.
— 2. Leaf and raceme.
— 3. Vesicles; one of them being supported on an abortive receptacle.
— 4. Raceme. 2—4 magnified.

XLV.—*On the Arrangement of the Brachiopoda.* By J. E. Gray, Esq., F.R.S.

Cuvier established this class of Mollusca as an order when he published the dissection of *Lingula,* and it has been almost universally adopted.

Linnæus, Müller, Pallas, Poli, Blainville, Owen, Philippi and D'Orbigny have made us acquainted with the animals of the other recent genera, and showed how they differ from one another.

Mr. M'Coy in his work on the Fossils of the Carboniferous Limestone, Mr. King in the 'Annals of Natural History,' and more lately M. D'Orbigny in a paper transmitted to the Academy of Sciences, and published in the 'Annales des Sciences Naturelles,' have availed themselves of these materials and proposed an arrangement of the genera of this class into families.

Mr. M'Coy's paper illustrates both the fossil and recent genera, and was an important addition to our knowledge; Mr. King's corrected some of the synonyma of the genera and added some details; M. D'Orbigny's is clever and rapid, and he has evidently availed himself of the labours of both the above-named gentlemen and of Philippi, though, with his usual want of generosity, he has not mentioned their names in any part of his paper, and has given new names to several of his genera, though many of them have long been distinguished by preceding authors.

Not considering the arrangement proposed by these authors as quite satisfactory, I have ventured to suggest the following. Some may be astonished at my proposing to place what they have been in the habit of considering as species of the same genus in different orders and families, but the number of species and forms known appears to me to justify this proceeding. Bronn in his late work gives a list of more than 950 fossil species of this class, many of them having several named varieties.

Synopsis of the Orders.

A. The oral arms recurved and affixed to fixed appendages on the disc of the ventral valve. Shell minutely and closely perforated. Ancylopoda.

1. Ancylobrachia. The oral arms affixed to calcareous plates, forming hoops attached to the hinge-margin of the ventral valve, and prominent in its cavity.

2. Cryptobrachia. The oral arms sunk into grooves in the convex centre of the inner surface of the ventral valve.

B. The oral arms regularly spirally twisted when at rest. Helictopoda.

3. Sclerobrachia. The oral arms supported by a shelly plate arising from the hinge-margin of the ventral valve.
4. Sarcicobrachia. The oral arms fleshy, without any shelly support.

C. ? The animal unknown; perhaps Conchifera.

5. Rudistes.

Subclass 1. Ancylopoda.

The oral arms not extensile or only at the tip; on fixed shelly supports, or in grooves in the under or ventral valve; the mantle is adherent to the shell, the substance of the shell being pierced with numerous minute perforations, which are pervaded by the processes of the mantle.

Order I. Ancylobrachia.

The oral arms are attached to two shelly plates arising from the hinder or cardinal edge of the ventral valves; they are recurved and convolute on the inner side of the lamina.

The animals are generally attached to marine bodies by a tendinous peduncle, which passes through a hole in the top of the umbo of the larger or dorsal valve; this peduncle and the hole are sometimes obliterated in the older specimens.

The order only contains a single family.

Fam. 1. Terebratulidæ,

which is nearly synonymous with the smooth *Terebratula* of Sowerby, the perforated *Terebratula* of Carpenter, the genus *Epithyris* of Phillips and *Terebratula* of King, the family *Terebratulidæ* of M'Coy, and *Cyclothyridæ* of Phillips.

The animal has been described by Linnæus, Pallas, Owen, Blainville, Philippi, D'Orbigny and others.

In some genera the hoops are united together below by a transverse band which is attached to medial longitudinal ridges of the ventral valve, as in *Terebratula* of Retzius = the *Terebratella* of D'Orbigny, as *T. dorsata*; and *Magas*, Sow. In others the hoop forms a ring and is free from the ventral valve, as *Gryphus*, Megerle = *Terebratula*, D'Orb., and *Terebratulina*, D'Orbigny, for *T. vitrea* and *T. caput serpentis*.

D'Orbigny indicates other genera under the names of *Terebrirostris* and *Fissirostris*.

Order II. The Cryptobrachia

have the oral arms entirely attached in the form of two or more lobed processes sunk into grooves in the disc of the ventral valve. They are generally thick shells. This order also only consists of a single family.

Fam. 1. Thecidæadæ.

The animals are described by Philippi and D'Orbigny. The genus *Argiope,* De Longchamps = *Megatheris,* D'Orb. (*Tereb. detruncata*) is attached by a tendon passing out of a very large perforation below the beak of the dorsal valves; Philippi confounds this genus with his *Orthis,* which is different from the *Orthis* of Dalman. *Thecidæa* has the shell attached by the truncated apex of the dorsal valve, or it is free when the apex is produced and entire. De Longchamps, who established the genus *Argiope* in 1839, pointed out the affinity of this genus to *Thecidæa.*

Subclass 2. Helictopoda.

The oral arms are elongate, regularly spirally twisted when in repose. The mantle lobes are merely applied to the inner surface of the shell, and the substance of the valves is not pierced with minute perforations, though the surface is sometimes spinulose, the spines being only formed on the edge of the shell while it is being increased in size.

Order III. Sclerobrachia.

The oral arms support a shelly band arising from the hinder or cardinal edge of the ventral valve.

Fam. 1. Spiriferidæ.

The oral arms very largely developed and supported the whole of their length by a thin shelly? or cartilaginous? spirally twisted plate.

These shells are only known in the fossil state, but the spiral supports of the arms are generally preserved, and may be discovered by sections of the fossil, and are often to be seen in the fractured specimens.

This family is equivalent to the genus *Spirifer* of J. Sowerby the father, the family *Delthyridæ,* M'Coy, who gave some excellent illustrations of the structure, and the *Spiriferidæ* of King. D'Orbigny proposed some genera under the names of *Spiriferina, Spirigera* and *Spirigerina,* according to the direction of the axis of the spiral cones, but it is doubtful if these genera are only new names to those already established.

The *Spirifer* of Sowerby, as reduced by M'Coy, and the *Martinia* of M'Coy, have the hinge as long or longer than the width of the shell. In *Atrypa,* Dalman, and *Athyris,* M'Coy, it is shorter and the shells oblong, rounder behind.

According to the description of Mr. King, the genus *Strigocephalus* would appear to form the passage between this and the next family (Ann. Nat. Hist. xviii. 89).

Fam. 2. Rhynchonellidæ.

The oral arms are elongate, fleshy, supported at the base by two short, hard, diverging shelly laminæ arising from the hinge-margin of the ventral valve.

They are easily known from the *Terebratulidæ* by the cavity of the shell being without shelly plates, its substance not perforated, and its surface being generally radiately plaited.

Only one species, *T. psittacea,* is known in the recent state: its animal has been described by Prof. Owen.

The family is equivalent to the plaited *Terebratula* of the elder James Sowerby and Von Buch, the non-perforated *Terebratula* of Carpenter, the genus *Hypothyris* of Phillips, and part of the family *Terebratulidæ* of King.

It contains the genus *Rhynchonella* of Fischer and D'Orbigny = *Hypothyris,* Phillips; *Comerophoria,* King; *Uncites,* Defrance; ? *Trigonoremus,* Kœnig; *Rhyncora,* Dalman; *Pygope,* Link; *Delthiridæa,* M'Coy; *Pentamerus,* Sowerby.

Order IV. Sarcicobrachia.

The oral arms fleshy to the base and without any shelly support, the lower valve without any processes on the hinge-margin or disc, or except sometimes a slight medial longitudinal elevation.

Fam. 1. Productidæ

consist entirely of fossil species, some much resembling those of the former family; but the shells are generally spinose; they are often attached to marine bodies by the surface of the ventral valve, as the genera *Productus,* Sow., *Stropholosia,* King, *Chonetes,* Fischer, *Leptæna* and *Orthis,* Dalman, *Strophonema,* Rafinesque, and *Calceola,* Lamk.

This family comprises Mr. King's *Productidæ, Strophomenidæ* and *Calceolidæ.*

Fam. 2. Craniadæ.

Nearly allied to the last, but the upper valve is simply conic like a *Patella,* and the animal is attached by the outer surface of the ventral valve.

The animal has been figured by Müller, Poli and others. It includes the recent genus *Crania* of Retzius, including the *Orbicula* of Lamarck, *Criopus* of Poli. The lower valve of the only recent species I am acquainted with varies greatly in thickness and form according to the position and habitation of the animal. This family in many particulars is allied to *Thecidæadæ.*

Fam. 3. Discinidæ.

The upper valve is conical and patelloid, the lower orbicular, and is attached to marine bodies by a short tendinous peduncle, which passes out through a slit in the hinder part of the disc of the *ventral* valve.

The animal of this genus has been described by Mr. Owen under the name of *Orbicula*, Mr. G. B. Sowerby having some years ago confounded this shell with that genus, which has caused confusion which has existed to this day. The shell was first described by Schumacher as a section of the genus *Crania*: Mr. King, probably misled by this mistake, does not include it in his arrangement. This shell is peculiar, for being a horny rather than a shell texture, it is flexible when moist.

Fam. 4. Lingulidæ.

The valves are nearly equal, elongate, and supported by a thick peduncle which comes out between the beaks of the two valves. The shells are covered with a horny periostraca, and in some species the shelly matter is so very thin that the shells are flexible and nearly entirely cartilaginous.

The family contains only a single genus, *Lingula*.

Order V. Rudistes.

This order has been placed by most modern authors with the Brachiopoda: the proofs of its belonging to this family are not very evident; but as there is no other to which they appear to be more nearly allied, they may as well be retained in this position.

Lamarck, Cuvier, Férussac, and some other authors have regarded some of the genera as belonging to Cephalopoda, and others as bivalves (Conchifera).

Deshayes regards them as more nearly related to *Chama*, the character of the family having been lost by the destruction of the inner coat of the shell during the fossilization of the specimen.

M. D'Orbigny has properly united them into one group under the name of Irregular Brachiopods or *Rudistes*, but he includes with them the genus *Crania*, which is a true Brachiopod.

They form three very distinct families:—

Fam. 1. Radiolitidæ.

The lower valves more or less elongate-conical, fixed; the upper valve conical or spiral, free; the texture of the lower valve cellular or fibrous.

The *Radiolites* has the upper valve flat or conical and cap-like.

The *Caprina*, D'Orb., has a spiral and produced upper valve. The first of these genera has had many names applied to it, but that given by Lamarck has the priority. It has been called *Sphærulites*, *Ostracites* and *Acardo*, and the cast of the interior cavity has been considered as a genus, under the name of *Birostris* and *Iodamia*.

Fam. 2. Hippuritidæ.

The lower valve is elongate, tapering, subcylindrical, of a solid laminated texture; the upper valve is nearly flat, and pierced with peculiar pores radiating to the circumference with branches diverging to the upper surface.

This family only contains a single genus, *Hippurites*, Lamk., which has also had many other names applied to it, as *Cornucopia*, *Orthoceratites*, *Batolites* (or *Batholites*), *Raphanister*, and *Bitubulites*.

Fam. 3. Caprotinadæ.

The lower or fixed valve is conical and spirally twisted, and marked internally with prominent ridges or transverse septa; the dorsal or free valve is oblique or spiral. They differ from *Caprina* in the valves not being of a cellular or fibrous texture.

This family contains two genera :—

1. *Caprotina*, D'Orb., which has the cavity of the shell merely marked with internal ridges.

2. *Ichthyosarcolites* has the cavity of the large spiral or involute fixed valve divided transversely by a number of oblique septa; the upper valve is probably like an operculum, but this genus is very imperfectly known.

BIBLIOGRAPHICAL NOTICES.

The Ferns of Britain and their Allies; comprising Equisetaceæ, Filicaceæ, Lycopodiaceæ and Marsileaceæ. By R. Deakin, M.D., London. Pp. 139. 8vo. London, 1848.

A Handbook of British Ferns intended as a guide and companion in Fern Culture, and comprising scientific and popular descriptions, with engravings of all the species indigenous to Britain, with remarks on their history and cultivation. By Thomas Moore, Curator of the Bot. Garden of the Apothecaries' Company. Pp. 156. 16mo. London, 1848.

Owing chiefly, it is probable, to the publication of Mr. Newman's beautiful work 'A History of British Ferns,' the study of this tribe of plants has taken a firm hold upon the affections of British botanists, and we now hail with delight the appearance of two other illustrated works upon them, as they cannot but tend still further to popularize the subject and lead to a more complete and scientific knowledge of it.

The books before us are of very different sizes and pretensions, but we do not know to which the preference is due. Happily however we can hardly be considered as called upon to decide their relative merits.

Mr. Moore's work is intended for use in the field and garden; Dr. Deakin's for the library and drawing-room; both aim at scientific accuracy, and will be of value to botanists. In each of them we are introduced to several newly-discovered species or varieties, and both are well and fully illustrated by figures of all the forms which have been found in Britain.

Our authors have paid much attention to *Lastrea filix-mas*, and Dr. Deakin separates from it a plant which seems to possess strong claims to specific distinction under the name of *L. erosa*, believing that he has identified it with the *Aspidium erosum* of Schkuhr. On this identification we are not qualified to give an opinion, never having seen a specimen of Schkuhr's plant nor possessing access to his plate. It is found "on the Cathcart Hills near Glasgow . . . in great profusion," but we have not seen specimens, and can therefore judge of its claims from the description and figures alone. It appears to be a more elegant plant than *L. filix-mas*, from which it is distinguishable by possessing acute inciso-serrate pinnules: the teeth being patent and again serrate and acute. Most of the pinnules are usually distinct at the base, which is narrowed both above and below, and their lateral veins are three or four times branched.

Mr. Moore describes under the name of *L. filix-mas β. incisa*, a fern which he considers as the *L. erosa* of Deakin, but in that opinion we do not concur. Beautiful specimens of it are before us, and after a careful examination of them we have been led to the conclusion that they are not distinguishable specifically from *L. filix-mas*, from which they seem chiefly to differ in the rather less obtuse extremity of their pinnules, the teeth of which are not patent, and are regularly furnished with one or more terminal or subterminal notches, but not toothed as in *L. erosa*. Their base also is similar to that of typical *L. filix-mas*, being narrowed above, but not at all or very slightly below, the lowest excepted: they are also usually decurrent and connected. The sori do not appear to occupy a greater length of the pinnules than they are often found to do in the typical plant, neither do the veins strike us as being materially different from those of it. It is probable that Mr. Moore has been led to suppose that his plant is identical with that described by Dr. Deakin, from the latter botanist having stated his belief that the plant found at Cockermouth by Miss Browne and figured by Mr. Newman (p. 197, *f. b.*) is his *L. erosa*. We think that Newman's figure represents Moore's variety *incisa*, and that a comparison of it with Deakin's figure (on page 102) will show that Dr. Deakin has been too hasty in identifying the plants. An elaborate description of *L. erosa* will be found in Dr. Deakin's work.

We have not succeeded in confirming the distinctness of *L. maculata* (Deak.), which according to that author differs from *L. dilatata* by its longer stem, uniformly coloured scales, more deeply cut and serrated secondary lobes, with the lateral veins terminating at the point, and the sori placed immediately under the cleft of the lobe, not in its middle as in *L. dilatata*.

Neither of our authors has ventured to place Newman's *L. collina* in the rank of a species, to which we are inclined to believe that it has strong claims. Its ovate obtuse pinnules, which are obtusely mucronate-serrate and attached broadly at their base as in *L. spinulosa*, distinguish it from *L. dilatata*, with which it agrees in having pointed scales on its stipes with a dark brown centre and diaphanous margin. It does not accord with French specimens named as the *Polysticum tanacetifolium* of DeCandolle.

Mr. Moore has distinguished three forms of *Polysticum angulare* which had not been previously noticed; we must refer to his book for an account and figures of them.

In the genus *Cystopteris* a very curious variety or monstrosity is figured by Mr. Moore under the name of *C. Dickieana* (Sim). By the kindness of Dr. Dickie of Aberdeen, its discoverer, "in two dripping caves on the coast near Aberdeen," we have had an opportunity of examining specimens of this curious plant, both wild and also after two years of cultivation, during which time they have not undergone any material alteration. It seems probable that the peculiar broadness of frond of this plant may result from its place of growth, and that it is nothing more than an abnormal state of *C. dentata*. The peculiarly broad ovate and entire pinnules of *C. Dickieana* contrast most remarkably with the slender almost linear notched pinnules of a variety of *C. fragilis* inhabiting a similar cave, situated high up on one of the cliffs of Snowdon.

We think that Mr. Moore is in error when he states that "in Wales the variety *dentata* [*C. dentata*, Hook.] is the most abundant," as we have never been able to find it in any part of that country: all the Welsh plants that we have seen are states of *C. fragilis*, under which we include the *C. angustata* (Sm.). Dr. Deakin has given (pp. 84, 85) beautiful figures in illustration of *C. fragilis*, under which he places *C. dentata*, and in addition characterizes as varieties the *C. cynapifolia* (Roth), *C. angustata* (Sm.), and *C. anthriscifolia* (Roth).

The Scottish *C. dentata* is in all probability a distinct species from *C. fragilis*, under which we would place the other above-mentioned plants. Its characters are well illustrated by Mr. Newman (Brit. Ferns, p. 154), and it seems to have been found in the highlands of Scotland alone, where it is by no means rare.

Mr. Moore has acted wisely in naming and distinguishing as varieties the two forms of *Pteris aquilina*, one of them having its lower pinnules pinnatifid, whilst in the other they are quite entire. It is singular that we should be unable to discover any previous notice of this well-marked variation in the writings of other botanists, with the exception of a cursory remark in Dr. Deakin's work.

In conclusion, we have only to add, that we can conscientiously recommend both these works to the favourable notice of our readers.

The Dodo and its kindred; or the History, Affinities, and Osteology of the Dodo, Solitaire, and other extinct Birds of the Islands Mauritius, Rodriguez, and Bourbon. By H. E. Strickland, M.A., F.G.S., F.R.G.S.; and A. G. Melville, M.D. Edin., M.R.C.S. London. Reeve, Benham and Reeve, 1848.

It would be difficult to name a subject more profoundly interesting to the naturalist than is that to whose investigation the work above named forms a valuable contribution. The inquiry indeed into the origin and extinction of species may be truly considered as the question of questions to the naturalist,—the highest and most sublime to which, in the most comprehensive study of his subject, his attention can be directed. The chronology of such origin and extinction forms indeed the great work to the completion of which the labours of the palæontologist are tributary, and which gives to them their greatest interest and charm. No earnest observer can doubt that such origin and extinction are subject to some certain laws of that Unity which, whenever we can penetrate below the surface, is found stampt upon the face of every created thing,—although we may be unable, at present, clearly to see and understand those laws. And the uncertainty we have upon the subject makes every illustrative contribution the more interesting. This interest is certainly enhanced when the inquiry concerns a creature or creatures which have become extinct within the memory of man. The fact, if established, adds an important illustration to the arguments by which that view is supported, which has gradually gained ground as the domain of science and observation has been enlarged, and which considers all the wide and varied changes which the earth's surface has undergone to have been due to causes now in operation; a generalization which again reflects no little light upon the question of the origin and extinction of species itself.

That species have, in fact, become extinct within the time and by the agency of man admits of no doubt. We cannot however agree with one of the authors of the above work in his enumeration of the instances of such "proved" extinction, inasmuch as we conceive that no evidence is yet before the world of the extinction, within human times or by human agency, of the *Megaceros Hibernicus* or Irish Elk—perhaps the most interesting of the cases he has cited. A careful consideration of this point has led us to the conclusion that, at present, there is no "evidence that the Megaceros co-existed with the human race, or that its extinction was the result of man's hostility*." And this conclusion has not been formed without a full consideration of all the facts recently brought forward as to certain remains alleged to have been found at Lough Gûr† near Limerick; the mode of arguing and of handling which facts seems to us in itself to put the cautious inquirer upon his guard as to how far he

* Owen's Brit. Foss. Mammals, p. 461.

† These discoveries, and the discussion arising out of them, are detailed in Charlesworth's Geol. Journal, p. 87 &c. (1847).

accepts the conclusions which are so eagerly sought to be drawn from them.

Although we regret that the conclusions as to the Irish Elk should have been so readily adopted in the present work, it is satisfactory to think that no similar uncertainty can exist as to the special object of the work itself. It is true that Mr. Strickland speaks (p. 62) of "*rescuing* these anomalous creatures from the domain of fiction." He can hardly intend, however, what these words seem to imply. Few persons who have any familiarity with the subject can now pretend to doubt the former existence of an actual creature,—the living Dodo. Even Mr. Gray, when doubting that the head and feet of Edwards's picture belonged to the same creature, cannot escape the conclusion of the former existence, and now extinction, of some great bird in the islands of the Eastern Seas. The present work is, nevertheless, of very great interest and value, even on this part of its subject, for the industry, care, and success with which all the notices of these creatures by any of the old navigators have been collected, together with many other incidental mentions made of them, and with the addition of notices of all the representations or remains of them whose existence can be ascertained. This part of the work forms an important illustration of the kind of evidence on which alone any true naturalist can admit the existence of any anomalous creature. In proof of the existence of the Dodo we have, unlike the assumed evidence of the existence of some other anomalous monsters of which we have lately heard much, every canon of cautious truthseeking fully satisfied. With no traditional superstition or belief to give an origin to such a story* (a point of no little importance in such an investigation), we have here fifteen or sixteen separate and independent authorities all alluding incidentally to the Dodo, each different in language and description, yet each of which has points of resemblance that cannot be mistaken as referring to similar objects. We have moreover drawings of the creature itself, made by different hands, and at different times, and with different objects; some of them rude and coarse to grotesqueness; others finished works of art. Yet throughout all these there run characters which it is impossible to mistake, and which satisfy us that the draughtsmen drew, not from imagination, but from something real,

* It has always seemed to us that the fable of the Great Sea Serpent, which first spread in modern times from Norway, was to be traced to the myth, in the fine Old Northern Mythology, of that fell offspring of Loki, Jormungandr,—the great world-surrounding serpent, whom Thor fished up with the bull's-head bait, and whom, at the great day of Ragnarokr, he shall slay. It is curious, by the way, that we are expressly told how Jormungandr, rearing his head, poured out fountains of venom upon Thor, very much as old Bishop Egede tells us of the great sea serpent raising up its head and spouting out water.

Since the above, and the former part of this note, were written, Professor Owen's letter has appeared in the 'Times' of November 14; which gives a simple and clear explanation of the circumstances that have recently attracted attention, and briefly, but conclusively, discusses the question of the existence of the Great Sea Serpent generally.

and from individuals of one and the same species. It were perhaps impossible to illustrate this better than by the two following figures.

Bontekoe's figure of the Dodo (about) 1646.

Van den Broecke's figure of the Dodo, 1617.

However grotesque the first may appear, the resemblance in main character between both and the well-known picture in the British Museum is obvious. All accounts agree, too, as to the local habitation of these creatures, a point in which, if it had been a mere travellers' wonder, they could certainly not have done without copying from one another. We do not find the creature met with at one time near the North Pole, at another in the West Atlantic, and at another near the Southern Tropics; in each case under circumstances of wonder, and referred to some unknown legendary marvel; while in none was it within actual reach and handling, nor were any organic remains of it brought away. The Dodo, on the contrary, is always named as having been found in the same region; is told of as no fearful thing, but as one very easy to be killed, though less easy to be eaten, but of which, nevertheless, very many were from time to time both killed and eaten by those who found it. Finally, actual relics of the creature were brought away and still exist. The genuineness and truthfulness of Savery's pictures of the Dodo seem to us to be fully and clearly shown, and every naturalist must, we think, feel that now, at least, we have satisfactory materials on which to work. And this should lead us to notice the other part of the work, the whole of which is valuable for the minute details which it affords, both by descriptions and figures of unsurpassed beauty, of the osteology of the Dodo.

With respect to the affinities which it is the object of this book to establish as those of the Dodo, it would be impossible, in a brief review, to enter into the discussion of the question. The patience and ability displayed in working out the osteological details will be admitted by every one, whether or not the special conclusions urged may be accepted. One or two remarks as to those conclusions may however be allowed us, without its being considered that we would wish to lessen any of the just weight which may belong to the points actually specified. Without discussing, then, the comparative anatomy itself of the Dodo, we must confess that the impression left on our mind after a careful perusal of this book was, that it is inconceivable that the whole matter can be so very clear, the columbine affinities so very obvious and unmistakeable, as is here represented. We would notice this point earnestly, inasmuch as every truth-seeker must feel that science is perpetually suffering much through a too eager haste in the attempt to establish some novel conclusion. When the undisputed success of the manifold researches of Prof. Owen is remembered, it would reflect little upon him that, in the case of the Dodo, or any other individual case, he should have erred. But when the care and caution upon which alone that success has depended and must depend are also remembered, and when it is known that to the anatomy of the Dodo he has devoted express attention, and, having devoted that attention, has arrived at a conclusion different from that of our authors,—though with less expression of confidence and certainty,—we cannot but feel satisfied that, be he right or be he wrong in his conclusions, it is at any rate too much now to say that "the only points in which the Dodo can be said to differ materially from the type of the Pigeons are few in number, and are not such as to make any approximation to the Raptorial form" (p. 45), and that "the whole or a majority" of "the family characters of the skull in the Columbidæ" (p. 75) are found so obviously in that of the Dodo, while it "differs from that of the Vulturidæ" (*ib.*) in a long enumeration of "important and *characteristic* distinctions." No one can have engaged in the close investigation of any branch of natural history, or indeed anything else, earnestly seeking the truth, and not have felt how easy it is, when once a particular idea has been taken up, to detect in every minute and barely distinguishable point imagined corroborations of that idea, while points inconsistent with the idea are overlooked;—that, in short, in order to feel any confidence in the truth of any result worked out, it is necessary, at every step, to contend, as it were, against the evidence itself, and cautiously to seek out, not so much for that which will support, as for that which will militate against, the conclusion which it is thought may be established. And where the case is a disputed one, there is, philosophically considered, more weight to be attached to, and reliance to be placed upon, results in the statement of which it is admitted that there exist points of difficulty and doubt,—thus affording proof that such points have been sought and not avoided,—than to those the statement of which appears so smooth and clear and free from doubt and difficulty that he who runs may read. While therefore we must bestow the warmest meed of approbation on the elaborate attention which has obviously been given to the anatomical details contained in the present work, and which no one can examine without interest and instruction, we are bound to remind the seeker after truth that this is not all that has been said upon the subject, and therefore not all that can be said: and, if he would advance truth and true science, he is bound, before accepting the conclusions here put forth, to give every attention to what has been or may be said in support of any other views. He has here one view of the present subject most carefully, elaborately and clearly stated, and with every advantage which pictorial illustration can give. Cordially congratulating the scientific reader that the materials for discussion are thus before him in the most ample form, we must then repeat that they can only, at present, be regarded as *materials*, and that the question of the affinities of the Dodo cannot be regarded as settled and conclusively established until a careful comparison has been made between the facts urged in support of the conclusion set forth in this volume and those which have more especially attracted the attention of others, who, from an examination of the materials which exist for a determination of the question, have arrived at a different conclusion.

Outlines of Botany, Part I. By W. Maten, M.D. London, H. Baillière. 1848.

This little work appears to have been drawn up as a substitute for the notes which industrious students make during their attendance on lectures. As such it may prove useful, but to those who have had no previous instruction it will be of little service. When we mention that it has been attempted to give an outline of the organography and physiology of plants in eighteen pages, and that all the more important organs and parts are alluded to, it will be comprehended that no great space could be afforded for explanations. On the whole the organography is tolerably clear, though in several points the author has adopted views now generally abandoned. Several of these cases we have marked for notice.

The description of the structure of stems is sufficiently vague, and the old doctrine of *endogenous* growth is still adhered to. No allusion is made to the essential difference between the dicotyledons and monocotyledons arising from the union or independence of their component parts. The cambium regions of the fibro-vascular bundles of dicotyledons are blended into a ring beneath the bark, and in their growth are capable of forcing this outward and forming new layers of wood; the cambium regions of the isolated bundles of monocotyledons (which are not "dispersed confusedly") are buried in the substance of the general parenchyma, and only capable of development up to a certain point; consequently these latter cannot enlarge the diameter of the stem to any considerable extent, but merely render it more dense and compact.

In a note on morphology the author speaks of the ovules as developed from the margins of the carpellary leaves. The existence of a doubt at least, on this point, in regard to many cases, should have been indicated, considering the high names of the supporters of the opposite opinion.

The integuments of the seed are here said to consist of three layers, viz. "episperm, mesosperm, and endosperm," or in other terms, "testa, sarcosperm, and endopleura." Now the integuments of a seed are two: the testa formed from the primine, and the endopleura or *membrane interne* formed from the secundine. The word episperm is usually applied as a general term to include both coats; the word endosperm is applied to the albumen. Some indeed propose to call the albumen *episperm* when formed between the embryo-sac and the endopleura, and *endosperm* when formed within the embryo-sac, but no such term as sarcoderm is now recognised.

The physiology is treated rather obscurely. The old notion of the excretion of useless matters by the roots is taken for granted; and the respiration and digestion described as opposite processes, since respiration is regarded as an inhalation of oxygen with a liberation of carbonic acid, taking place in the dark, while growth or nutrition is said to "consist in varied combinations of oxygen, hydrogen, carbon and azote, got from the air and water," forming proximate principles, such as sugar, gum, starch, &c. If *nutrition*, especially so-called, consists in this, it is difficult to see what digestion and respiration are for.

The manner of growth of cells is summed up very briefly, being said to take place by the development of new ones from "certain germs or cytoblasts affixed to the wall of each." Such statements as these are worse than no account at all of such matters.

The second section is devoted to classification, and gives the Linnæan system with an analytical tribe of DeCandolle's Natural system; and four pages are devoted to the geography and medicinal properties of plants.

Seven plates accompany the text, not very artistic, but sufficiently clear for those who are satisfied with diagrams.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Feb. 22, 1848.—Wm. Yarrell, Esq., Vice-President, in the Chair.

Additional Measurements of the Red Corpuscles of the Blood of Vertebrata. No. 4. By George Gulliver, F.R.S.

A reference to the preceding numbers of these papers will be found in the Proceedings of the Zoological Society, October 14, 1845, p. 93, where are also tables of my measurements of the blood-corpuscles up to that date, with summary notices of the most remarkable results as to the size of those corpuscles in vertebrate animals. A note concerning the size of the blood-corpuscles of Birds is given in the same Proceedings for March 24, 1846: and numerous observations on the size, shape, and structure of the blood-corpuscles of Vertebrata are contained in my Notes to the edition of Hewson's Works, lately printed for the Sydenham Society.

The following measurements, like all my former ones, are expressed in vulgar fractions of an English inch, and for the sake of brevity, on this occasion the average sizes only are given: L.D. denotes the long diameter and S.D. the short diameter of the corpuscles. A few remarks may be now added to illustrate the bare figures.

After my observation (see Dublin Medical Press for November 1839, and Proceedings of the Zoological Society, No. CXV. p. 107) of the remarkable minuteness of the red corpuscles of the blood of the Napu Musk Deer, it was to be expected that the corresponding corpuscles in the other species of *Moschus* would have a similar character. Accordingly, in Stanley's Musk Deer I found those corpuscles almost as small; and in my late measurements, the average of which is now given, of the blood-corpuscles of the Meminna Deer, I could perceive no difference between them and those of the Napu Musk Deer.

In the books of physiology, before the observations just mentioned, the blood-corpuscles of the Goat used to be described as the smallest in the Mammalia (see Prevost and Dumas; and Müller, Physiology, tr. by Dr. Baly, 1838, vol. i. p. 101; Mandl, Anatomie Générale, 1843, p. 248); but to the list of animals in which I have already found those corpuscles still smaller, are now to be added the Meminna and two species of Brocket Deer.

In the Red Brocket Deer (a female) the majority of the blood-corpuscles were of the spear-shaped, lunated, and sigmoidal forms, described and figured from the blood of some other *Cervidæ* in the Lond. and Edin. Philosophical Magazine, November 1840, p. 329, and noticed in my Appendix to Gerber's Anatomy, p. 11 to 12: there were also many of the common circular corpuscles. The blood-corpuscles of a new species of Brocket Deer (a male, from Brazil) were of the usual circular shape. In the magazine above-cited it is suggested that those irregular forms may result from changes in the common circular discs; and this now appears more probable from the facts just mentioned. The cause of these curious changes in the shape of the blood-discs is well-deserving of further inquiry.

The blood-corpuscles of the Aurochs are scarcely distinguishable in any respect from those of its congener the Bison and of some other large ruminants.

Of the *Edentata*, as far as can be inferred from the few yet examined, the mean size of the blood-corpuscles is larger than in mammals generally. And in the genus *Bradypus*, as fully explained in the Proceedings of the Zoological Society, June 11, 1844, I found those corpuscles larger than any yet observed in Mammalia, with the single exception of those of the Elephant. This large size of the blood-corpuscles of the Sloth is confirmed by the measurement now given of them, from a younger animal than that which afforded me the blood for the former observations.

Judging from the facts at present ascertained, the marsupial animals appear to agree in the size and form of the blood-corpuscles with the corresponding placental Mammalia, as mentioned in my notice in the Dublin Medical Press, November 1839, and in the Proceedings of the Zoological Society, June 8, 1841. But in the Marsupials further observations are required. The measurement now given of the blood-corpuscles of the Crab-eating Opossum accords with the view just stated.

The following measurements of the blood-corpuscles of Birds tend to confirm the result which I have before published, that in this entire class the law for the size of the corpuscles is the same as in a single family of Mammalia; and that the short diameter of the oval blood-corpuscles of Birds has a general correspondence with the diameter of the circular blood-corpuscles of mammals.

Through the kindness of Dr. Andrew Smith, I am enabled to add measurements of the blood-corpuscles of such reptiles as were alive some time since in his very interesting and valuable collection.

Laland's Megalotis (*Otocyon Lalandii*, [Desm.])		1-3600
Meminna Deer (*Moschus Meminna*, Erxl.)		1-12325
Red Brocket Deer (*Cervus nemorivagus*, Cuv.)		1-7060
A Brocket Deer (*Cervus*—a new species)		1-7125
Aurochs (*Bos Urus*, Bodd.)		1-4074
A young Sloth (*Bradypus didactylus*, Linn.)		1-2778
Anteater (*Echidna histrix*, Cuv.)		1-3300
Crab-eating Opossum (*Didelphis cancrivora*, Temm.)		1-3436
Red-legged Falcon (*Falco rufipes*, Bechst.)	L.D.	1-2000
	S.D.	1-3790
Long-eared Owl (*Otus vulgaris*, Flem.)	L.D.	1-1830
	S.D.	1-3400
Little Owl (*Strix passerina*, Temm.)	L.D.	1-1885
	S.D.	1-3555
Red-backed Shrike (*Lanius collurio*, Linn.)	L.D.	1-2230
	S.D.	1-3878
Cassowary (*Casuarius emu*, Lath.)	L.D.	1-1455
	S.D.	1-2800
Great Bustard (*Otis tarda*, Linn.)	L.D.	1-1811
	S.D.	1-3200

Houbara Bustard (*Otis houbara*, Gmel.)	L.D.	1-1814
	S.D.	1-3200
Three-keeled Emys (*Emys trijuga*, Schw.) ..	L.D.	1-1333
	S.D.	1-1909
Caspian Emys (*Emys Caspica*, Schweig.)	L.D.	1-1103
	S.D.	1-2000
Testudo mauritanica, Dum. & Bib.	L.D.	1-1280
	S.D.	1-2000
Testudo tabulata, Walbaum	L.D.	1-1143
	S.D.	1-2000
Gymnopodus Ægyptiacus, Geoff.; *labiatus*, Bell	L.D.	1-1143
	S.D.	1-2000
Morelia Argus, Dum. & Bib.	L.D.	1-1371
	S.D.	1-1685
Proteus (*Proteus anguinus*, Laur.)	L.D.	1-400
	S.D.	1-727
Common Trout (*Salmo fario*, Linn.)	L.D.	1-1524
	S.D.	1-2900
Grayling (*Thymallus vulgaris*, Nilss.)	L.D.	1-1684
	S.D.	1-2900

On seven new species of Australian Birds.

By John Gould, F.R.S. etc.

Graucalus hypoleucus.

Lores black; crown of the head and all the upper surface dark grey; wings and tail black; chin, under surface of the wings, abdomen and under tail-coverts white; breast pale greyish white; irides brownish black; bill blackish brown; legs and feet black; insides of the feet and spaces between the scales of the tarsi mealy grey.

Total length 9 inches; bill $1\frac{1}{8}$; wing $5\frac{3}{4}$; tail $4\frac{3}{4}$; tarsi 1.

Hab. Port Essington.

Remark.—Distinguished from all the other Australian members of the genus by the whiteness of the under surface.

Limosa uropygialis.

All the upper surface brownish grey, becoming dark brown in the centre and nearly white on the edges of the feathers; primaries brown, with white shafts; rump and upper tail-coverts conspicuously barred with brown and white; tail alternately barred with brown and white; throat and abdomen white; neck and breast brownish grey; under wing-coverts and flanks barred with brown and white; bill white at the base, becoming brown at the tip; irides dark brown; legs brownish black.

Total length 15 inches; bill $3\frac{1}{4}$; wing $8\frac{3}{4}$; tail $3\frac{1}{4}$; tarsi $2\frac{1}{8}$.

Hab. Australia.

Remark.—Distinguished from *Limosa rufa* by the rump being barred instead of white as in that species. The female is about a third larger in all her admeasurements than the male.

Charadrius veredus.

Crown of the head and all the upper surface brown, each feather narrowly fringed with buff; primaries blackish brown, the shaft of the first white; tail brown, narrowly edged with white, the brown colour gradually fading as the feathers recede from the centre; face, a broad stripe over the eye, and the chin, buffy white; sides and back of the neck, and the breast, buffy brown; abdomen and under surface white; irides very dark brown; legs and feet brownish flesh-colour; bill dark brown.

Total length $8\frac{1}{2}$ inches; bill $1\frac{1}{8}$; wing $6\frac{1}{2}$; tail $2\frac{1}{8}$; tarsi 2.

Hab. Northern Australia.

Remark.—This species exhibits characters pertaining both to the true Plovers and to the Coursers, and would seem therefore to have just claims to be made the type of a new genus; but before separating it, it will be necessary to know something of its habits, and also if it undergoes any periodical change of plumage.

Totanus griseopygius.

Head, all the upper surface, rump and tail, greyish brown; primaries dark brown; line over the eye and all the under surface white; the neck, breast and flanks strongly freckled with brown; irides reddish brown; bill blackish brown, except the base of the under mandible, which is scarlet; legs and feet hyacinth-red.

In winter the upper surface is of a much lighter hue, and the under surface is of a greyish white and destitute of the brown freckles.

Total length $8\frac{3}{4}$ inches; bill $1\frac{3}{4}$; wing $6\frac{3}{4}$; tail $2\frac{7}{8}$; tarsi $1\frac{1}{4}$.

Hab. Port Essington.

Remark.—Distinguished by the uniform grey colouring of the rump and upper tail-coverts.

Schœniclus magnus.

Crown of the head, and the neck, brownish grey, each feather with a stripe of brown down the centre; back and wings brown, broadly margined with brownish grey; primaries blackish brown; rump white, each feather tipped with brown; tail brownish grey; feathers of the breast dark brown, with a crescent of white at the extremity; abdomen and under tail-coverts white; flanks mottled with brown; bill, feet, and irides, olive.

Total length $9\frac{1}{2}$ inches; bill $1\frac{3}{4}$; wing 7; tail $2\frac{1}{4}$; tarsi $1\frac{3}{8}$.

Hab. Australia.

Remark.—Of this species of *Schœniclus*, which is distinguished by its large size, the only examples that have come under my notice are in the British Museum, and a second in the possession of the Hon. Charles Neville, to whom I am indebted for the loan of it for illustration in my 'Birds of Australia.'

Ardetta macrorhyncha.

Crown of the head and occipital crest black, with green reflexions; neck, all the upper surface and wing-coverts greenish olive; wing-coverts narrowly margined with deep rufous; primaries and tail slate-grey; spurious wing, secondaries and all but the three or four external primaries with an irregular triangular-shaped spot at the tip; down the centre of the throat a series of oblong marks of dark brown and white, forming a conspicuous mottled stripe, continued into the breast, where it is lost in the mingled grey and buffy brown of the abdomen; upper mandible dark reddish brown; basal portion of the lower one oil-green; tibiæ and hinder part of the tarsi bright yellow; remainder of the legs and feet yellowish brown.

Total length 17 inches; bill $3\frac{3}{4}$; wing $7\frac{3}{4}$; tail 3; tarsi $2\frac{1}{8}$.

Hab. East coast of Australia.

Remark.—Differs from the *Ardetta Javanica* in being considerably larger in size and in the great size of its head and bill.

Cracticus picatus.

Collar at the back of the neck, centre and edge of the wing, rump, abdomen, under tail-coverts and tips of all but the centre tail-feathers white; remainder of the plumage deep black; irides dark reddish brown; bill ash-grey, the tip black; legs and feet dark greenish grey.

Total length 10 inches; bill $1\frac{3}{4}$; wing 6; tail $4\frac{3}{4}$; tarsi $1\frac{1}{4}$.

Hab. Northern Australia.

Remark.—A miniature representative of, and nearly allied to, but distinct from, *Cracticus nigrogularis*.

March 14.—Dr. Gamble in the Chair.

The following papers were read:—

1. Diagnoses Specierum novarum generis Planorbis collectionis Cumingianæ. Auctore Guil. Dunker, Dre.

1. Planorbis inflatus, Dkr. *Pl. testâ magnâ, inflatâ, fusco-, olivaceo- et cinereo-corneâ, nitidâ, striatâ, suprà profundè umbilicatâ, infrà concavâ, anfractibus 4 inflatis celerrimè crescentibus; aperturâ reniformi; fauce fuscâ.*

Diam. max. 1″ 1‴; alt. aperturæ 8‴.

Species tum colore, tum habitu varietatibus quibusdam *Pl. cornei*, simillima. Anfractus primordiales striis spiralibus insignes.

Patria cochleæ eximiæ ignota est.

2. Planorbis nitidulus, Dkr. *Pl. testâ parvulâ, pallidè corneo-fulvescente, nitidulâ, pellucidâ, suprà profundè umbilicatâ, basi planâ; anfractibus $3\frac{1}{2}$ rotundatis; aperturâ obliquè ovatâ.*

Diam. max. $1\frac{3}{4}$‴; alt. $\frac{1}{2}$‴.

Species hæc parvula basi planâ et latere superiore umbilicato noscenda, in Chersoneso aureâ (pæninsula Malacca) plantis aquaticis insidens reperta est. (H. Cuming.)

3. Planorbis Gilberti, Dkr. *Pl. testâ depressâ, sublenticulari, pallidè corneâ, nitidâ, pellucidâ, superâ paginâ planiusculâ, infernè umbilicatâ; anfractibus tribus utrinque obtusè angulatis; infrà medium acutè carinatis; aperturâ obliquâ, subcordatâ; margine superiore producto.*

Diam. max. $2\frac{1}{2}$‴; alt. $\frac{3}{4}$‴.

Species *Planorbi exacuto*, Say., similis, differt vero umbilico latiore, foveolâ lateris superioris medianâ, et carinâ obtusâ in superâ et inferâ anfractuum paginâ. Reportata est e Novâ Hollandiâ à cl. Gilbert.

4. Planorbis chinensis, Dkr. *Pl. testâ parvâ, corneâ, subtiliter striatâ, subdiaphanâ, paginâ superâ convexiusculâ, medio impressâ,*

paginâ inferâ latè umbilicatâ; anfractibus $3\frac{1}{2}$ *ovatis medio subcarinatis; aperturâ obliquâ, subcordatâ.*

Diam. max. $2\frac{1}{4}'''$; alt. $\frac{2}{3}'''$.

Species hæc à cl. H. Cuming in rivulo ad Hong Kong in China detecta, *Pl. deformi*, Lam., similis, sed carinâ obsoletâ et latere superiore minus convexo diversa.

5. Planorbis panamensis, Dkr. *Pl. testâ parvulâ, albidâ vel pallidè corneâ, diaphanâ, haud nitente, striis tenuissimis confertis lineisque spiralibus remotis et obsoletis subdecussatâ, suprà plano-convexâ, medio impressâ, infrà umbilicatâ; anfractibus* $2\frac{1}{2}$—3 *ovatis; aperturâ obliquâ.*

Diam. max. $1\frac{1}{2}'''$; alt. $\frac{1}{2}'''$.

Hab. in rivulis ad Panama (H. Cuming). Magnam affinitatem præbet cum *Pl. elevato*, Adams.

6. Planorbis Hindsianus, Dkr. *Pl. testâ parvulâ, corneâ, subviridescente, tenuissimè confertimque striatâ, diaphanâ, subnitidâ, suprà planiusculâ, medio impressâ, infrà umbilicatâ; anfractibus tribus ovatis; aperturâ obliquâ.*

Species magnitudine ferè præcedentis, sed colore et striis spiralibus deficientibus satis diversa.

Hab. in insulâ Puna in sinu ad Guayaquil (R. B. Hinds).

7. Planorbis obesus, Dkr. *Pl. testâ solidâ, tenuiter densèque striatâ, nitidâ, subsericeâ, fusco- seu luteo-corneâ, utrinque concavâ; anfractibus* $3\frac{1}{2}$—4 *tumidis celeriter crescentibus, aperturâ subreniformi, labro intus subincrassato.*

Diam. max. $7'''$; alt. $3\frac{1}{4}'''$.

Pl. trivolvi, Say., affinis, sed striis subtilioribus, aperturâ minore, testâ crassiore et carinâ in latere basali deficiente distincta.

Patria ignota.

8. Planorbis Cumingianus, Dkr. *Pl. testâ magnâ, discoideâ, crassiusculâ, suprà corneâ subrufâ, infrà olivaceâ, nitidâ, obsoletissimè striatâ, ferè glabratâ, utrinque concavâ; anfractibus senis ovatis, suturâ profundâ divisis; aperturâ obliquâ, ovato-sublunatâ.*

Diam. max. $1''$ $1\frac{1}{3}'''$; alt. $3'''$.

Planorbi olivaceo simillimus, sed colore, testâ crassiore, splendidiore ferè glabratâ, umbilico latiore, anfractibus convexioribus minus involutis aliisque notis bene distinguendus.

Patria ignota.

9. Planorbis sibiricus, Dkr. *Pl. testâ parvâ, tenui, pallidè corneâ, subtilissimè striatâ, suprà planiusculâ, medio impressâ, infrà concavâ; anfractibus* $3\frac{1}{2}$ *ovatis, modicè crescentibus, suturâ distinctâ divisis; aperturâ obliquâ, ovatâ.*

Diam. max. $2'''$; alt. $\frac{1}{2}'''$.

Pl. albo affinis, sed colore et capillis deficientibus diversus.

Hab. in Sibiriâ.

10. Planorbis Fokkesii, Dkr. *Pl. testâ parvâ, albidâ, subcorneâ, nitidâ, diaphanâ, suprà plano-convexâ seu planâ, medio profundè*

impressâ, infrà umbilicatâ; anfractibus tribus subtumidis, celeriter ferè crescentibus tenuiterque striatis, ultimo declinato; aperturâ subrotundâ, perobliquâ, margine superiore producto.

Diam. max. $2\frac{1}{2}'''$; alt. $1'''$.

Patria ignota.

11. Planorbis fuscus, Dkr. *Pl. testâ tenui, fuscâ, subtilissimè longitudinaliter transversimque striatâ, suprà convexiusculâ, infrà concavâ, latere utroque umbilicatâ; anfractibus $2\frac{1}{2}$ teretibus, subceleriter crescentibus, ultimo paullò descendente; aperturâ rotundatâ.*

Diam. max. $3\frac{1}{2}'''$; alt. $1\frac{1}{4}'''$.

Tria hujus speciei exemplaria plane congruentia exstant, quæ cl. Cuming in paludibus ad Valparaiso invenit.

12. Planorbis sericeus, Dkr. *Pl. testâ majusculâ, tenuissimè decussatâ, fusco-corneâ, interdum luteo-albidâ, nitore sericeo insigni, superâ et inferâ paginâ concavâ; anfractibus quinis albis utrinque carinatis; aperturâ obliquâ, ferè semilunatâ, infrà et suprà angulatâ.*

Diam. max. $7'''$; alt. $3'''$.

Testa *Pl. tenagophilo*, Orb., affinis, sed magis involuta et regularis.

Patria ignota.

13. Planorbis stramineus, Dkr. *Pl. testâ tenuistriatâ, nitidâ, parùm diaphanâ, stramineâ, subcorneâ, suprà plano-concavâ, medio impressâ, infrà umbilicatâ; anfractibus 4 subrotundis; aperturâ dilatatâ, ferè rotundatâ.*

Diam. max. $5'''$; alt. ferè $2'''$.

Primo adspectu Helicibus quibusdam similis, ex. gr. *Helici ericetorum.*

Patria America australis (H. Cuming).

14. Planorbis Ruppellii, Dkr. *Pl. testâ opacâ, tenuiter striatâ, pallidè corneâ, subcinereâ, suprà umbilicatâ, infernè concavâ, anfractibus 4 ovatis modicè crescentibus; aperturâ ovatâ, obliquâ.*

Diam. max. $6'''$ ferè; alt. $2'''$.

Patria Habessinia (Rüppell).

15. Planorbis limosus, Dkr. *Pl. testâ cinereo-corneâ, opacâ, striatâ, subcarinatâ, suprà convexiusculâ, medio impressâ, infrà umbilicatâ; anfractibus tribus ovatis; aperturâ obliquâ, subovali; faucibus subflavis.*

Diam. max. $3'''$; alt. $1'''$.

Hæc species *Pl. deflectum* Sayi in mentem vocat.

Hab. in Asiâ minore (H. Spratt).

16. Planorbis Philippianus, Dkr. *Pl. testâ discoideâ, subnitidâ, tenuissimè obsoletèque striatâ, pallidè corneâ, diaphanâ, suprà planatâ, medio impressâ, infrà parùm concavâ; anfractibus senis rotundatis sensim crescentibus; aperturâ subrotundâ, subobliquâ.*

Diam. max. $5\frac{1}{2}'''$; alt. $1\frac{1}{4}'''$.

Patria Cochabamba in Boliviâ.

2. Some observations on Myodes Hudsonicus and the other species of the genus Myodes. By J. E. Gray, Esq., F.R.S. etc.

The Governor of the Hudson's Bay Company having kindly sent to the British Museum the extensive series of Mammalia, Birds and Fish collected by Dr. J. Rae in his late very interesting journey, I have been induced to lay before the Society some remarks on the species of the genus *Myodes*, which I hope will tend to elucidate the history of these interesting animals.

Myodes Hudsonicus has been distinguished as a species by the large size and peculiar form of the claws on the front feet; but the specimen contained in this collection appears to prove that these large claws are only found in some individuals, or more likely in only one sex, and that the other individuals or sex have small, curved, sharp claws, like the typical species of the genus; and this also appears to be the case with *Myodes helvolus*, Richardson, for one specimen in the collection has the small typical claws which Sir John Richardson assigns to the species, and the other has very large, thick, rounded, bluntly truncated claws on the fore-feet, which is probably the character of the males.

The species of the genus in the British Museum may be thus divided:—

I. The upper cutting teeth narrow, smooth, without any longitudinal grooves. Thumb with a compressed, curved, acute claw.

a. Claws of fore-feet simple, curved.
M. Lemurus, two specimens; Sweden.
M. helvolus, Richardson, one specimen.

b. Claws of fore-feet of some (males?) specimens compressed above, with a round, dilated, expanded pad beneath.
M. Grœnlandicus. Fur with a dorsal streak.

c. Claws of fore-feet of some (males?) specimens very large, compressed, strap-shaped, and with a deep triangular notch at the end.
M. Hudsonicus.

II. The upper cutting teeth broader, with a central longitudinal groove; claws of the thumb strap-shaped, truncated, and notched at the tip.

M. helvolus, Rich. Claws of some specimens (males?) thick, subcylindrical, curved, truncate.
M. trimucronatus, Rich., two specimens. Claws of both specimens similar, acute, curved.

3. Description of a new species of Anatifa. By J. E. Gray, Esq., F.R.S. etc. etc.

In the collection of my friend Mr. Joseph Fryer, of Whitley House, Northumberland, I have observed a very interesting new species of this genus, which was given him by Mr. Hewitson, who found it attached to a *Gorgonia* in Madeira.

It is interesting as having the solid, thick, ventricose valves of

Mr. Hinds's genus *Trilasmis*, and it also resembles that genus in the anterior basal and the upper opercular valves being very small, so that it forms the passage between *Pentalasmis* and that genus.

There are in Mr. Fryer's collection two specimens, which differ considerably from one another. One is pale red and elongate-ovate, smooth, rather compressed, and the larger opercular valves have a rather distinct line towards the extremity. The anterior basal valve is much-compressed. The second is yellowish white, pink at the base, ovate, swollen, slightly radiately and concentrically striated; the left larger opercular valve is larger than the right one, more convex, and partly inclosing it; the anterior valve and upper opercular valve are very narrow.

I propose to call the species *Anatifa crassa*. Peduncle short; valves thick, opake, convex, large, the anterior basal valve and upper opercular valves very narrow.

Inhab. Madeira, on *Gorgonia*.

MISCELLANEOUS.

How to prevent the Attacks of the Bed-bug, Cimex lectularius. By Walter White, Esq.

To Richard Taylor, Esq.

Nov. 6, 1848.

Sir,—May I be permitted to offer a few remarks on the communication "How to prevent the Attacks of the Bed-bug" in your last number?

It is in no depreciatory spirit that I say the means recommended are not new: more than twenty years ago I met with instances of inverted cones of glass being used as bases for bedposts; sometimes the entire leg below the framing was glass, or it stood in a glass vessel lined with a viscous fluid. Similar instances have repeatedly come to my knowledge since, and I may add that due precautions were taken to isolate the bedstead, by keeping the curtains and draperies clear of wall and floor.

In spite of such precautions bugs *will* get into bedsteads, much to the *wonder* of those ignorant of the reason why. I learnt it by experience during a five years' residence in New York, the head-quarters of bugs. I slept on a French bedstead, having no hangings, and placed quite free from all contact except the points by which it touched the floor. It was well searched every day, a necessary precaution where the thermometer is sometimes at 90° after sunset, yet bugs found their way into the bed. They effected their entrance by crawling up the walls and along the ceiling until over the bed, when they let themselves fall, probably aware that the shock would not be fatal. My attention was first drawn to the fact by the descent of one of the loathsome creatures into my mouth, while I was lying in a dose in the dim twilight of a summer morning: after this nauseous experience I several times observed the fall of bugs. If surprised by daylight before their plunge, the animals would remain motionless on the ceiling until the succeeding night.

One fact, it is said, proves nothing; but I found on inquiry that the fall of bugs from ceilings was a phænomenon in their natural history generally believed in*. And a friend of mine one night placed his bed on a table with each leg in a vessel of water in the middle of a room: he also observed bugs crawl along the ceiling before sunrise and drop upon his couch.

The only effectual way to avoid the attacks of bugs is to keep the creatures out of rooms as well as out of bedsteads. Unfortunately our mistaken, not to say absurd English custom of loading our bedsteads with hangings is a great encouragement to bug-propagation. Besides, bedsteads are so seldom cleaned, whereby not only bugs but spiders have ample opportunity to establish colonies. If the cumbersome garniture of hangings were dispensed with, none but French bedsteads used, with a framed lath-bottom, so as to be easily removable—and the whole, as well as the mattresses, &c., well brushed once a week—if bedroom walls were covered with paint instead of paper—if bedroom floors were occasionally scrubbed with soap and lime, there would be but few bugs, even in London.

Light, and free circulation of air will do much towards checking the increase of these nocturnal pests. The Americans are wiser than we in matters of bedroom drapery; they avoid it altogether, or have so little as to afford no shelter to vermin.

THE GREAT SEA-SERPENT.

To the Editor of the Times.

Sir,—Subjoined is the answer to a question relative to the animal seen from the Dædalus, addressed to me by a nobleman distinguished in literature, and taking much interest in science.

As it contains the substance of the explanation I have endeavoured to give to numerous inquirers, in the Hunterian Museum and elsewhere, and as I continue to receive many applications for my opinion of the "Great Sea-Serpent," I am desirous to give it once for all through the medium of your columns, if space of such value may be allotted to it.

I am, Sir, your very obedient servant,

Richard Owen.

Lincoln's Inn Fields, Nov. 9.

The sketch† will suggest the reply to your query, "whether the monster seen from the Dædalus be anything but a Saurian?" If it be the true answer, it destroys the romance of the incident, and will be anything but acceptable to those who prefer the excitement of

* We are able to confirm the statement of our correspondent from similar instances.—Ed.

† This was a reduced copy of the drawing of the head of the animal seen by Captain M'Quhae, attached to the submerged body of a large seal, showing the long eddy produced by the action of the terminal flippers.

the imagination to the satisfaction of the judgement. I am far from insensible to the pleasures of the discovery of a new and rare animal, but before I can enjoy them, certain conditions, *e. g.* reasonable proof or evidence of its existence, must be fulfilled. I am also far from undervaluing the information which Captain M'Quhae has given us of what he saw. When fairly analysed, it lies in a small compass; but my knowledge of the animal kingdom compels me to draw other conclusions from the phænomena than those which the gallant captain seems to have jumped at. He evidently saw a large animal moving rapidly through the water, very different from anything he had before witnessed—neither a whale, a grampus, a great shark, an alligator, nor any other of the larger surface-swimming creatures which are fallen in with in ordinary voyages. He writes, "On our attention being called to the object, it was discovered to be an enormous serpent" (read "animal"), "with the head and shoulders kept about four feet constantly above the surface of the sea. The diameter of the serpent" (animal) "was about 15 or 16 inches behind the head; its colour a dark brown, with yellowish white about the throat." No fins were seen (the captain says there were none; but from his own account he did not see enough of the animal to prove his negative). "Something like the mane of a horse, or rather a bunch of sea-weed washed about its back." So much of the body as was seen was "not used in propelling the animal through the water, either by vertical or horizontal undulation." A calculation of its length was made under a strong preconception of the nature of the beast. The head, *e. g.* is stated to be "without any doubt that of a snake;" and yet a snake would be the last species to which a naturalist conversant with the forms and characters of the heads of animals would refer such a head as that of which Captain M'Quhae has transmitted a drawing to the Admiralty, and which he certifies to have been accurately copied in the 'Illustrated London News' for October 28, 1848, p. 265. Your Lordship will observe, that no sooner was the captain's attention called to the object than "it was discovered to be an enormous serpent," and yet the closest inspection of as much of the body as was visible, *à fleur d'eau*, failed to detect any undulations of the body, although such actions constitute the very character which would distinguish a serpent or serpentiform swimmer from any other marine species. The foregone conclusion, therefore, of the beast's being a sea-serpent, notwithstanding its capacious vaulted cranium and stiff inflexible trunk, must be kept in mind in estimating the value of the approximation made to the total length of the animal, as "at the very least 60 feet." This is the only part of the description, however, which seems to me to be so uncertain as to be inadmissible in an attempt to arrive at a right conclusion as to the nature of the animal. The more certain characters of the animal are these:—Head, with a convex, moderately capacious cranium, short obtuse muzzle, gape of the mouth not extending further than to beneath the eye, which is rather small, round, filling closely the palpebral aperture; colour dark brown above, yellowish white beneath; surface smooth, without scales, scutes, or other conspicuous modifications of hard and naked cuticle. And the captain says, "Had it been a man of my acquaintance, I should have easily recognized his features with my naked eye." Nostrils not mentioned, but indicated in the drawing by a crescentic mark at the end of the nose or muzzle. All these are the characters of the head of a warm-blooded mammal; none of them those of a cold-blooded reptile or fish. Body long, dark brown, not undulating, without dorsal or other apparent fins; "but something like the mane of a horse, or rather a bunch of sea-weed washed about its back." The character of the integuments would be a most important one for the zoologist in the determination of the class to which the above-defined creature belonged. If any opinion can be deduced as to the integuments from the above indication, it is that the species had hair, which, if it was too short and close to be distinguished on the head, was visible where it usually is the longest, on the middle line of the shoulders or advanced part of the back, where it was not stiff and upright like the rays of a fin, but "washed about." Guided by the above interpretation of the "mane of a horse, or a bunch of sea-weed," the animal was not a cetaceous mammal, but rather a great seal. But what seal of large size, or indeed of any size, would be encountered in latitude 24° 44′ south, and longitude 9° 22′ east—viz. about 300 miles from the western shore of the southern end of Africa? The most likely species to be there met with are the largest of the seal tribe, *e. g.* Anson's sea-lion, or that known to the southern whalers by the name of the "Sea Elephant," the *Phoca proboscidia*, which attains the length of from 20 to 30 feet. These great seals abound in certain of the islands of the southern and antarctic seas, from which an individual is occasionally floated off upon an iceberg. The sea-lion exhibited in London last spring, which was a young individual of the *Phoca proboscidia*, was actually captured in that predicament, having been carried by the currents that set northward towards the Cape, where its temporary resting-place was rapidly melting away. When a large individual of the *Phoca proboscidia* or *Phoca leonina* is thus borne off to a distance from its native shore, it is compelled to return for rest to its floating abode, after it has made its daily excursion in quest of the fishes or squids that constitute its food. It is thus brought by the iceberg into the latitudes of the Cape, and perhaps further north, before the berg has melted away. Then the poor seal is compelled to swim as long as strength endures; and in such a predicament I imagine the creature was that Mr. Sartoris saw rapidly approaching the Dædalus from before the beam, scanning, probably, its capabilities as a resting-place, as it paddled its long stiff body past the ship. In so doing, it would raise a head of the form and colour described and delineated by Captain M'Quhae, supported on a neck also of the diameter given; the thick neck passing into an inflexible trunk, the longer and coarser hair on the upper part of which would give rise to the idea, especially if the species were the *Phoca leonina*, explained by the similes above-cited. The organs of locomotion would be out of sight. The pectoral fins being set on very low down, as in my sketch, the chief impelling force would be the action of the deeper immersed terminal fins and tail, which would create a long eddy, readily mistakeable by one looking at the strange phænomenon with a sea-serpent in his mind's eye, for an indefinite prolongation of the body.

It is very probable that not one on board the Dædalus ever before beheld a gigantic seal freely swimming in the open ocean. Entering unexpectedly upon that vast and commonly blank desert of waters, it would be a strange and exciting spectacle, and might be well interpreted as a marvel: but the creative powers of the human mind appear to be really very limited, and on all the occasions where the true source of the "great unknown" has been detected—whether it has proved to be a file of sportive porpoises, or a pair of gigantic sharks,—old Pontoppidan's sea-serpent with the mane has uniformly suggested itself as the representative of the portent, until the mystery has been unravelled.

The vertebræ of the sea-serpent described and delineated in the 'Wernerian Transactions,' vol. i., and sworn to by the fishermen who saw it off the Isle of Stronsa (one of the Orkneys), in 1808, two of which vertebræ are in the Museum of the College of Surgeons, are certainly those of a great shark, of the genus *Selache*, and are not distinguishable from those of the species called "basking-shark," of which individuals from 30 feet to 35 feet in length have been from time to time captured or stranded on our coasts.

I have no unmeet confidence in the exactitude of my interpretation of the phænomena witnessed by the captain and others of the Dædalus. I am too sensible of the inadequacy of the characters which the opportunity of a rapidly passing animal, "in a long ocean swell," enabled them to note, for the determination of its species or genus. Giving due credence to the most probably accurate elements of their description, they do little more than guide the zoologist to the class, which, in the present instance, is not that of the serpent or the saurian.

But I am usually asked, after each endeavour to explain Captain M'Quhae's sea-serpent, "Why there should not be a great sea-serpent?"—often, too, in a tone which seems to imply, "Do you think, then, there are not more marvels in the deep than are dreamt of in your philosophy?" And freely conceding that point, I have felt bound to give a reason for scepticism as well as faith. If a gigantic sea-serpent actually exists, the species must of course have been perpetuated through successive generations from its first creation and introduction in the seas of this planet. Conceive, then, the number of individuals that must have lived and died and have left their remains to attest the actuality of the species during the enormous lapse of time from its beginning to the 6th of August last! Now, a serpent, being an air-breathing animal with long vesicular and receptacular lungs, dives with an effort, and commonly floats when dead; and so would the sea-serpent until decomposition or accident had opened the tough integument and let out the imprisoned gases. Then it would sink, and, if in deep water, be seen no more until the sea rendered up its dead, after the lapse of the æons requisite for the yielding of its place to dry land—a change which has actually revealed to the present generation the old saurian monsters that were entombed at the bottom of the ocean of the secondary geological periods of our earth's history. During life, the exigencies of the respiration of the great sea-serpent would always compel him frequently to the surface; and when dead and swollen—

> "Prone on the flood, extended long and large,

he would

> "Lay floating many a rood; in bulk as huge
> As whom the fables name of monstrous size,
> Titanian or earth-born that warr'd on Jove."

Such a spectacle, demonstrative of the species if it existed, has not hitherto met the gaze of any of the countless voyagers who have traversed the seas in so many directions. Considering, too, the tides and currents of the ocean, it seems still more reasonable to suppose that the dead sea-serpent would be occasionally cast on shore. However, I do not ask for the entire carcase. The structure of the back-bone of the serpent tribe is so peculiar, that a single vertebra would suffice to determine the existence of the hypothetical Ophidian; and this will not be deemed an unreasonable request, when it is remembered that the vertebræ are more numerous in serpents than in any other animals. Such large, blanched, and scattered bones on any sea-shore would be likely to attract even common curiosity; yet there is no vertebra of a serpent larger than the ordinary pythons and boas in any museum in Europe.

Few sea-coasts have been more sedulously searched, or by more acute naturalists (witness the labours of Sars and Lovén), than those of Norway. Krakens and sea-serpents ought to have been living and dying thereabouts from long before Pontoppidan's time to our day, if all tales were true; yet have they never vouchsafed a single fragment of their skeleton to any Scandinavian collector; whilst the other great denizens of those seas have been by no means so chary. No museums, in fact, are so rich in the skeletons, skulls, bones, and teeth of the numerous kinds of whales, cachalots, grampuses, walruses, sea-unicorns, seals, &c., as those of Denmark, Norway, and Sweden; but of any large marine nondescript or indeterminable monster they cannot show a trace.

I have inquired repeatedly whether the natural-history collections of Boston, Philadelphia, or other cities of the United States, might possess any unusually large ophidian vertebræ, or any of such peculiar form as to indicate some large and unknown marine animal; but they have received no such specimens.

The frequency with which the sea-serpent has been supposed to have appeared near the shores and harbours of the United States has led to its being specified as the "American Sea Serpent;" yet out of the 200 vertebræ of every individual that should have lived and died in the Atlantic since the creation of the species, not one has yet been picked up on the shores of America. The diminutive snake, less than a yard in length, "killed upon the sea-shore," apparently beaten to death, "by some labouring people of Cape Ann," United States (see the 8vo pamphlet, 1817, Boston, page 38), and figured in the 'Illustrated London News,' October 28, 1848, from the original American memoir, by no means satisfies the conditions of the problem. Neither do the *Saccopharynx* of Mitchell, nor the *Ophiognathus* of Harwood—the one $4\frac{1}{2}$ feet, the other 6 feet long; both are surpassed by some of the congers of our own coasts, and, like other murænoid fishes and the known small sea-snakes (*Hydrophis*), swim by undulatory movements of the body.

The fossil vertebræ and skull which were exhibited by Mr. Koch in New York and Boston as those of the great sea-serpent, and which are now in Berlin, belonged to different individuals of a species which I had previously proved to be an extinct whale; a determination which has subsequently been confirmed by Profesors Müller and Agassiz. Mr. Dixon, of Worthing, has discovered many fossil vertebræ in the Eocene tertiary clay at Bracklesham, which belong to a large species of an extinct genus of serpent (*Palæophis*), founded on similar vertebræ from the same formation in the Isle of Sheppey. The largest of these ancient British snakes was 20 feet in length; but there is no evidence that they were marine.

The Sea Saurians of the secondary periods of geology have been replaced in the tertiary and actual seas by marine mammals. No remains of Cetacea have been found in lias or oolite, and no remains of Plesiosaur, or Ichthyosaur, or any other secondary reptile, have been found in Eocene or later tertiary deposits, or recent, on the actual sea-shores; and that the old air-breathing saurians floated when they died has been shown in the 'Geological Transactions' (vol. v., second series, p. 512). The inference that may reasonably be drawn from no recent carcase or fragment of such having ever been discovered, is strengthened by the corresponding absence of any trace of their remains in the tertiary beds.

Now, on weighing the question, whether creatures meriting the name of "great sea-serpent" do exist, or whether any of the gigantic marine saurians of the secondary deposits may have continued to live up to the present time, it seems to me less probable that no part of the carcase of such reptiles should have ever been discovered in a recent or unfossilized state, than that men should have been deceived by a cursory view of a partly submerged and rapidly-moving animal, which might only be strange to themselves. In other words, I regard the negative evidence, from the utter absence of any of the recent remains of great sea-serpents, krakens, or Enaliosauria, as stronger against their actual existence than the positive statements which have hitherto weighed with the public mind in favour of their existence. A larger body of evidence from eye-witnesses might be got together in proof of ghosts than of the sea-serpent.

Description of a new species of Smynthurus (*S. baulastinus*). By J. Hardy, Esq.

This small species of *Smynthurus* was very abundant upon the leaves of potatoes and other plants in gardens, deriving its sustenance from their sap. The leaves, apparently in consequence, had numerous minute black spots dispersed over their surface, and to it, while the aphis theory raged, was ascribed, in a provincial paper, the blackening of the potato leaves which accompanies the potato disease, and forms its external symptoms. It is a minute insect, about the size of a small pin-head; the head is small and rounded; the body, consisting of the thorax and abdomen confounded in a single mass, oval or subquadrate, broadest behind, and looking as if the insect wore a cloak. The head, the general colour of the body above, and its apex are light yellow, and there is an orange cloud or some irregular maculæ of that colour posteriorly; the body is very pale beneath, as are the legs and antennæ; and there are six white spots (or fewer), three on each side behind the posterior legs; the head is slightly dusky in front, and the eyes are black. It is furnished beneath with a leaping-fork, of a pellucid white, which is fastened behind, and lies along the belly in a state of repose; but, by projecting it backwards at will, the insect is propelled forwards with a rapid jerk. It usually falls on its back, and takes some time to recover its upright position, which after a struggle it often does by seizing some adjacent object with its legs. It runs rather quickly.—*From the Gardeners' Chronicle for Nov.* 18.

The Liquidamber Tree of the Tenasserim Provinces. By the Rev. F. Mason.

"Did you ever see in this country the tree which produces the balsam of tolu?" a gentleman once asked the writer. "I never did," was the reply. "I have one in my compound," he continued; but unfortunately his compound was two hundred miles distant. Years passed away and I found myself beneath this tree in flower, and soon discovered that it was not *Myrospermum toluiferum*, but *Liquidamber altingia*; and that it produced, not balsam of tolu, but liquid storax.

The tree is indigenous on the coast, and in some sections is quite abundant. A considerable stream in the province of Mergui derives its name from this tree, in consequence of its growing so thick on its banks. It seems to have escaped the notice of Dr. Helfer, for, if I recollect right, it is not once alluded to in any of his reports, nor has it ever been brought to notice by any one; if we except a Catholic priest, a resident of Rangoon, who has introduced it in a little Burmese medical treatise that was lithographed a few years ago by Col. Burney, who took a lithographic press with him into Burmah.

The Padre seems however to have been ignorant of botany, for he describes it as the tree which produces the balsam of Peru (*Myrospermum peruiferum*), and which belongs to a different natural family. The medicinal properties of their exudations too are materially different. Liquid storax, the production of this tree, is described by Lindley merely as "a stimulating expectorant substance—influencing the mucous membranes, especially that which lines the air-passages." The writer of the Burmese medical treatise recommends the exude of the tree for the usual purposes to which the balsam of Peru is applied, under the delusion that it is the same substance!

Here is a fine illustration of the fallacies of medicine. It is probable that this substance has been used in all the various cases many times by the author, and quite as much good done, and as wonderful cures effected, as if he had used the veritable balsam of Peru. And the same glorious effects are still being produced, for the book is in the hands of many natives and is highly valued, but no part more so than this, because it points them to a production of the country, while most of the medicines mentioned are foreign productions.

It seems to me that our liquid storax might be made an article of commerce, but I know not how it sells in the market.

The tree is called by the Burmans *Nan-ta-rouk.—From the Journal of the Asiatic Society of Bengal for June* 1848.

METEOROLOGICAL OBSERVATIONS FOR OCT. 1848.

Chiswick.—October 1. Densely overcast: clear. 2. Heavy clouds: fine: overcast. 3. Very fine. 4. Rain: cloudy. 5. Cloudy and mild: clear. 6. Very fine. 7. Slight fog: very fine: heavy rain. 8. Very fine: heavy rain. 9. Rain. 10. Cloudy. 11, 12. Clear and fine. 13. Clear: cloudy. 14. Rain. 15, 16. Hazy: rain. 17, 18. Cold rain. 19. Cloudy. 20. Cold rain. 21. Rain. 22. Rain: clear. 23. Overcast: rain. 24. Very clear: overcast: rain. 25. Boisterous, with slight rain. 26. Slight fog: fine: clear. 27. Heavy rain. 28. Heavy showers, with intervals of sunshine. 29. Low clouds: overcast: foggy. 30. Fine: overcast: foggy. 31. Foggy: rain at night.

Mean temperature of the month	49°·27
Mean temperature of Oct. 1847	52 ·14
Mean temperature of Oct. for the last twenty years	50 ·44
Average amount of rain in Oct.	2·56 inches.

Boston.—Oct. 1. Cloudy: rain early A.M. 2. Fine. 3. Fine: rain early A.M. 4. Rain. 5. Cloudy. 6. Fine. 7. Cloudy: rain early A.M. 8, 9. Fine. 10. Cloudy: rain A.M. and P.M. 11, 12. Cloudy. 13. Rain. 14. Cloudy: rain A.M. and P.M. 15. Rain. 16. Rain: rain early A.M. 17. Rain. 18. Snow and sleet. 19. Rain. 20. Fine: rain P.M. 21. Fine. 22. Rain. 23. Fine: rain P.M. 24. Fine. 25. Rain: rain A.M. 26. Fine. 27. Rain: rain A.M. and P.M. 28. Fine: rain P.M. 29. Cloudy. 30. Fine: rain P.M. 31. Foggy

Applegarth Manse, Dumfries-shire.—Oct. 1. Drizzling day. 2. Fair A.M.: slight drizzle P.M. 3. Fine: threatening P.M. 4, 5. Very wet. 6. Fair: strong wind. 7. Slight showers: cleared P.M. 8. Showers A.M.: cleared: shower P.M. 9. Showers. 10. Slight showers. 11. Fair, but dull. 12. Slight showers. 13, 14. Fair and clear. 15. A very slight shower: cleared P.M 16. A very slight shower. 17. Bright and fair: snow-shower seen at a distance. 18. Frost: aurora borealis. 19. Frost. 20. Frost, but mild. 21. Slight rain. 22. Heavy rain all day. 23. Rain morning and evening. 24. Heavy rain early, morning. 25. Rain early: cleared: fine. 26. Frost: fine: shower P.M. 27. Threatening rain: heavy P.M. 28. Rain: hail: thunder. 29. Frequent showers. 30. Raw frost A.M.: rain P.M. 31. Rain all day.

Mean temperature of the month	46°·5
Mean temperature of Oct. 1847	49 ·5
Mean temperature of Oct. for the last twenty-five years	46 ·6
Average amount of rain in Oct. for twenty years	3·56 inches.
Rain in Oct. 1847	5·09 ,,

Sandwick Manse, Orkney.—Oct. 1. Drizzle. 2. Bright: clear: aurora. 3. Damp: clear: aurora. 4. Rain: aurora. 5, 6. Cloudy. 7. Bright: clear: aurora. 8. Fog: clear: aurora. 9. Rain: clear. 10. Showers: clear: showers. 11, 12. Cloudy. 13. Fine: hoar-frost: clear. 14. Cloudy. 15. Clear: cloudy. 16. Showers: hail-showers. 17. Snow-showers: hail-showers. 18. Snow: snow-showers: aurora australis. 19. Snow: clear: aurora. 20. Clear: aurora. 21. Damp: showers: aurora. 22. Drizzle. 23. Showers: clear: aurora. 24. Rain: clear: aurora. 25. Showers: clear: aurora: hoar-frost. 26. Showers: cloudy: hoar-frost. 27. Damp: showers. 28. Rain: clear. 29. Shower: thunder: shower: clear. 30. Shower: thunder: shower: clear. 31. Clear: hoar-frost: clear.

Meteorological Observations made by Mr. Thompson *at the Garden of the Horticultural Society at* Chiswick, *near London; by* Mr. Veall, *at* Boston; *by the* Rev. W. Dunbar, *at Applegarth Manse*, Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse*, Orkney.

Days of Month.	Barometer.							Thermometer.								Wind.				Rain.			
	Chiswick.		Boston.	Dumfries-shire.		Orkney, Sandwick.		Chiswick.		Boston.	Dumfries-shire.		Orkney, Sandwick.									
1848. Oct.	Max.	Min.	8¾ a.m.	9 a.m.	9 p.m.	9¼ a.m.	8½ p.m.	Max.	Min.	8¾ a.m.	Max.	Min.	9¼ a.m.	8½ p.m.	Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.
1.	29·681	29·673	29·16	29·40	29·46	29·47	29·48	63	39	56	56½	52	54	53	sw.	s.	w.	se.	......	·30	......	·05
2.	29·688	29·604	29·29	29·49	29·43	29·60	29·60	67	46	54	59	47	53	52	s.	calm	e.	se.	·03	......	......	·09
3.	29·940	29·711	29·22	29·49	29·49	29·57	29·54	67	49	56	59½	47½	55	52½	sw.	calm	e.	se.	·04	·09	......	......
4.	29·988	29·804	29·23	29·37	29·61	29·28	29·54	65	58	60	59	50	54	52½	sw.	calm	sse.	ssw.	·01	·14	......	·50
☽ 5.	30·151	29·588	29·46	29·76	29·81	29·74	29·82	67	49	60·5	61	55	55½	52	sw.	calm	sw.	ese.	......	......	......	·24
6.	30·143	30·124	29·54	29·77	29·98	29·48	29·85	74	49	62	64	57	57½	54	sw.	sw.	sw.	w.	......	......	......	......
7.	30·128	30·030	29·59	29·92	29·90	30·00	29·94	73	50	62	62	48½	51½	49	sw.	calm	sw.	e.	......	·08	......	·05
8.	30·092	30·011	29·43	29·74	29·78	29·65	29·63	68	46	63	60	53½	54	50	w.	calm	wsw.	ssw.	......	......	1·55	......
9.	30·013	29·758	29·39	29·68	29·51	29·52	29·48	62	46	57	56	49	53	45	sw.	calm	sw.	calm	·06	......	......	·39
10.	29·803	29·652	29·11	29·54	29·80	29·75	29·94	59	41	55	58½	46	52	50	w.	calm	nw.	n.	......	·94	......	·07
11.	29·927	29·793	29·45	29·88	29·90	29·98	30·02	60	35	51	55½	42½	48½	48	nw.	calm	nw.	n.	......	·15	......	·07
○ 12.	29·975	29·946	29·52	29·93	30·02	30·04	30·21	56	38	47·5	54	35	48	47	n.	calm	nw.	n.	·01	......	......	·01
13.	30·041	29·997	29·60	30·18	30·20	30·34	30·42	58	44	51	55	42½	48	47	ne.	n.	ne.	calm	·02	·32	......	......
14.	30·046	30·005	29·70	30·22	30·17	30·42	30·36	54	40	53	54	40	47	47	ne.	n.	nne.	ne.	·14	·38	......	......
15.	29·815	29·755	29·35	30·04	29·88	30·27	30·18	52	41	50	56	42	49½	46½	nw.	nne.	nne.	ne.	·21	·10	......	......
16.	29·749	29·697	29·34	29·82	29·86	30·05	30·13	54	44	50	55½	45½	45	39	ne.	nne.	nne.	n.	·04	·25	0·15	......
17.	29·944	29·808	29·44	29·94	29·90	30·10	30·04	49	33	47	50½	40½	37	32½	ne.	n.	nnw.	n.	·02	·10	......	·15
18.	29·636	29·550	29·28	29·77	29·78	30·01	30·03	42	36	36	41	30½	33½	34	n.	nnw.	n.	nne.	·04	·12	......	·16
☾ 19.	29·738	29·596	29·34	29·80	29·90	30·04	29·98	50	41	45	45	32½	36	39	ne.	n.	n.	s.	·01	·03	......	·18
20.	29·789	29·747	29·52	29·97	29·94	30·04	30·05	50	41	48	46½	29	41½	39½	ne.	ne.	nne.	s.	·34	·03	......	·03
21.	29·887	29·759	29·42	29·81	29·70	29·97	29·90	53	29	47	51	29½	46	46	ne.	e.	ne.	ese.	·10	·24	......	·06
22.	29·720	29·594	29·33	29·49	29·30	29·79	29·66	58	36	45	54	40½	46	47	s.	e.	e.	e.	·12	·06	......	·16
23.	29·624	29·487	29·22	29·35	29·28	29·49	29·44	56	44	48	49	43	49	44	sw.	s.	se.	ne.	·56	......	0·53	·20
24.	29·536	29·493	29·04	29·08	29·30	29·19	29·30	60	47	50	50	41½	47	47	sw.	s.	sw.	n.	·15	·64	......	·28
25.	29·652	29·163	28·73	29·24	......	29·28	29·46	56	31	48	...	35	41	40	w.	nne.	nw.	n.	·02	·66	......	·11
26.	29·861	29·812	29·46	......	29·60	29·58	29·76	61	38	44	62½	...	39	36	s.	ssw.	sw.	e.	·08	·18	......	·10
● 27.	29·488	29·280	29·05	29·30	29·09	29·50	29·25	56	43	51	53	43½	50½	50	s.	se.	se.	e.	·39	·06	......	·03
28.	29·594	29·452	29·03	29·06	29·20	29·32	29·34	54	37	50	50	41½	46½	47	sw.	s.	se-sw.	e.	·34	·23	......	·45
29.	29·511	29·493	29·10	29·33	29·40	29·44	29·57	53	31	48	48	38	47½	45	sw.	s.	sw.	ne.	·01	·12	......	·19
30.	29·528	29·498	29·17	29·44	29·46	29·67	29·72	56	32	45	46½	35½	45½	48½	sw.	se.	se.	calm	·07	......	1·97	·25
31.	29·566	29·545	29·18	29·48	29·50	29·75	29·72	50	38	43	44½	41½	40	37	sw.	calm	se.	calm	·12	·11	......	·15
Mean.	29·814	29·658	29·31	29·643	29·671	29·752	29·785	58·16	40·38	51·0	50·5	42·5	47·46	45·69					2·93	5·33	4·20	3·97

INDEX TO VOL. II.

END OF THE SECOND VOLUME.

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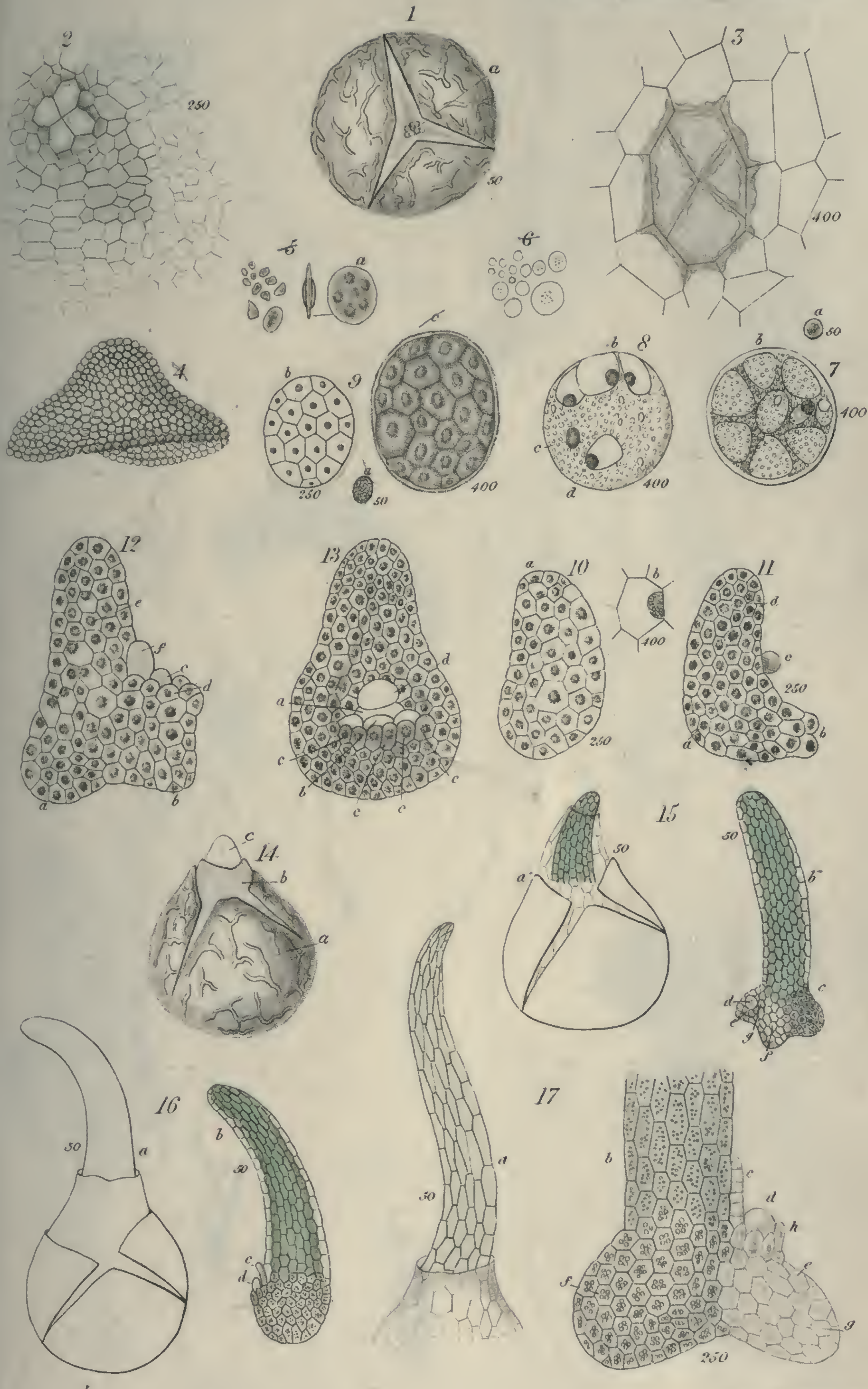
ALERE FLAMMAM.

Antrophyum Grevillii.

Dr. Greville del.

J. De C. Sowerby sc.



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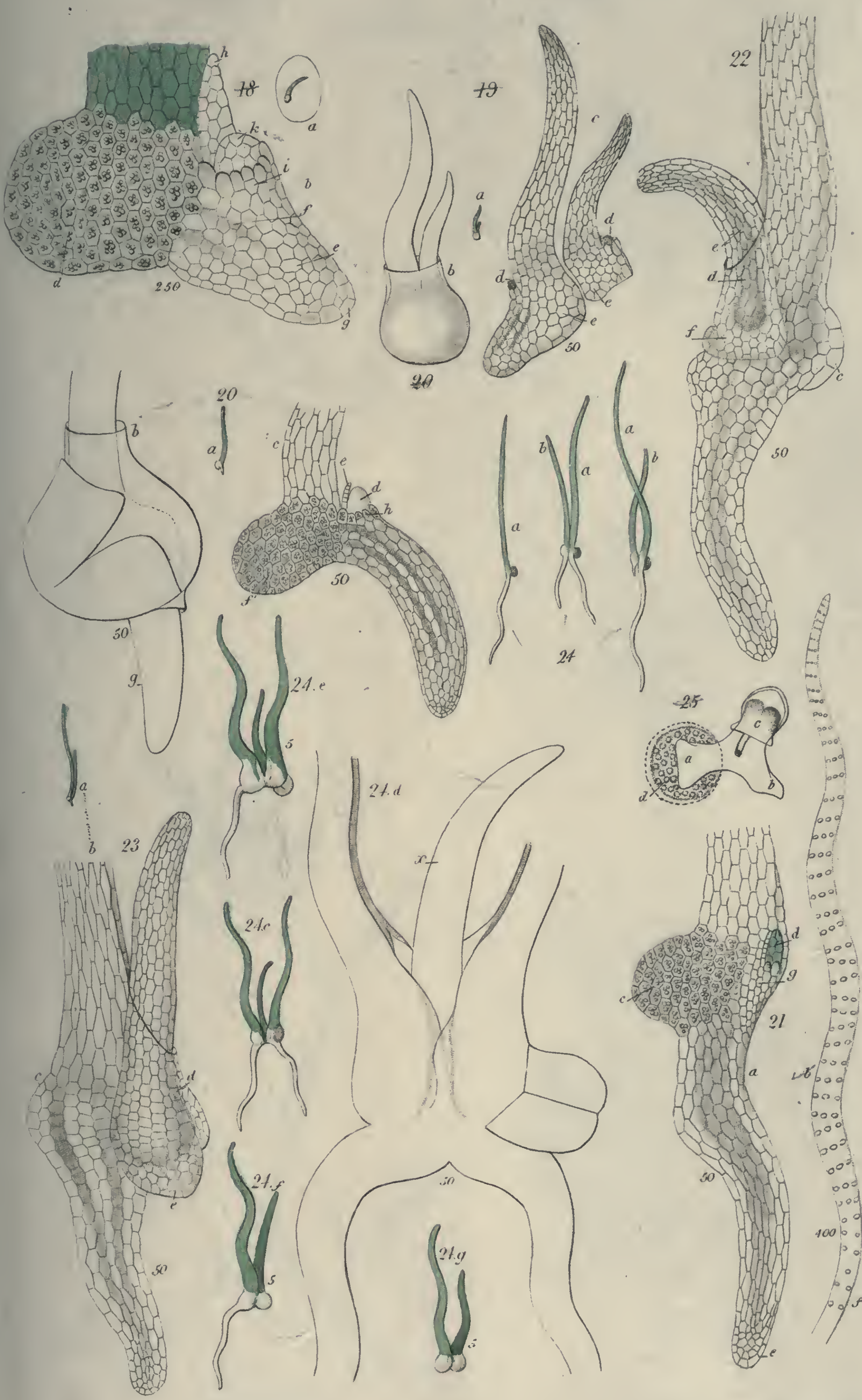


J. De C. Sowerby sc.

Sargassum Henslowii.

S. Vachellianum.

S. ornatum.

Dr Greville del

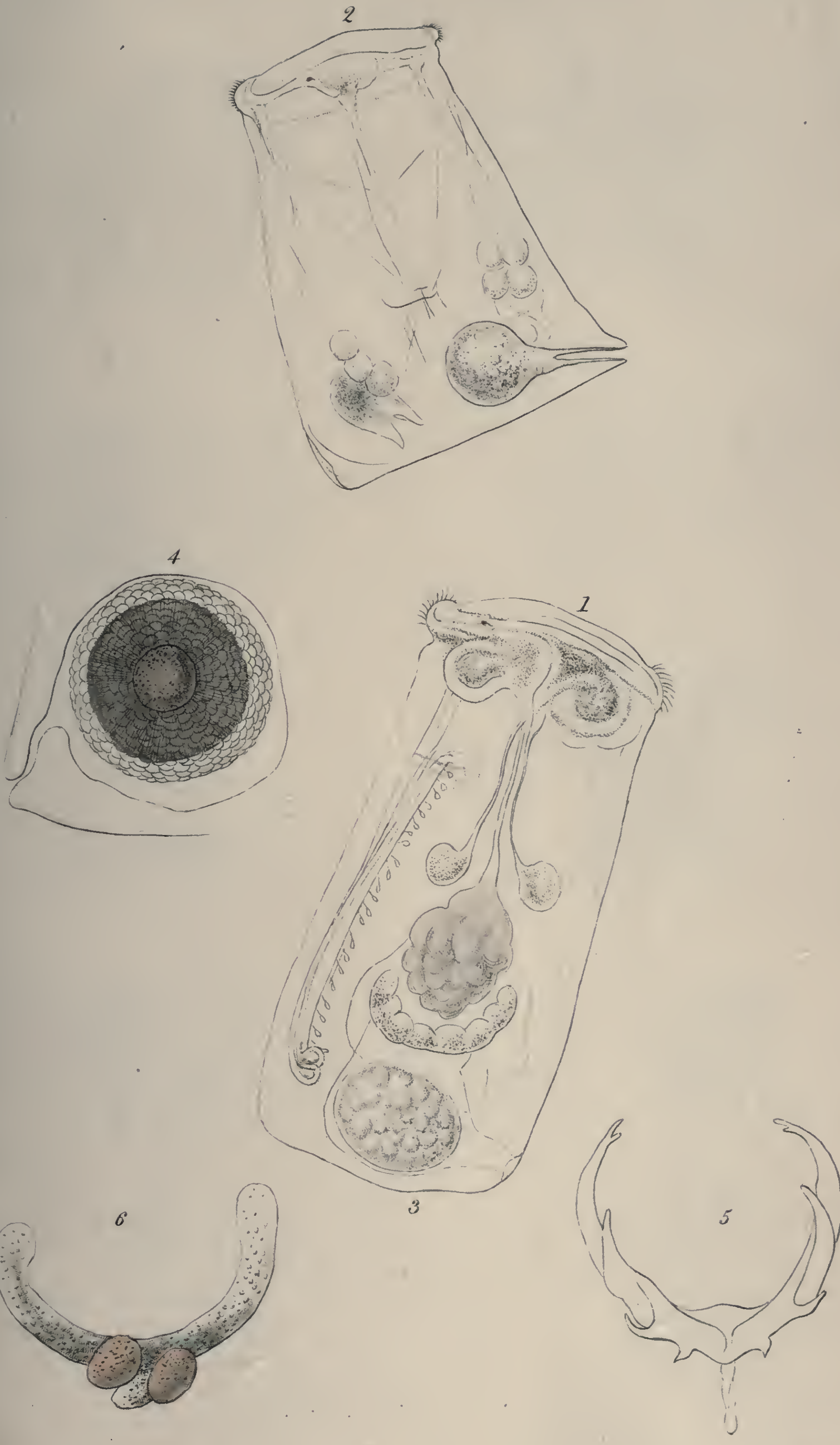
J. De C. Sowerby sc.

Sargassum echinocarpum.

S. Campbellianum.

S. debile.

W. Greville del. J. De C. Sowerby sc.

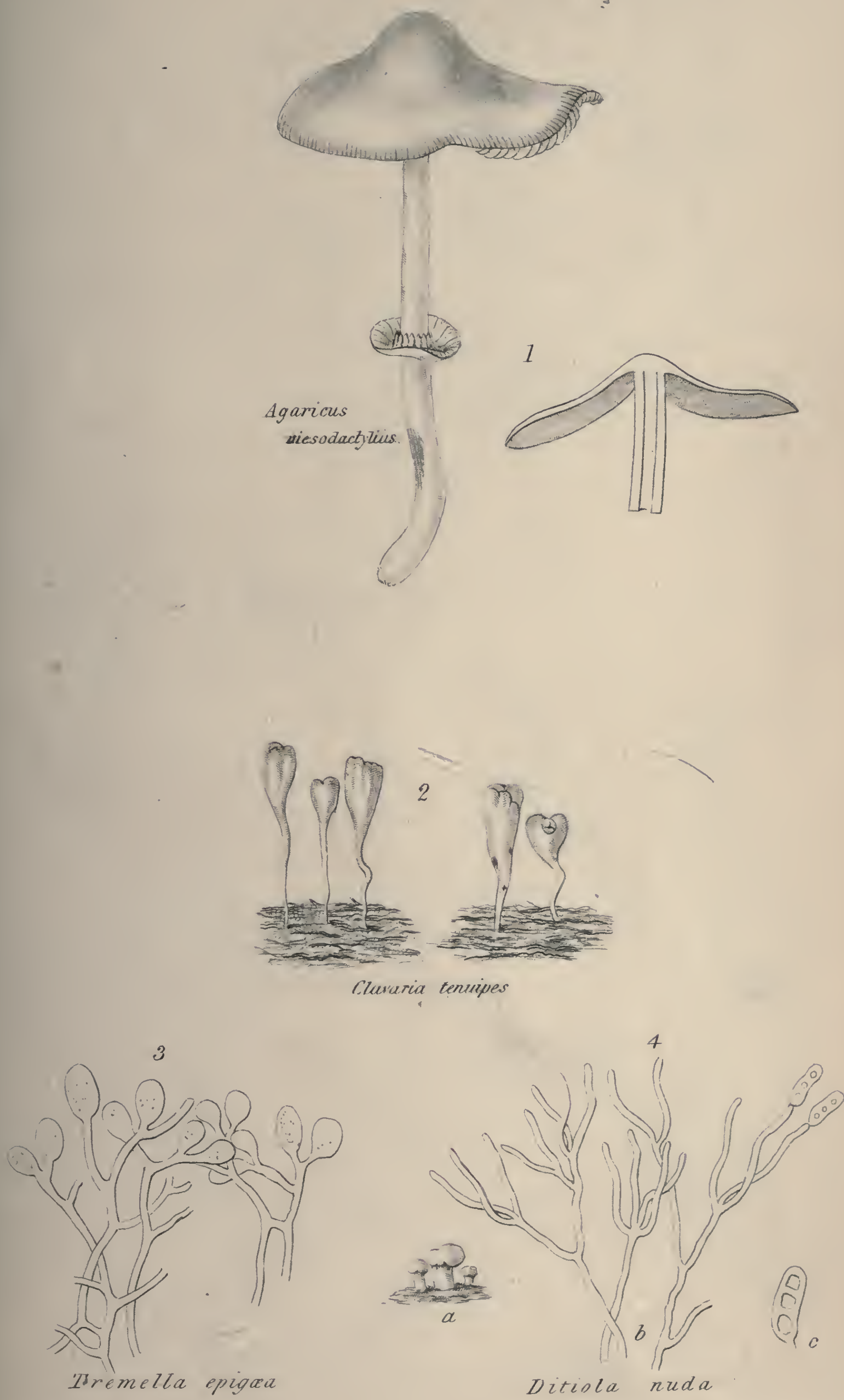


T. Brightwell del.

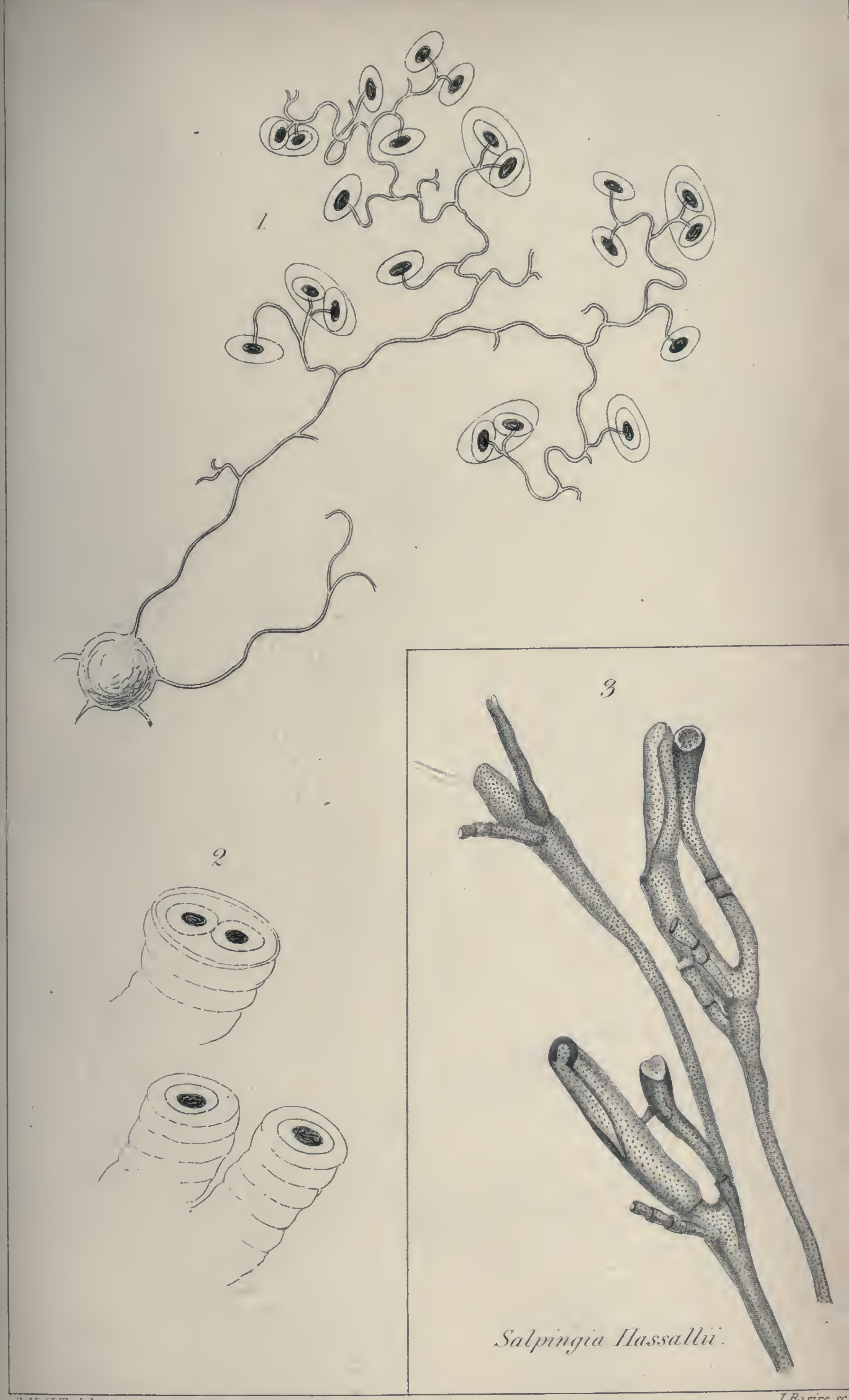
J. De C. Sowerby sc.

Dr. Dickie del.	J. De C. Sowerby sc.

J. Basire sc.



Revd. M.J. Berkeley del.t J.De.C.Sowerby sc.

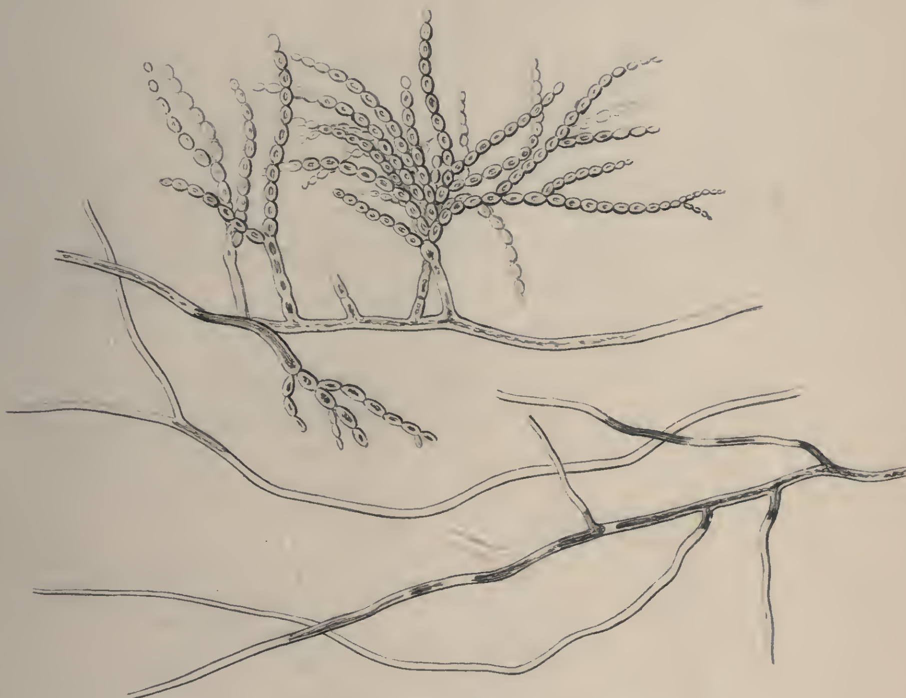


Salpingia Hassallii.

G.H.K.T. del. J. Basire sc.

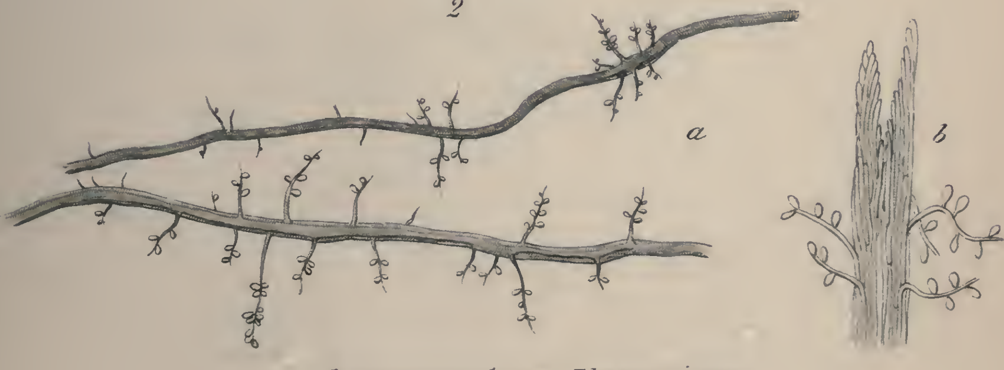
Limnea Burnetti.

1 B



Penicillium curtipes.

2



Brachycladium Thomasinum.

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1

2

Streptothrix spiralis

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C. F. Schmidt del.

Sargassum lanceolatum

S. acanthicarpum

S dumosum

Dr Greville del. J. De C. Sowerby sc.

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